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Presidential Address delivered by R. C. DUTT, Esq., C. I. E.

YOU have done me high honour by selecting me President of this First Industrial Conference held in India in connection with the National Congress. Impressed with the growing need for the expansion of our industries, that great and representative body has held an Industrial Exhibition from year to year; all classes of manufacturers, European and Indian, have sent in their goods to these Exhibitions; and the Government of India and Provincial Governments have generously helped and fostered their growth. This year, you have taken a new departure; you have felt that, beyond exhibiting our goods we might, as practical men, compare notes with each other in reference to the various industries with which we may be familiar; and you have resolved therefore to hold an Industrial Conference as a necessary adjunct to the Industrial Exhibition. For the rest, the object of this Conference is the same as that of the Industrial Exhibition, viz., the promotion of Indian Industries. We meet here to-day, not to discuss political or social questions, but purely industrial questions; and we invite practical suggestions from practical men of all classes,—Hindu and European, Mahomedan and Parsee,—who are familiar with various Indian trades and industries.

## TWO EXTREME VIEWS: THE TRUTH LIES MIDWAY.

Gentlemen, there are two extreme views often expressed about our Indian industries, both of which I believe to be wrong. One is a despondent view,—a cry of despair,—that Indian industries have no future against European competition, and that India is sinking lower and lower as a purely agricultural country. The other is a roseate view,—that the trade of India is increasing by leaps and bounds under the British Rule, and that the increasing figures of Indian imports and exports are an index to the growth of Indian manufactures and of the prosperity of the people. I have seen the first view,—the despondent view,—expressed in its extremest form in our Indian newspapers. And I have heard the second view expressed in meetings held in London by Englishmen, who naturally take the trade figures as an index to the prosperity of a nation.

As usual, the truth lies midway. We are beset with grave difficulties, but we have no reason to

despair. Our industrial condition in the present day is lamentable, but it is not hopeless. We have to face a severe, and in some respects an unequal competition, but our future is in our own hands if we face our difficulties like men. Let us, to use an expressive phrase of Dr. Johnson, clear ourselves of cant; let us examine our position impartially and soberly as practical men.

Our difficulties are of a two-fold nature. In the first place our old industries have undoubtedly declined, and we have to recover lost ground. In the second place we have to recover our position under exceptional economic conditions which few nations on earth have to face. Our two difficulties may be briefly described thus:—Firstly, other competitors have got the start of us; and secondly, we are unfairly handicapped in the race.

## OUR FIRST DIFFICULTY.

It would serve no useful purpose to narrate at length the manner in which our old industries have declined in a competition which was not altogether fair. I have written largely on this subject in my published works, and may only briefly refer to a few facts to-day. For many centuries past, the manufactures of India were prized in the markets of Europe and Asia; and Arab and Portuguese merchants, Dutch and English traders, shipped large consignments of Indian goods to various ports in the world. In those days there was no thought of repressing Indian industries; on the contrary, it was the interest of the foreign traders to foster them, as far as it was in their power to do so, because the excellence and the largeness of Indian manufactures were the sources of their own gain and profit.

But when England acquired political power in India in the middle of the eighteenth century,—this policy was reversed. Englishmen were manufacturers themselves, and it was their policy in those days to repress the manufactures of their own Colonies in order to promote their own. The same policy was unfortunately pursued in India; and, for the first time in the history of India, her manufacturing industries were discouraged, instead of being encouraged. The export of Indian manufactures to Europe was repressed by prohibitive duties, and the import of English manufactures

into India was facilitated by the levy of almost nominal duties. The idea was to make India a country of raw produce for the promotion of English manufacturing industries. The British manufacturer, in the words of the historian H. H. Wilson, "employed the arm of political injustice to keep down, and ultimately strangle, a competitor with whom he could not have contended on equal terms."

Among all the Indian industries of the eighteenth century, the textile industry was the most extensive; and the invention of the power-loom in England completed the ruin of that industry which a system of unfair tariffs had begun. I do not wish to place before you elaborate statements to-day, but a few figures, showing the decline of our cotton manufactures in the first quarter of the 19th century, have a melancholy interest.

The export of cotton piece goods from Calcutta to the United Kingdom was over 6,000 bales in 1801, over 14,000 bales in 1802, and over 13,000 bales in 1803; it never reached a thousand bales after 1826. The export of the same goods from Calcutta to America was over 13,000 bales in 1801; it dwindled to less than 300 bales by 1829. Denmark took over 1,400 bales in 1800, but never took more than 150 bales after 1820. Portugal took nearly 10,000 bales in 1799 but never took over a thousand bales after 1825. And the exports to the Arabian and Persian Gulfs, which rose to between four and seven thousand bales between 1810 and 1820, never exceeded 2,000 bales after 1825. The export of cotton piece goods from Calcutta to the different countries of the earth practically disappeared within the first quarter of the nineteenth century, and what was true of Calcutta was true of every other part in India.

It is needless to say that, while the export of cotton goods from India declined, the import of cotton goods into India from Europe rose by leaps and bounds. By 1858, which was the year when the late Queen assumed the direct administration of India, the value of cotton goods imported into India had reached nearly 5 million pounds sterling. By 1877, which was the year when Her Gracious Majesty assumed the title of Empress of India, the value of the cotton goods imported into India had reached nearly 16 millions sterling. This steady increase in the import of cotton piece goods is often quoted as a mark of India's increasing prosperity. But is there any practical man in India who does not see in these figures the decline of the most extensive

of Indian industries, and therefore a loss in the wealth of the nation? I will not dwell longer on this point; I have said enough to show how we have lost ground in the past; I will now turn to our second difficulty, the economic conditions which we have to face in our endeavour to recover our position.

#### OUR SECOND DIFFICULTY.

Gentlemen, we will not consent to see our country made a land of raw produce, or a dumping ground for the manufactures of other nations. I do not believe a country can prosper by agriculture alone, any more than a country can permanently prosper by manufactures alone; the two must thrive side by side to give employment to the population of a country. I do not envy the position of England to-day which has so far neglected her agriculture as to be dependent on foreign nations for her food-supply; that state of things cannot last for ever. On the other hand, I do not appreciate the position of our own country which is dependent on foreign countries for most of the manufactured articles required for daily use. We must rescue her from that unhappy position, but in order to do so, we must clearly see and understand the difficulties we have to face.

In the first place we have to change an ancient and time-honoured habit, the habit of carrying on our industries in our homes and cottages. India is a country of cottage industries. Each agriculturist tills his own little field, pays his rent, and transmits his holding to his son. Each humble weaver, with the aid of his wife and children, adjusts his warp and works his loom. I am myself partial to this cottage industry. The tillers of the soil, who own their little plots of land from generation to generation, are more dignified beings than the labourers who live on their landlord's vast estate, and earn only the wages of labour. The humble weavers, working with their wives and children in their homes, live better and more peaceful lives than men and women working in crowded and unwholesome factories. The dignity of man is seen at its best when he works in his own field or his own cottage,—not when he is employed at a part of a vast machine which seems to crush out all manhood and womanhood in the operatives. I have seen many of the largest cotton mills of Lancashire, and the thousands of factory lads and factory girls employed there; and I would not like to see any very large proportion of our labourers

so employed. And those who ought to know, tell us that the fresh air of the country is the best suited for building up strong constitutions, and that a race deteriorates, when it neglects rustic industry and lives mostly in towns. But nevertheless, while we may avoid the mistake of sending all our population to towns, we must at the same time learn to create large centres of industry in towns. We must change our old habit of universal cottage industries, and learn to form companies, erect mills and adopt the methods of combined action, if we desire to protect or revive our industries.

But the formation of companies and the erection of mills require capital, and the conditions in India are not favourable to the accumulation of capital. I do not wish to travel into political subjects to-day, but it is necessary to mention, what is known to every one of you, that the sources of wealth in this country are not as broad and spacious as in happier countries. Our land is more heavily taxed than it is in England or America or Japan, and the land tax in most Provinces is enhanced at each recurring Settlement. Our revenues are not all spent in India, a large portion of it is remitted for Home Charges year after year. And the highest and most lucrative appointments in the empire are not open to us. All these facts tell against the accumulation of capital needed for large enterprises, and our moneyed men are poor compared to those in other lands. A man owning half a lakh of Rupees is considered a rich man in India, while a man with only three thousand pounds in funds would hardly be deemed to have a decent competence in England.

Lastly there is the difficulty about our fiscal legislation which is oftener controlled by Lancashire than by us in this country. You all remember how Lord Lytton's Government was compelled to repeal the import duties on cotton goods against the advice and the vote of every Member of Lord Lytton's Council except Sir John Strachey and the Military Member. And when the import duties were reimposed, you remember how Lord Elgin's Government was compelled to impose an excise duty on the mill-produce of India to conciliate Lancashire. I know of no act in modern fiscal legislation more unwise and hurtful to an infant industry than the imposition of an excise-tax, unknown in any civilised country. And I know of nothing more humiliating to the Government of a great empire like India than the correspondence which you will find recorded in

Parliamentary Blue Books, leading to these fiscal changes.

#### NOW WE HAVE FACED THESE DIFFICULTIES.

These, then, are the difficulties before us. In the first place, we have lagged behind, and have to recover lost ground. And in the second place we have to run the race with the triple disadvantage of want of modern industrial training, want of capital, and want of control over our own fiscal legislation. I mention these difficulties not to discourage you, but because we have to face and conquer them. Few countries on earth would have succeeded under these difficulties, but I have faith in the capacities of our nation, in the patience and skill of our artisans, in the adaptability of our race to new methods, in the resources of this wonderful land, and in the advantages of cheap labour. I have been something of an optimist all my life; I think it better to fight and to fail than not to fight at all; but in this industrial movement I believe we are destined to fight and to conquer. I have no patience with those of my countrymen who throw up their hands in despair, and declare that all is lost! The history of the last twenty or thirty years shows that all is not lost, and that much has been gained.

Turning once more to the cotton industry, you are aware that we have adopted the power-looms invented in England; and have started mills in Bombay, in Nagpur, and in Ahmedabad, which are yearly increasing in number and in business, and promise in the new future to supply to a large extent the requirements of India. The hand-loom has not yet died out in India, and is not destined to die out; under the improvements effected by such friends and well-wishers of India as Mr. Chatterton, Mr. Churchill, and Mr. Havell, it has more than doubled its out-put, and promises to hold its own yet in the villages and rural tracts of India. Sericulture and silk-weaving are on the increase, and the demand for Indian silk is increasing in India from year to year. Woollen mills have been started in the Punjab and Northern India by enterprising Englishmen, whom I reckon among our true benefactors; and the woollen stuff which most of you are wearing to-day, and which I wear to-day, have been manufactured in India. Jute industry is increasing in Bengal by leaps and bounds, and before long jute will largely enter into fabrics woven in India. The aluminium industry is a new invention which has a great future; and the enamelled ironware of Europe will never replace our brass and copper



## THE FIRST INDUSTRIAL CONFERENCE.

articles, the use of which is rather on the increase than decreasing.

Lastly, coal and iron, which are the most effective means of extending all modern industries, are being worked in increasing quantities from year to year, and new iron ores have been discovered in Orissa which promise the most favourable returns. The possibilities of electricity being employed in manufacturing industries are also as great in India as in any other country.

The figures given below show that the production of cotton and woollen goods has increased nearly a hundred per cent. and fifty per cent. respectively, in recent years.

	1896—97	1904—05
Cotton goods ...	lbs.	lbs.
	82,933,000	158,747,000
	1894	1903
Woollen goods ...	lbs.	lbs.
	1,657,000	2,977,000

Gentlemen, these are some of the results which we have achieved in recent years, and all classes of men, Hindu and Mussalman, Englishman and Parsee, have helped in the onward march. I make bold to say that no other country in Asia, except Japan, has shown such industrial progress within the life time of a generation; and no country on earth, labouring under the disadvantages from which we suffer, could have shown more adaptability to modern methods, more skill, more patient industry, more marked success.

### THE SWADESHI MOVEMENT.

And now, at the commencement of the twentieth century, we are more resolved than ever not to be beaten in this industrial race. I see in the faces of those who fill this hall to-day a strong determination that—God helping—we will work out our own salvation by our own hands. Men educated in English Schools and Colleges in India, men trained in the Universities of Cambridge and Oxford, have come to share this noble work with practical manufacturers and traders in India. And to-day there is a desire, which is spreading all over India, that by every legitimate means, by every lawful endeavour, we will foster and stimulate the use of our own manufactures among the vast millions who fill this great continent.

Gentlemen, I am drifting into a subject which has raised much angry discussion, when I speak of the Swadeshi Movement. And yet I would not be fulfilling the duty which you have imposed

upon me to-day if I passed silently over that subject which is in every man's thought. I speak in the presence of some who are among the leaders of this movement in Bengal and speak from personal knowledge when I say that these leaders have tried their very utmost to conduct this movement lawfully and peacefully, to the best interests of the people and of the Government. If there have been any isolated instances of disturbance, here and there, we deprecate such acts. On the other hand, if the Government have, in needless panic, been betrayed into measures of unwise repression, we deplore such measures. But neither the rare instances of disturbance, nor the unwise measures of repression, are a part and parcel of the Swadeshi scheme. The essence of the scheme, as I understand it, is, by every lawful method, to encourage and foster home industries, and to stimulate the use of home manufactures among all classes of people in India. Gentlemen, I sympathise with this movement with all my heart, and will co-operate with this movement with all my power.

Gentlemen, the Swadeshi Movement is one which all nations on earth are seeking to adopt in the present day. Mr. Chamberlain is seeking to adopt it by a system of protection. Mr. Balfour seeks to adopt it by a scheme of retaliation. France, Germany, the United States, and all the British Colonies adopt it by building up a wall of prohibitive duties. We have no control over our fiscal legislation, and we adopt the Swadeshi Scheme therefore by a laudable resolution to use our home manufactures, as far as practicable, in preference to foreign manufactures. I see nothing that is sinful, nothing that is hurtful in this; I see much that is praiseworthy and much that is beneficial. It will certainly foster and encourage our industries in which the Indian Government has always professed the greatest interest. It will relieve millions of weavers and other artisans from the state of semi-starvation in which they have lived, will bring them back to their hand-loom and other industries, and will minimise the terrible effects of famines which the Government have always endeavoured to relieve to the best of their power. It will give a new impetus to our manufactures which need such impetus, and it will see us, in the near future, largely dependent on articles of daily use prepared at home, rather than articles imported from abroad. In one word, it will give a new life to our industrial enterprises; and there is nothing which the people of India and the

Government of India desire more earnestly than to see Indian industries flourish, and the industrial classes prosper.

Therefore, I sincerely trust that the Swadeshi Movement will live and extend in every Province and in every village in India. There should be Associations formed in every District to extend and perpetuate this movement, and to stimulate the use of country-made cloth and country-made articles, not only in towns, but in rural villages. Such Associations should peacefully and quietly extend their operations from year to year, disregarding the jeers of their critics, and braving the wrath of their opponents. Spasmodic and hysterical exhibitions should be avoided, for, as a great English writer remarks, strength consists not in spasms but in the stout bearing of burdens. Mindful of the great work we have to perform, we should work with the calm consciousness of doing our duty towards our countrymen. If we succeed in this noble endeavour, we shall present to the world an instance, unparalleled in the history of modern times, of a nation protecting its manufactures and industries without protective duties. If we fail in this great endeavour, and prove ourselves false to the resolutions we have formed and professed, then we shall deserve to remain in that state of industrial serfdom to other nations from which we are struggling to be free.

#### PROGRESS OF INDUSTRIES IN NATIVE STATES.

And now, Gentlemen, in concluding my remarks to-day, I think I should say a word or two about the progress of industries in Native States, which are not by any means backward in comparison with British Provinces. You have heard of the great endeavours made in Mysore to foster industries in all directions by modern methods. You have heard of the growing silk industry of Kashmir, and of the many flourishing industries of other States in India. And you have probably heard something also of the State which I have, at present, the honour of serving.

Gentlemen, the State of Baroda has the good fortune of being ruled by one of the most enlightened Princes in India. And no part of his administration receives his more earnest attention than the fostering of industries in the State. Over twenty years ago, when the people of Baroda scarcely knew of the value and importance of cotton mills, His Highness the Gaekwar

of Baroda started a State Mill to educate the people by an object-lesson, as it were. And now that the importance of cotton mills is so largely appreciated, the Maharajah has transferred the State Mill into private hands in order to foster private enterprise. Nor is he disappointed in his anticipations;—the success of one mill under private ownership has encouraged other capitalists; new companies have been formed and new mills are starting into existence; and before long we hope to be able to supply the needs of a large portion of the people of Baroda, and outside Baroda.

Hand-loom still have a great future, and the Gaekwar of Baroda has established a school of weaving which teaches the use of improved hand-loom, brought from Bengal, from Ahmednagar and elsewhere, to a large number of students. It is hoped that these weaver boys, when they have learnt the lesson, will introduce the improved hand-loom in their own villages, and in all weaving centres.

We have a Technical Institute which teaches mechanical industries to all classes of students. The success of this institute is so pronounced that the Government of the Central Provinces of India grants scholarships to boys of those Provinces to proceed to Baroda and learn industries there.

One Baroda student, educated at this Technical Institute, has started a dyeing factory which sends out large quantities of dyed cloths to all parts of India, and even to Rangoon. Another Baroda man, educated in Europe, has started a chocolate factory which I hope, will soon send delightful little packets to little children in all parts of India. And an ingenious District Officer in Baroda, who also received his education in Europe, has been successful in the preparation of cigarettes from Baroda tobacco, and is now busy with the manufacture of matches,—I suppose for lighting his own cigarettes!

Gentlemen, those of you who have been over the Exhibition grounds will have seen some Baroda girls who are making laces for use by our Indian ladies. And when I add that students have been sent, this year, from Baroda to Europe, to America, and to Japan, at State expense, to learn different industries, you will admit that the quiet, retiring, and silent worker, who rules Baroda, is not the least earnest and patriotic among the many earnest and patriotic men, who are devoting themselves to-day to foster and revive the industries of India.

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# HAND-LOOM WEAVING IN INDIA.

By RAOJI. B. PATEL, M.R.A.C., Director of Agriculture and Industries, Baroda State.

## THE HAND-LOOM INDUSTRY IN INDIA.

**H**AND-LOOM weaving is the largest industry in India next to agriculture and it is also the oldest. There is some difference of opinion as to which country or nation can claim the honour of inventing the art of weaving, but most probably, there was an independent development in every old country. The Indian hand-loom as it now is, is the same as it was, some thirty centuries ago, and has still survived the competition of the power-loom. With the extension of rapid and cheap transit, however, which is bringing the products of the power-loom to the remotest corners of India, the decline in the industry is rapid; and unless something is done to give it a fresh impetus, the Indian hand-loom, will have to go the way of her more advanced sister of the West, before her formidable rival, the power-loom. Hand-loom weavers in India are engaged in weaving cotton, silk, and woollen fabrics, but the cotton industry being the largest, requires our best and the first consideration, and that is the branch to which I shall confine myself in this paper.

### NUMBERS ENGAGED.

It appears from the Census of 1901, that there are in all India about 27 lakhs of hand-loom weavers of cotton fabrics, supporting an equal number of dependents. To what extent this number has decreased as compared with the number ten, twenty, or thirty years ago, is difficult to find. The headings in the Census tables have been changed at each Census. The number of hand-loom weavers as a class was never before separated, nor does the last Census give their territorial distribution. It is, however, a patent fact, that the industry has been slowly but steadily declining, since, the introduction of Manchester piece goods into India. Taking the principal weaving castes in India, it appears that between 1891 and 1901, all the weaver castes have held their own in point of population, better even than others, excepting the Panka weavers of Central Provinces, who lose 15 per cent. against a general decrease in population

Name of weaver caste.	Provinces.	Strength in 1901.	Per cent. increase or decrease of general population compared with 1891.	Per cent. increase or decrease of weaver caste compared with 1891.	Percentage of actual workers following traditional occupation.
Tanti and Tetwa ...	Bengal ...	9,46,463	+4	+18	38
Sali and Kosti ...	Bombay ...	1,41,052	-2	+9	63
Koshti ...	Central Provinces ...	1,36,079	-9	-14	73
Panka ...	Do. ...	1,37,855	*	-15	72
Kilokan ...	Madras ...	*	*	*	50
Sali ...	Do. ...	3,25,912	+7	+5½	69
Julaha ...	North West Provinces.	9,23,042	+1½	+2½	*
Kori ...	Do. ...	9,95,680	+7	+7½	*
Julaha ...	Punjab ...	6,96,216	+7	+4	*

\* Not available.

of 9 per cent. on account of the famines. Curiously enough, this is the only caste in which all but 27 per cent. have left their ancestral art. The Bengal weavers are the next in order of renegades with 38 per cent. while nearly two-thirds of the weavers in Bombay, are still weavers, notwithstanding the strongest competition of local mills and foreign goods. The Koshtis of the Central Provinces lead all other weavers, with 73 per cent. sticking to their traditional occupation.

### PRODUCTION OF HAND-LOOMS.

To obtain an idea of the present production of the hand looms is still more difficult. Mr. Robertson says in his review of the trade of India in 1904-05, that the production of cloth by the hand-weaving industry is probably double that of the Indian mills. The mill production of cloth is 15·87 crore lbs. or about 67 crore yards. At this rate the hand-loom production would be 31·74 crore lbs. or 134 crore yards.

The yarn imported into India is 2.75 crore lbs. and the yarn produced by the Indian mills is .. .. .	57.84 crore lbs.
Making a total of .. .. .	60.59 crore lbs.
Deducting the yarn exported and re-exported amounting to .. .. .	25.01 crore lbs.

The yarn consumed annually in India is .. .. . 35.58 crore lbs.

In parts of the country remote from the railway and markets, a certain amount of yarn is still spun by the wheel, but this may be taken as more than compensated for, by the amount of mill yarn put to uses other than weaving. On this computation Mr. Robertson's rough estimate seems fairly correct and the total cloth production of the hand-looms may be taken, at not more than a hundred and fifty crore yards. This divided among the 27 lakh weavers gives an average output of 555 yards per weaver per annum, or 5½ feet per day at 300 working days in the year. This seems such a miserable return that further inquiry into the subject seems necessary.

CONSUMPTION OF CLOTH.

The import of cotton piece-goods into India in 1904-05 is .. . . .	228 crore yards.
The mill production .. .. .	67 Do.

Total .. .. .	295	Do.
Deducting exports and re-exports .. .. .	17	Do.
This leaves for consumption .. . . .	278	Do.

The total population is 29½ crores, and allowing 15 yards per head per annum of cotton cloth, which would be a very fair average for a poor country like India, the total consumption would be 442½ crore yards. The difference between this demand and the mill supply is 164½ crore yards, the probable production of hand-looms. This calculation increases the average daily output by only six inches, and makes it a full fathom.

THE ACTUAL WORK OF THE WEAVER.

Let us now look into the Indian weavers' home and see if we can find a solution. The Census tells us that among the weavers, there are half workers and half dependents. It also tells us that there is an average of four in an Indian family, and we may fairly take it that the weaver is not an exception. Thus in a family of four, two are workers and two dependents. One of the two is at the loom, while the other winds the thread on the shuttle bobbins, gives out the warp by parts when neces-

sary, helps the weaver in drawing the warp thread through healds and reed, and attends to other odd jobs. The warping and sizing is usually done by warp makers and sizers, and the weaver weaves either for himself or for a merchant, technically called the Putter out, who employs him. The drawing requires about 2½ days of the weaver and his mate, and when the same class of pieces are to be woven one after another, a day and a half for twisting in. The warp is generally short, ranging from 18 to 50 yards according to the class of weaving, and on an average the time taken up in drawing is about half of that taken in weaving. Calculating on this data we find, that out of every two taken as actual workers, one alone weaves on the loom, and that one also, has to pass two-thirds of his time in weaving and one-third in drawing. Thus of every two weavers in the Census, only two-thirds of a person or one-eighth of the whole number is at actual work on the loom. With the hand-loom making an average of 25 picks per minute, the daily production of a loom would range from about 3 yards to 10 according to the kind of cloth and would average about 6 yards. A third of this or 6 feet, is once again the daily output of cloth per person engaged in the industry.

PROSPECTIVE.

I do not think that this should at all discourage us. Think for a moment of the 27 lakhs of weavers, who have successfully withstood the competition of the power-loom, notwithstanding this miserable output and you will at once be convinced, not only that they will be hard to beat, but also, that any fresh impetus given to their industry, will once again make them even the masters of the situation.

If we can but raise his average from 6 feet to 6 yards or even to 5 yards a day, we can make him strong enough to withstand competition and at the same time obtain an additional supply of cloth, even exceeding the total imports of India from Manchester. This, gentlemen, I understand to be the intention of this Conference. Most of us probably believe, as I myself did a few months ago, that when we have increased the working speed of the hand-loom to 80 or a 100 picks per minute, we shall have done all that is needed for this consummation. That, I am afraid, will be only partially true, as I shall show you by an example, and by taking you deeper into the web of the weaving business.

FLY-SHUTTLE IN ENGLAND.

The English hand-loom before 1738 was almost exactly like the Indian hand-loom of to-day. It

had just the same three motions of shedding, picking and putting the weft in place, performed in the same way. The two feet raised the heddles alternately, to form a shed in the warp, one hand threw the shuttle with the weft thread through and being disengaged, gave a slight blow with the reed-sley to put the weft in position. The other hand caught the shuttle emerging on the other side, and as soon as a shed was formed again, it did from that side what the other hand did before. This alternation of hands, both with the shuttle and the reed, took a lot of time, and the average work was 25 picks a minute, the same as in the Indian hand-loom. In 1738 John Kay invented the fly-shuttle. The alternation of hands was stopped and one hand gave motion to the shuttle, while the other stuck to the reed. This simple invention more than doubled the work and raised the number of picks per minute to 60. A very curious result followed:—Paradoxical though it may appear, this improvement in the hand-loom killed the industry. The accelerated hand-loom required larger quantities of yarn and spinning machines were invented to meet the demand. The yarn production soon overtook and left the looms behind and the power-loom was invented to consume the excess of yarn. It was found, however, that preparatory processes of warping, sizing, &c. were too slow, and the power-loom did not make much headway in production, notwithstanding the enormous increase in the number of picks. Winding machines for warp and shuttle bobbins, and warping, beaming and sizing machines were next invented to take full advantage of the power-loom, and this put an end to the hand-loom. The invention of the fly-shuttle thus killed the hand-loom industry, but gave England a still higher form of textile industry, and the loss has really proved an enormous gain to the country.

#### FLY-SHUTTLE IN INDIA.

In India the conditions are somewhat different, and I believe we can find ways, both to make the hand-loom more productive and to give the weaver its full benefit. To find how this can be done, we shall have to enquire in some detail into the whole course, from the yarn to the finished cloth. We shall take it for granted that the weaver has got a simple contrivance, by the addition of which to his loom, he can work at the rate of 100 to 120 picks per minute. If he is weaving a cloth, say four feet wide, in one minute he will use up 160 yards of weft, and he will have to change the shuttle bobbin every minute and a half. This

will take about 15 seconds or one-sixth of his working time, unless there is some one to keep his shuttles ready filled. The number of bobbins required in a day will be so large, that a woman working with the ordinary wheel will not be able to supply them, and a small hand-machine for this purpose, will be an absolute necessity, if full advantage is to be taken of the loom. The warp, as is now made, will run out in a short time, and the weaver will have to give more time, to drawing in, than to weaving. Larger warps equal to about 200 to 300 yards will be required and these cannot be made by the peg system. This will require hand warping machines, with winding and beaming machinery. The present system of sizing by stretching the warps and brushing in the size, will not avail, and some sort of sizing machines will also be necessary.

#### DEVELOPMENT OF THE INDUSTRY.

Assuming then that some contrivance is found by which, the number of picks per minute in the hand-loom is increased, say four times, the industry will naturally divide into four sections.

(1) *Warping*:—This will be done by central factories, generally with hand winding and warping machines. The owners will either buy their own yarn and sell the warps, or simply warp the yarn supplied by the weavers and charge for the labour.

(2) *Beaming*:—To beam long warps by hand is very difficult and the work is generally uneven. Beaming by hand machines will be the next work, that can either be done independently or in connection with warping.

(3) *Sizing* will also have to be done either in an independent small establishment or it may be combined with the warping and beaming, in places where the number of looms is large. In this last case, a small factory using steam and working with steam machinery, will probably be the best arrangement.

(4) The fourth or last section of the industry will be the weaving proper.

The recent Universities Act is sure to create a large army of half educated young men of moderate means, and some of these, will find the founding and working of such small village factories, one of the best things that they can do. With such small concerns, aiming at moderate profits, planted throughout the weaving centres to help him, and with a loom giving him more than half the out-turn of a power-loom, the Indian weaver can hold his own against the power-loom for generations to come, in fact, until such time

as most of these small concerns, by growing bigger and bigger, get converted into veritable power-loom mills. I have left the yarn out of consideration, as that can be imported instead of the cloth, till the increase of spindles in the country produces enough for our needs. This, gentlemen, is neither a dream, nor too glowing a picture of the coming millennium. I can assure you, that it is coming within a measurable distance of time. Four causes are working strongly towards it.

(1) Trials in all parts of the country to improve the hand-loom.

(2) The Universities Act.

(3) The interest the educated classes are taking in the development of industries, as witness the exhibitions and this conference.

(4) And last, though not the least, a spirit, which is taking a firm hold on the masses all over the country, I mean, the Swadeshi spirit.

THE KIND OF LOOM REQUIRED.

The *Indian Textile Journal* writing about the hand-loom at the Bombay Exhibition, says "The improvement in the Indian hand-loom is a matter of great urgency. An enormous number of good looms is required, but a new design of general utility would seem to demand the combined ability of several experienced weavers and inventors. The object of the inventors should be to ascertain the best possible working speed in picks per minute of the average weaver, and then to adapt the mechanism of the loom to withstand this strain of work." This is excellent advice. Whether the new loom be worked by the feet alone or by both hands and feet, a weaver will not on an average be able to move them more than twice in a second, and when it is considered, that the shuttle has to travel the width of the loom between each pick, this speed seems to be the highest that may be attempted. 100 to 120 picks per minute for cloths ranging from 50 to 24 inches in width respectively, seems to me to be the best average speed attainable for a loom of general utility.

LOOMS AVAILABLE AT PRESENT.

At the desire of His Highness the Maharajah Gaekwar of Baroda, I collected many of the improved hand-loom available in India, with a view to select the most suitable one for general introduction among the weavers in the State, and I take this opportunity to note here my conclusions, which were drawn after a careful examination and consultation with experienced weavers. The Hattersley automatic loom was found to be the fastest of those that were tried, but its

complicated construction, rather heavy working and its prohibitive price are against its general adoption. The same remarks would almost apply to the Japanese loom, which is less automatic in working, and consequently less complicated in construction. The Churchill loom of Ahmednagar is only a coarse calico-loom, working freely at from 100 to 125 picks per minute, and is, perhaps, the best loom designed for the kind of cloth for which it is intended. But its present price is heavy for the class of work it turns out. Most of the other improved hand-loom in the market are slight variations of the ordinary fly-shuttle loom, and they are good general purpose looms, but their working speed is only 60 picks. Mr. Havell's Serampore loom is probably the cheapest of this type.

WHAT IS WANTED.

Unless I am greatly mistaken, the problem of the loom is still open, and it may be stated thus for intending inventors.

(1) Wanted, for the village weaver, a special attachment, by the addition of which to his existing loom, he can increase its working speed to 100 picks per minute. The cost of this attachment not to exceed Rs. 20 and the parts easy of repair by the village carpenter.

(2) Wanted, for hand-loom factories and for well-to-do weavers, a loom, making 100 to 120 picks per minute and providing a simple arrangement to control the picks per inch in the cloth. The construction to be as simple as possible and the parts should be easy of repair by town mechanics. The cost of the complete loom should not exceed Rs. 100.

(3) Wanted, for the full development of the industry, hand adaptations of winding machines for warps and shuttle bobbins and of warping, beaming, and sizing machinery.

These are the three chief problems to be solved. With the co operation of a weaver, I have tried to solve the problem of the village loom, and the result is exhibited as the Sayajee Cottage Loom in this exhibition, but I have no doubt that some one better fitted for the work will work out a still better solution in time. I commend these problems to the earnest attention of all interested in the regeneration of the weaving industry of India and the material progress of their country. Their solution requires the special efforts of a few brains and when they are solved, the Swadeshi spirit and the educated young men without work will do the rest to bring about the weaver's millennium.

# POWER-LOOM MILLS AND HAND-LOOMS.

By Mr. E. B. HAVELL, Superintendent, School of Arts, Calcutta.

**A**MONG the proposals for meeting the present increased demand for country-made cloths, I have noticed one which has been strongly advocated, namely to start cotton-mills, i.e., mills for weaving cloth by power-looms. I hardly think that those who make this suggestion have realised the economic and industrial bearings of the problem they attempt to solve. If the profitable working of power-loom mills in India were merely a question of obtaining the capital required for starting them, it is quite certain that long before the present movement began, there would have been enough mills in India to meet the whole demand for the Indian textile trade, and the great hand-loom industry which now exists would have been practically extinct. The fact that, after fifty years of competition with Indian power-loom mills, hand-loom weaving is still by far the most important of Indian industries (excluding agriculture), is sufficient to show how totally different are the industrial conditions in India to those which obtain in Europe.

For a good many years I have been endeavouring to show that, as long as these conditions last, it is possible for hand-loom weavers in India to more than hold their own against power-loom mills, if only they are provided with proper hand-apparatus and proper instruction. If this is the fact, the only sound policy is to develop to the utmost the hand-loom industry and not to divert any of the funds, which might be devoted to that purpose, towards promoting in India a system based entirely on European industrial conditions. No one can maintain that these conditions are an improvement on those which obtain in India from a humanitarian point of view. It is beyond dispute that the work in modern power-loom factories is physically, morally and intellectually degrading.

The number of hand-loom weavers in Bengal is estimated at 400,000. The present demand for country-made fabrics will soon largely increase this number, for many weavers who have taken up other occupations are now returning to their looms. The number of persons benefited by improvements in hand-loom weaving is thus very large. Power-loom factories only increase the wages of a very small number of workmen, at the

expense of their physical, moral and intellectual well-being. By spending about ten rupees per loom on improved weaving and warping apparatus the 400,000 hand-looms in Bengal can be made to double their out-turn. This would cost about 40 lakhs. The same sum would not provide more than two or three fully equipped power-loom mills. Again, if Indian weaving mills can even now barely hold their own against the primitive, unimproved native hand loom, which is 150 years behind the times, where will their dividends be when the hand-loom weaver has doubled, trebled and quadrupled his present out-turn, as he can do by the use of up-to-date hand-weaving apparatus? Some of the best engineering firms in Europe are now producing first class hand-looms which nearly equal power-looms in speed. Messrs. Hattersley and Sons, Keighly, have already produced a special loom for weaving saris and dhooties. They have lately reduced the price of this to a remarkably low figure. Messrs. Raffael Bros., John Dalton Street, Manchester, who, on my suggestion, have been experimenting for some time with the object of producing a hand-loom especially adapted for Indian labour, inform me that they have now succeeded in perfecting a model which in point of lightness and easy working will satisfy all the requirements of Indian labour. It will, I understand, be placed in the market at the beginning of 1906. The improvement of Indian hand-looms and other weaving appliances has now become the first industrial question of the day. It is making rapid progress all over India and it cannot be many years before power-loom mills, both in India and in Europe, will have to face a very much stronger competition than before. Under these circumstances I think the prudent investor would be well advised to leave power-loom weaving alone.

Capitalists, with patriotic, philanthropic or other motives, who wish to assist the Indian textile industry can find sound investments in three ways:—first, in the manufacture of improved hand-weaving apparatus; second, in starting small hand-loom factories in suitable localities; third, in spinning mills.

With regard to the latter it is obvious that a prosperous hand-loom industry must be very much to the advantage of spinning mills, for as hand-

loom weaving progresses the greater will be the demand for yarn which cannot be made sufficiently cheap by the native hand spinning apparatus. There is no immediate prospect of improvements being made in hand-spinning apparatus, similar to those which have been made in hand-weaving apparatus, to enable cheap Indian hand labour to compete successfully with steam and electric power, though this is a question which might well be taken up.

The type of spinning-mill most suitable for India would be one, placed near the principal hand-loom weaving districts, which would spin yarn and supply prepared warps direct to the hand-loom weavers in their houses, or direct to a number of small hand-loom factories. It would also assist the weavers in getting improved apparatus, instruct them in the use of it, give facilities for repairs, buy up the finished cloth from the weavers and act as their distributing agent. A combined scheme of this kind would be financially sound and one against which no power-loom mills could compete.

Professed experts on industrial questions, taking their stand on an assumed universal superiority of steam and electric power over hand power, ridicule the idea of hand-looms. They, however, entirely overlook the fact that the manifest superiority of steam or electric power in works of great magnitude, such as the making

of a 100-ton gun, does not apply to operations not exceeding the strength of an ordinary man. In the latter case, provided that the man uses efficient apparatus which does not waste the strength, the one-man power in a human being is as good as the same power produced by steam or electricity, and has the supreme advantage that is entirely under the control of human intelligence. The process of weaving belongs to this class of work. The power exerted in throwing the shuttle is the same whether steam or electricity, or hand power, is employed. Any excess of power is not only useless, but causes loss of time and inferior work by breaking the thread in the shuttle. The question of economic superiority therefore lies not in the quantity of power which can be produced, but in the comparative cost of hand-power and mechanical power. In Europe the cost of mechanical power required for a loom is generally less and therefore the power-loom has to a great extent driven the hand-loom out of the market. In India the cost of hand-power is less (provided that efficient apparatus is used), therefore the hand-loom can compete successfully with the power-loom so long as the rates of wages are not raised above the point at which the requisite mechanical power can be produced. Until India becomes a very much richer country than it is at present, this condition will not arise.

## AGRICULTURAL ASSOCIATIONS IN INDIA.

By Mr. H. K. BEAUCHAMP, C.I.E., Editor, "The Madras Mail."

IN the three words "Improvement From Within" may be summed up Dr. Voelcker's pregnant advice in connection with the development of Indian Agriculture, after an exhaustive examination of agricultural conditions in India. To that extent Dr. Voelcker was an out-and-out *Swadeshi*; and practically every competent critic and earnest student of Indian Agriculture has come to the same conclusion. But the improvement of Indian Agriculture along familiar Indian lines cannot be accomplished to any appreciable extent by spasmodic efforts on the part of individual cultivators here and there, or even by mere experiment and "demonstration" on the part of the various Agricultural Departments. There must be, amongst the cultivators themselves, co-operation and organisation, mutual

instruction, mutual experimenting; and the Agricultural Departments, in their turn, can help the general body of ryots hardly at all unless there are organisations through which the latter can be reached and persuaded.

Sir A. Fraser, Lieutenant-Governor of Bengal, who did so much to encourage the formation of Agricultural Associations in the Central Provinces in notifying the creation of a Provincial Agricultural Association for Bengal at Calcutta last year said:—"The Agricultural Department has admittedly failed hitherto to make known among the people the results which have been attained by experiment. Accounts of the various operations undertaken are published annually, but they have not reached the cultivating classes; and even in the vicinity of the various Agricultural Farms



improved methods of cultivation have not been adopted. There are many zemindars and merchants keenly interested in Agriculture, but their sympathy and co-operation have not been enlisted. In these circumstances, the Lieutenant-Governor is of opinion that an agency is wanted to disseminate agricultural knowledge, and to awaken further interest in, and discussion of, the agricultural development of the Province." In the Central Provinces, Sir Andrew pointed out, the advantage which has followed the creation of advisory Agricultural Associations has already been immense.

Again, the Hon'ble Mr. A. E. Castlestuart Stuart, I.C.S., Director of Agriculture in Madras, has remarked in this connection at a Meeting of the Tanjore Agricultural Association:—"The formation of District Agricultural Societies of this kind—and I trust that before long every District in the Presidency may have such an Association, with a central organisation in Madras so as to bring them into the closest possible touch, not only with each other but with every branch of the Agricultural Department—affords gratifying evidence of an awakening desire of the people to co-operate for purposes of almost incalculable advantage to themselves, and gives Government the best practical means of helping those who thus show that they are willing to help themselves."

Since these words were uttered by Mr. Castlestuart Stuart, towards the end of 1904, the Agricultural Associations movement in Madras has made great strides, until now every one of the 24 Districts in the Presidency has a local Association, and some of the District Associations have already one or more Branches within their own area. It is hoped that in time every Revenue Division, every Taluk, and even every important village, or group of villages, will have an Association of its own. For although, owing to the peculiar conditions of India, it has been found necessary, in Madras, Bengal, the Central Provinces and elsewhere to begin to organise from the top rather than from the bottom, that is, to start Central Agricultural Associations for the Province first, and to develop District and Local Associations afterwards—the same procedure by the way, having been adopted with quite remarkable success in Ireland and Ceylon, also—nobody can help seeing that the movement, to produce, any real and substantial results, must depend mainly, nay entirely, on the practical work performed in the field of actual operations by the Mofussil Associations and cultivators themselves. At the same time the Central Associations at the

Provincial capitals will also have much useful work to do after they have succeeded in stimulating the organisation of Local Agricultural Associations in the Mofussil.

In brief, the purposes of the Central Provincial Associations would be to assist in: establishing, and to aid and advise already established Agricultural Associations in the Mofussil; to act as a medium of communication between the Government and these Associations; to collect, collate, and distribute new information on practical and locally useful agricultural practices; to study the proceedings of similar Associations and of Agricultural Departments elsewhere in India, and to communicate to the Mofussil Associations any information thus obtained that is likely to prove useful to them. The Mofussil Associations, in their turn, would communicate such information to their members and to the ryots generally by translating them into the vernaculars and publishing them in leaflets and in the special village sheets of the District *Gazettes*, or by bringing them up for discussion at meetings of their members.

There are other directions, of course, in which it would be possible for a Central Agricultural organisation to help in the improvement of agriculture. It might, for instance, establish a permanent Central Exhibition of select agricultural products and implements. It might offer prizes, or induce others to offer prizes, for essays on select agricultural topics. It might do much to aid Mofussil Agricultural Associations in the holding of periodical Agricultural Shows. It might itself organise a Central Agricultural Show at intervals of a few years. It might, if funds permitted, or by collecting special funds for the purpose, depute persons to make special enquiries into special agricultural methods elsewhere in India, or even abroad. It might arrange for chemical analyses of soils, manures and agricultural products, and for special botanical investigations. It might do something in helping to develop Co-operative Credit Societies, and in developing agricultural co-operation generally in matters such as the buying of manures, seeds and implements, selling of agricultural produce, the securing of favourable railway rates for agriculturists, etc.; And as the work developed it might establish a Journal on the lines of the *Journal of Agricultural Associations and Societies* in other countries.

As regards the Associations in the Mofussil, which must ever form the real backbone of the movement, the practical work before them is im-

mense, and as varied as it is extensive. I might, by quoting from the Progress Reports of the Associations already at work in the Madras Mofussil, fill a fair-sized volume with suggestions of the kind of work that can be done. At the same time, of course each District and tract of country has its own peculiar needs; and these have come into special prominence in Madras since the Associations were started. Thus, the Associations in the West Coast Districts of Malabar and South Canara are devoting themselves first and foremost to the improvement of the cattle, which have been allowed to degenerate most woefully. Again, the rice-growing delta District of Tanjore is devoting itself first and foremost to alternatives to rice, and especially to sugar-cane, a most profitable crop hitherto practically unknown in the District. But with regard to the work that can be done by Mofussil Associations perhaps I had better content myself with quoting the example of Tanjore. A perusal of the Association's first Annual Report impresses one with surprise at the amount of good work which has already been accomplished. A collection of samples of improved agricultural implements; practical demonstrations in fibre-extracting, rope-making and cloth manufacture from plantain stalks; the establishment of several oil-engine pumping installations for irrigation purposes; the introduction of new and selected sugar-cane seed; the establishment of a model farm of eight acres of *padugai* lands; the creation of a Museum of Agricultural Products, with a Library of Agricultural Books, Bulletins and Reports; the setting apart of model plots of land by private landholders for experimental cultivation in conjunction with the Agricultural Department; the establishment of a vernacular weekly journal for the dissemination of useful agricultural information on subjects such as the importance of various kinds of manures, of well irrigation, of new methods of cultivation, the introduction of new implements and new crops, and the adoption of extended cultivation of profitable crops such as sugar-cane, turmeric, etc.; the supply, at cost price, of vernacular books on agriculture; agricultural implements from the Ceded Districts and elsewhere, and the instruction of local ryots in their use—such were the principal items in the Association's first year of working. And if so much can be accomplished by the Association in a single year—and that the initial year—what may not be accomplished as the Association becomes older, more vigorous and more experienced?

As another more concrete example of the varied work that can be done by local Agricultural Associations I am tempted to add here the following summary of the latest Progress Report of the little Association at Penukonda in the Anantapur District of the Madras Presidency, which was the first Association of the kind established in these parts:—

The Penukonda Agricultural Society organised an Agricultural Exhibition in 1903 and a Cattle Show in 1905, and has resolved to hold another Cattle Show in 1906 during the car festival at Kottacheruvu. At the instance of Mr. Scott, the Collector, the Committee of the Society has decided to repeat the Cattle Show every year, which as a permanent institution is likely to improve the live-stock, on which successful agriculture so much depends.

*The Krishi*, the vernacular journal of the Society, has been doing useful work in the way of educating ryots and disseminating useful knowledge in agricultural matters.

The Association has purchased a folder-cutting machine for Rs. 40 and five special grape thinning scissors, the grape industry being a special local industry for which the Association has already done much. The use of Bordeaux mixture as a cure against mildew in the vines is becoming popular, and the thinning system has been introduced in the vineyards with success. A white variety of grapes has also been planted on the Society's Experimental Farm. The Society has further decided to introduce another variety of grape, experimented with and successfully grown by Mr. Dhone Subba Rao of Kurnool Road Station.

In fruit culture, the example of Mr. P. Srinivasa Charlu has had a wholesome influence on the inhabitants of neighbouring villages, with the result that several mango plantations have been planted in the district. The incentive given by His Excellency Lord Amthill's present of Rs. 10 to a poor widow for growing figs at Penukonda has had an excellent effect and a considerable number of fig trees have been planted at Penukonda and other places. A new variety of plantains from Madura District is being grown on the Experimental Farm of the Society. The Society has procured a small consignment of Bengal Bala seedlings and distributed the same for trial.

A large quantity of seeds of the Rain-tree and Mahogany was sent for and distributed for trial. Mr. H. Narayana Rao, B.A., B.L., has planted a number of Kanuga (Pungam) trees with a view to use the leaves as a manure for his lands, as an object-lesson to the ryots. A member of the Society has induced his pupils in the school to plant trees and take care of them in the school compound.

The Society is encouraging the cultivation of sugar-cane, and several members have taken it up.

Mauritius ground-nuts and other garden crops are being popularised.

Chrome tanned leather buckets for well irrigation are being introduced into the district.

Banku paddy is being tried by several members of the Society, the seeds of the same having been sent for from the Tanjore Association.

About 50 varieties of cholam received from Surat are being tried and are reported to be better than the local

indigenous variety. But for want of better instructions as to the season for sowing and the necessity for irrigating the crop the trial seems not to have been very successful.

Lima beans obtained from the Bellary Experimental Farm are under trial, in some places the seeds having sprouted.

The experiment with the grass *Paspalum Dilatatum* as a fodder crop proved a failure.

By the efforts of the Society a Rural Bank has been started at Bukkapatnam and it is expected that it will serve as an object-lesson for other villages. The Society has formed a Committee for considering the possibility of starting a Weavers' Co-operative Credit Society at Tadpatry. A few inhabitants of Hindupur have addressed the Society to help them in opening an Urban Co-operative Credit Bank at Hindupur.

The fly-shuttle looms that were demonstrated at the anniversary of the Society and introduced later in important weaving centres of the district have been found not to work well for weaving very coarse cloths such as are made at Uravakonda; and accordingly the Society has sent for a fly-shuttle loom that will suit coarse cloths.

A member of the Society has introduced the homestead system of farming at Kottacheruvu, Penukonda Taluk.

It is gratifying to note that a few members of the Society at Kottacheruvu have made an offer to supply bricks for building a rural agricultural school according to the new scheme of the Hon'ble Dr. Bourne, the Director of Public Instruction.

It has again and again been urged that it is only by whole-hearted, indigenous self-help like this that the great agricultural industry of India can be radically, substantially and permanently improved. The marvellous change that has come over the face of agriculture in Ireland since Sir Horace Plunkett's rural Societies for the improvement of agriculture were established is an object-lesson which India may well lay to heart. For between India and Ireland, as regards general agricultural conditions, there are numerous similarities; at any rate, they are remarkably similar in the general dead-levelness of agricultural practice and in the absence of co-operative instruction and effort. But in Ireland during the last five years there has been a quite extraordinary awakening in these respects, and the whole country is now studded with Associations and Societies, both Agricultural and Industrial, which are working nothing less than a revolution in methods and results. That very much may be done in India in the same way nobody can doubt for a moment. "At his best," Dr. J. A. Voelcker remarks in his Report on "The Improvement of Indian Agriculture," "the Indian ryot or cultivator is quite as good as, and in some respects the superior of, the average British farmer; while at his worst it can only be said that his state is brought about largely by an absence of facilities for improvement which is probably unequalled in any other country, and that the ryot will struggle

on patiently and uncomplainingly in the face of difficulties in a way that no one else would."

There can be no doubt as to the truth of every word of this; but there is also no gainsaying the fact that the ryot's methods of procedure are too often laborious and old-fashioned, his implements more distinguished for the simplicity and rudeness of their construction than for the effectiveness of their operation, and his seeds are year after year such as chance puts in his way instead of being intelligently selected. In such directions there is vast room for improved practice.

In a pamphlet which I published a few months ago I endeavoured to show what other countries had been doing in recent years in the directions of Agricultural Association and improvement. I pointed out how, in countries of the West, and also Japan, there has taken place, during recent years, a most extraordinary development of organisation and co-operation in agriculture among the cultivating classes themselves, that is, apart from, though supplementing, State organisation and Departments of Agriculture. "The new agriculture" as it has been not inaptly called, and the effect thereof on both the material and the social conditions of the peoples of these countries, have been described in many most interesting books and pamphlets, the most succinct, comprehensive and instructive of which is, perhaps, "The Organisation of Agriculture" by Mr. Edwin A. Pratt, published by John Murray last year, and issued in a third and revised edition, at the price of one shilling, a few months ago.

It is impossible, within the prescribed limits of a paper like the present, even to summarise the marvellous records which the New Agriculture has achieved during the past ten years and less in countries so widely differing in agricultural conditions as Great Britain, Australia, Canada, Denmark, Germany, France, Belgium, Italy, Holland, Hungary, Austria, Switzerland, Scandinavia, Finland, Siberia, Servia, Poland, Luxemburg, Argentine and the United States, all of which will be found detailed in Mr. Pratt's book. In every one of the countries named, Mr. Pratt tells us, there has been an agricultural revival which has led to the spreading throughout each of them of a more or less complete network of agricultural organisation, manifesting itself, in varying degrees, in the spread of agricultural education, and in combinations among the agricultural community for an endless variety of purposes, including the virtual transformation of farming methods in accordance with the latest developments of agricultural

science; organisations for obtaining agricultural necessities of reliable qualities at lesser cost; the purchase in common of costly machinery which would otherwise be beyond the means of a small cultivator; the formation of Co-operative Societies for purposes both of production and of sale; the setting up of Agricultural Credit Banks as a means of keeping the farmer out of the hands of the usurer, and enabling him to carry on his operations more successfully; and the improvement of the individual lot of the agriculturist in many different ways. The special circumstances in which this network of organisation has been developed differ in each particular country, and it is a fundamental principle of the movement, regarded as a whole, that not only has each of the countries concerned differed from every other in establishing agricultural organisations suited to its national conditions, but the greatest degree of success has been obtained where the Associations have been started on a very small scale in rural districts to meet local, or even parochial, conditions, and while maintaining their individual entity, have afterwards combined with other similar bodies to form district, country, or even national Federations for the attainment of common advantages.

As Japan and everything Japanese is just now attracting the widest and the deepest attention in India, let us see what forms the New Agriculture has taken there. This we are enabled to do by studying a Report presented to the United States Government a few months ago by Consul-General Bellows. Now, as regards "Small holdings" agricultural Japan resembles agricultural India in a striking manner. Thus in Japan, fifty-five per cent. of the families engaged in agriculture cultivate less than two acres each, 30 per cent. cultivate from two acres to a little less than three and three-quarter acres, and the remaining 15 per cent. cultivate three and three-quarter acres or more. Not only, too, are the farms small in themselves, but they are generally made up of different patches of land, so that a farm of two acres may consist of several non-adjacent lots, the average size of a lot being about one-eighth of an acre. The tools and appliances used are primitive in character, but the Japanese farmer fertilizes and cultivates in a thorough-going fashion, thus securing an abundant harvest, besides often raising two or more crops a year on the same field. In the warmer latitudes barley, indigo, beans, and rape are grown successively on one plot of ground within the space of one year. The other agricultural

products include rice, rye, wheat, mulberries, sweet and other potatoes, millet, buck-wheat, tea, tobacco, cotton and hemp. Stock-raising is in its infancy and poultry-farming is inadequately developed, eggs being imported from China to the value of £100,000 a year. On the other hand, the Japanese farmer generally follows some subsidiary occupation, such as rearing silkworms, reeling silk, or spinning. Alternatively he may work for wages in the intervals of his own farm work.

Such are the normal conditions of Japanese agriculture on which the organisation scheme fostered by the Government is being developed. That scheme would seem to be mainly of a three-fold character—legislative, educational, and financial. Under the first head are comprised laws respecting irrigation, the protection of forests, the control of rivers in the interests of the farmers, the re-arrangement of farm boundaries, and the formation of Farmers' Guilds. Under the second head the Government aids the Local Treasuries to maintain six Agricultural Schools for the instruction of farmers' sons in the general principles of agriculture, surveying, veterinary science, and kindred subjects. The Government also conducts an experimental tea farm on which is a curing workshop, a laboratory for investigating the diseases of cattle and poultry, a cattle-breeding pasture for improving the native breeds of cattle for meat and dairy purposes, and two horse-breeding pastures for promoting the introduction of better horses. As regards Farmers' Guilds or Agricultural Associations, we learn that they are formed by the farmers (under the auspices of the Government) "for the promotion of the common interests"; but when organised in conformity with the prescribed conditions, they are further permitted to borrow money from the State Hypothec Banks under conditions much more favourable than could be secured by farmers acting independently. The Guilds also undertake works for the common benefit, and especially those that relate to controlling the course or volume of rivers, irrigation and drainage systems, road building, reclamation of uncultivated land, measures for protection against insect pests, and similar enterprises.

But leaving Japan, let us see what can be done in the direction of Agricultural organisation by a country much nearer India. I refer to Ceylon. There the movement was started last year on the personal initiative of His Excellency the Govern-

nor, Sir Henry Blake, who had seen what useful work such Associations were doing in Jamaica. Although the Ceylon Agricultural Society was started only last year, there are already over 40 local Branches of the Society in the island. The central Society itself numbers over 700 members, and there are probably three or four times as many more who are members of the local Branches only. Out of the central Society has been formed the Ceylon Board of Agriculture, which is not only the executive body of the Society itself, but practically the Department of Agriculture in Ceylon. It has non-official as well as official members; but the official element in it comprises all the official Agricultural experts, and it has been entrusted with very large powers by the Government. The Ceylon Agricultural Society, working through and with the Government by means of the Board of Agriculture, "diffuses" information most thoroughly. The following are the advantages offered to members, and also, of course, to members of branch Societies in the Districts:—

(a) You will receive all the latest information on matters affecting the Agricultural interests of the Island, e.g., directions for the cultivation of new products, hints as to the best soil, the best manures and the best markets, the results of experiments in farm products, improvement in live stock, etc.

(b) Your efforts in pioneer cultivation will be generally assisted by the Officers of the Government Botanical Garden at Peradeniya, and in cases favourably reported upon, Government assistance may be given.

(c) Your suggestions as to improvement in cultivation, etc., will be fully considered and will obtain the benefit of full publication and discussion at Meetings of the Board and through the Journal of the Society; the latter will, it is hoped, enable agriculturists to impart and obtain information and offer facilities for exchange and disposal of farm produce.

(d) You will be taking part in a scheme for the general improvement of agriculture throughout Ceylon, and by assisting in a general movement will enable Agri-Horticultural knowledge to be more readily and widely disseminated than is at present possible.

Considering the thorough and energetic way in which the Ceylon Agricultural Society has gone to work under the patronage and experienced guidance of His Excellency Sir H. Blake, it is not altogether surprising to find that such excellent results have been attained. The fact that over 40 local Branches of the Society have already been established is sufficiently noteworthy. And these local bodies are actually *working* bodies, as may be gathered from the particulars given in the excellent monthly Progress Reports of the Society.

If Agriculture can be "organised" on such lines in Ceylon, surely it must be possible in India also. Personally I cannot help thinking that Agricultural Associations are more suited for growth in India than in many other countries. For one thing, agriculture is the industry of India hugely preponderating over all others. It is regarded as the most honourable of all industries. To possess land is to possess status. It is in land that practically every native of India, who has money to spare, prefers to invest that money,—from the prosperous Vakil and pensioned public servant to the returned coolie emigrant. Under present out-of-date methods of agriculture the return on the capital invested may be small; but the predilection for land is such that that is cheerfully enough accepted.

Now, this consideration is not merely academic: it has, as I will explain, a direct bearing at the present day on the prospects of organisation and combination in Indian agriculture. If such organisation and combination are to be initiated and developed, there must be local leaders—agricultural experimenters, demonstrators and business-like organisers. Are these to be found? Not, surely, it will be argued, amongst the great mass of those land-holders and ryots, pure and simple, who hitherto have shown no ambition to advance beyond local agricultural practice, no desire to try new methods or new crops. But it happens that we have, within comparatively recent years, arrived at a period when the first batches of Indian officials, Vakils, Pleaders, etc., educated on Western lines, have reached the time of life when they can retire from active employment and devote their time and means and talents to other pursuits for the rest of their lives. Imbued with the prevailing spirit of India as regards the holding of land and the honourableness of agriculture, a large proportion of these men instinctively turn to the land to afford them interest, occupation and livelihood for the remainder of their days. Certainly, then, it is amongst these men that we may hope to find leaders, good and true, of movements having for their object the improvement of agriculture and the development of agricultural organisation and co-operation.

As I have remarked elsewhere, it would be the greatest mistake, everybody must admit, for these Mofussil Agricultural Associations to become in any considerable way "official" in character, for that would stifle individual enthusiasm and diminish effort amongst the very classes

upon whose enthusiasm and effort their success must ultimately depend. But, at the same time, the countenance and friendly advice of officials are essential to the success of the movement, especially in its initial stages. In the Central Provinces and in Bengal, where Sir Andrew Fraser has done so much to stimulate agricultural organisation, the Agricultural Associations appear to have assumed a preponderatingly official character which will certainly be found a great mistake in the long run. The Government's interests and actions are sufficiently well represented and centralised in the Agricultural

Departments, and the uses and functions of Agricultural Associations are distinct from, though supplementary of, the proceedings of Government.

If the nascent spirit of *Swadeshi* is to stimulate any real substantial work for India's progress, surely it should predominate in the greatest of all Indian industries, *viz.*, Agriculture. Here "mother earth" and "mother country" have a co-relation, a community of sentiment, that they have nowhere else, and it behoves every son of Mother India, to do the utmost that lies in his power to make two blades of grass, two ears of corn to grow where only one grows at present.

## INDIAN AGRICULTURE.

By Mr. D. M. HAMILTON, Senior Partner of Messrs. Mackinnon, Mackenzie & Co., Calcutta.

WHEN you asked me to write a paper on the agricultural development of India, for the Benares Industrial Conference, I hesitated to do so for this reason, among others, that my knowledge of the subject is more general than particular, and I seemed to have elsewhere exhausted all I had to say. On second thoughts, however, and at your urgent repeated request that I should not fail you, it seemed to me that I might venture to reiterate what I had previously tried to impress upon the public attention, more particularly when, at a time like the present, the public gaze is so fixed upon *Swadeshi* manufacturing industries that the all-important fact is apt to be lost sight of, that *Swadeshi* manufactures are themselves almost entirely dependent for their success on the success of agriculture. That this is so will at once be apparent when it is realised that the manufacture of *Swadeshi* piece-goods can only be successfully established when it has been found possible to grow suitable cottons; and I may also add in passing, that when the growing and manufacturing problems have been solved, the question of markets will be found also

to depend on agriculture, for the simple reason that the great market for piece-goods is the agricultural population, and the more flourishing that population is, the more can it afford to spend on manufactures. It hardly seems necessary to mention such self-evident propositions, but when the voice of the multitude of councillors is as the voice of many waters, it is perhaps well to call attention afresh to the "still small voice" of first principles. I might also here remind you that when you have captured the whole of the Manchester and Dundee cotton and jute industries you will have converted into manufacturers only one million of the 300 millions of India. When the healthy cotton smoke of Bombay has become still more dense, and when you have doubled the jute mills which now dot the banks of the Hooghly, you will still have to provide for the 299 millions that remain. When you have enriched your country by transferring some crores of rupees from the pockets of Bengal to the purses of the men of Bombay; when you have had your little gamble and your money has changed hands and added to the wealth of your country as the money does which passes on the

race-course, you will still have 90 per cent. of your countrymen appealing to you for help, and how are they to get it? There is only one way, and that is, by increasing the produce of their fields, and this can only be done by providing them with cheap money and by improving their methods of cultivation. India's economic problem can be briefly stated thus—What are the wants of her people? They are these:—

FOOD  
CLOTHING  
HOUSING

and these three are one—Agriculture, for even the roof over his head has to be grown by the cultivator. And the cultivator has to bear not only his own burden, but also, in a very real sense, the burden of the Empire. He it is who provides the produce to enable our merchants to trade; he it is who grows the cotton and the jute to run our mills; he it is who provides the bulk of the traffic for the railways, and fills the steamers with the rice, the linseed, the jute and the indigo, the hides and the tea; he it is who brings the piece-goods from Europe; he it is who pays the land revenue and the army, and grows the income of the Zemindar; he it is who grows the opium and pays the bulk of the salt-tax; even the mineral industry depends on him, for the coal is wanted to run the trains and the steamers which carry the produce of the soil. The problems of India are undoubtedly the problems of Agriculture; anything, therefore, which advances Agriculture, advances the Empire.

Every one interested in India, and who is not, must be gratified to find Government taking a great step forward in providing India with the best that can be had in scientific agriculture. Rs. 20 lakhs a year are promised, with more if necessary, and we cannot err in having too much for so beneficial and reproductive a purpose. It now rests with the leaders of the people to link up the training offered by Government with the practice of the people, and what is the link now missing? Lord Curzon the other day remarked that the first condition of progress in general was money, and he was right. The progress of India, like that of every other country, depends on how its industry is financed, and it is here, unless some system more satisfactory than that on which the great industry of the country now rests can be devised, that India will come to a standstill. If the great body of cultivators have to work, not so much for themselves as for their creditors, why

should they take the trouble to assimilate new methods of agriculture. They will not do it. To get them to do it, you must make it worth their while, for none of us care to work for nothing. The first thing to be done, therefore, is to get Indian Agriculture put on a satisfactory financial basis. Can this be done? I do not see why it should not, and I do see that unless it is done India cannot progress as she otherwise would. The solution of the problem can be found only by experiment, and it does not much matter if most of the experiments fail provided the way is found in the end. Various remedies have been put forward from time to time; for example, the Hon'ble Mr. Gokhale recommends the buying up of the cultivator's debts by Government and so starting him with a clean sheet. With surpluses in hand I see no reason why this should not be tried experimentally in one or two districts, for, as I have said, it is only by experimenting in various directions that we shall ultimately find the way to success. Again, the Government of India, as appears from the recent resolution, is hopeful that by allowing the local Governments a freer hand in the working of the Agricultural Loans Act and the Land Improvement Act the people may be induced to take fuller advantage than they have hitherto done of the money which Government is willing to advance at 6½ per cent. By all means let experiments be made in all directions, but I am just afraid that, while Government is willing to lend the money at 6½ per cent., our old friend the middleman, from the chuprasse upwards, will find ways and means of defeating the beneficent aims of Government by insisting on another 10 per cent. for himself. My own feeling is that success is more likely to be found in the development of the co-operative principle, where the people will work together and leave no room for the middleman to come between, and I should like if a few Zemindars who do not mind risking Rs. 1,000 to 2,000 only, would join me in experimenting on co-operative lines with the help of the Government Registrars, and with grain banking as a basis from which to start. The undernoted memorandum, written a short time ago, will explain what I mean.

I realise, however, that business cannot depend on charity for capital; if we are to solve the question of rural finance it must be done as a business, not as a charity; but how is the enormous capital required to be found, for capital is shy of new ventures. Something in the nature of a

Government guarantee will, I think, be both necessary and advisable. What I have to suggest therefore is (if the foregoing experiments should be carried out and should show indications of success) that

(1) The Zemindars or other gentlemen of influence in the districts should join together and form themselves into district cash or grain banks, and should at the same time take steps to organize Co-operative Credit Societies in the villages on their properties.

(2) These Co-operative Credit Societies should, to begin with, confine themselves to the lending of seed grain—the seed grain to be found by the zemindari district banks and to be advanced to the Co-operative Societies at 6 or 7 per cent. interest (cash transactions to be added later).

(3) Government should guarantee 3 per cent. on the capital advanced to the villages by the district banks—the difference between 3 and 6 or 7 per cent. being the inducement for the Zemindar to push the business.

Let Government lay aside a lakh or two of rupees for guaranteeing experiments of this kind and see how the idea is likely to take. If successful, the money would never be asked for. Government now give away crores of rupees in the remission of land revenue and the writing off of agricultural loans, and it would, perhaps, be a truer charity if they were to risk something in an experiment which, if successful, would tend to create that spirit of self-help and trust between man and man which is so sadly wanting in India at the present time, and the absence of which so retards the economic and social advance of the country. If the experiment proved a success it would eventually result in a great saving to Government, for when the question of rural finance is solved we have solved the famine problem.

The organization of agriculture is a matter which is daily receiving more and more attention in all civilised countries, and the greatest measure of success would appear to be attained in those countries where the co-operative principle is being developed. With the other nations of the world moving forward in the organization of their resources, India cannot afford to lag behind. Will the leaders of the people therefore come forward and help on the development of their country? With a soil which, taking it all over is, I believe, as fertile as that of the great majority of countries, the Indian cultivator should, in proportion to his holding, be among the

wealthiest in the world, for while his land is fertile his requirements are few, and his balance therefore ought to be large. Even in the districts where rainfall is scanty there are many products which would serve as a standby in times of scarcity. Take, for example, the date sugar trees which are now running to waste by the million in Central India. There you have the raw material of genuine Swadeshi sugar to be had for the lifting, and yet none of the leaders of the people appear to be sufficiently interested in their poorer countrymen to shew them how to tap the trees. I am safe in saying that in no other country would resources of this nature be left lying unused as they are in India. If the men who are so fond of talking about "the bread problem" would respond to the cry of their country for food, with something more satisfying than eloquence, India would be further ahead than she is to-day. It is to be hoped, therefore, in the interests of all concerned, that the beneficent efforts now being put forward by Government to develop the agricultural resources of the country will meet with the response which they deserve. The Agricultural Colleges and the Demonstration and Seed Farms which are now about to be established all over India if taken advantage of in conjunction with a sound system of finance, will make the rich richer, and ease the burden of the poor. Who will help the man with the hoe?—

Bowed by the weight of centuries, he leans  
Upon his hoe and gazes on the ground,  
The emptiness of Ages in his face,  
And on his back, the burden of the world.

The foregoing remarks apply in the main to the Indian agriculturist. Whether the principle of co-operation might not also be applied to European agriculture, such as that of Behar, is a question which might be worth considering. In Behar the agricultural industry has two of the main elements of success, namely, plenty of good land and labour. The element chiefly wanting is finance. Would it not be possible for the planters to establish a Co-operative Banking system in which each man would be jointly and severally responsible for his neighbour, care of course being taken to see that only reliable men were admitted within the circle? Backed by a small Government guarantee the capital required for such a banking system should easily be forthcoming, and when so much money is being spent on the Army, Government might well be asked for a small share to help on the industry conduct-



ed by men who have a military as well as an industrial value. The Governments of other countries and also of the British Colonies give financial aid to agriculture, and it would be a great pity if the district in which Pusa is situated should not be able, owing to the want of capital, to take full advantage of the scientific research which Government is now about to offer; for without capital to apply it, science will be of no value.

#### MEMORANDUM.

1. No country can prosper whose chief industry rests on an unsound financial basis.

2. The Indian agriculturist, having to pay his Banker anything from 25 to 100 per cent. for accommodation, cannot keep pace with his brother cultivators of other countries who pay only 5 to 10 per cent.

3. A Western system of banking, in which the Bank deals direct with the cultivator, is impossible in India, where the loans are so small and the cultivators are numbered by the hundred million. The village or a village society must therefore be the unit which borrows from the outside capitalist.

4. The question then arises, what security can a village offer for capital so borrowed?

5. A possible answer to this question may be found in the Dharmagola system of grain banking as instituted by Rai Parvati Sankar Chowdry, to whose philanthropic enterprise is due the credit for the Dharmagolas now successfully working.

6. In the Dharmagola system the grain capital which accumulates so rapidly at interest would form an excellent security with which to commence drawing capital from outside.

7. The Dharmagola might be registered under the Co-operative Credit Societies Act, in which case the members would be jointly and severally responsible for the money so borrowed, thus providing additional security, if such were considered necessary.

8. It would be advisable, if possible, to get the villagers to contribute the grain capital necessary to set the Dharmagola agoing, as they would then take a keener interest in it. Failing the villagers, the Zemindars might join with me in providing experimentally say 100 maunds (or more if required) of grain capital for 100 villages.

9. The grain would be lent out for the season at the usual seed grain rate of 25 to 50 per cent. interest, the profit with the original capital being

dumped into the Gola for the benefit of the village,—the advance to be at our risk and to be repaid with 6 per cent. interest as circumstances permit.

10. When the villagers thus see with their own eyes that the profit belongs to themselves they will realise the advantages of co-operation and may be induced to extend the system to their general financial requirements.

11. The Dharmagola might in time be developed into a village grain store in which the villager could deposit his crop and draw advances thereon at a reasonable rate of interest, instead of, as he now does, throwing his entire crop in a lump on the market or into the hands of the friendly Bania, and getting the low price which must result from the whole of the crop being dumped on the market at one time.

12. Such advances on crops would be drawn from outside by the village society at, say, 6 per cent. and re-lent to the cultivator at, say, 10 per cent., the profit going to swell the Dharmagola's reserve and so enable it to draw further cheap capital into the village. This further capital might be utilised in paying off the old debts of the members, or otherwise as might be deemed advisable.

13. I understand that, under Clause 15 of the Co-operative Credit Societies Act, grain capital deposited in a Gola registered under the Act cannot be attached by a creditor. This should prove a great incentive to the villagers to form themselves into Co-operative Credit Societies and to adopt the Dharmagola system, which, even if it developed into nothing greater, would still be a great boon to the cultivator.

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#### Improvement of Indian Agriculture.

By John Augustus Voelcker, Ph. D., B.A., B.Sc., etc., second edition, with an appendix containing the resolutions of the Government of India on the Proceedings of the Agricultural Conferences of 1893 and 1895-96. Price Rs. 2-8-0.

**Industrial India.**—By Glyn Barlow, M.A. Price Rs. 1-8. To subscribers of the *Indian Review* Re. 1 only.

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# INDIAN COLLEGE OF TECHNOLOGY.

By Dewan Bahadur K. KRISHNASWAMI RAO, C.I.E.

If India is to regain her lost place in her industries, she must learn to use steam, gaseous or electric power much more extensively than at present. Hand machines, however good they may be, will not meet the demand of the country for manufactured articles; and make us independent of imported goods. The use of steam, gas, and electricity require a thorough knowledge of mechanism, theoretical and practical, and of the scientific processes used in America, Europe and Japan in manufactures. It is a matter for deep regret that India is not yet blessed with an institution, in which the required scientific and technical knowledge and training could be obtained to enable us to work our industries on advanced lines without foreign aid. In making this observation, I have not overlooked the existence of a number of technical schools established by Government and private agencies in several places. But the instruction given in them is too elementary to be of any practical use, so far as the substantial improvement of the productive capacity of our industries is concerned. It is often said that our deplorable condition is due more to our want of public spirit, enterprise and mutual trust which are indispensable to the combination of capital, skill and labour without which no large and profitable undertaking is possible, than to the absence of a first class technical institute in India; and that at present there is no adequate demand for highly skilled labour to justify the heavy expenditure involved in the establishment of such an institute. We have now in India more than 1,200 mills and factories worked by machinery. The skilled labour they require is more than what one well-equipped institute of technology could supply. More mills and factories will come into existence to meet the growing demand for the indigenous manufactures. The existing mills and factories are now worked under great disadvantages, and even at a comparative loss by having to import from foreign countries, not only the necessary machinery, but also the mechanics to set them up and work them. I believe there is not a single workshop in the whole of the Indian Empire, where a small gas-engine of the simplest character could be constructed. Mr. Chatterton had demonstrated the superiority

in efficiency and economy of oil-engines for pumping water for irrigational purposes. It is a matter for gratification that some of our intelligent and well-to-do agriculturists have begun the experiment of pumping water by this improved means. The success of the experiment, which seems to be certain, will raise a great demand for pumping engines. But the inability of the Indian workmen to repair engines whenever they may go out of order and the heavy cost of sending them for repairs to distant workshops and getting them back may greatly tell against their extensive use. There is no industry which may not require the use of machinery, if it is to serve the country efficiently, under the present conditions. All these circumstances are, I hope, sufficient to prove that there is a demand for advanced technical knowledge and skilled labour enough to warrant the opening of at least one first class college of technology in India.

The system of granting scholarships for technical education in foreign countries is wholly inadequate to secure the supply of the large number of men with advanced scientific knowledge required to meet the growing demands of the Indian mills and factories. Climatic and religious considerations and the inconveniences of residence in a foreign country, vastly differing from India in manners and customs and especially in food and drink, deter many a promising youth from availing himself of scholarships. In the nature of things, the number of scholarships available is few. The donors generally attach conditions to them, which often discourage would-be candidates to seek them. Moreover, no amount of private philanthropy and effort will ever be able to secure as many skilled workmen under the scholarship system, as a well conducted local college of technology will do. Scholarship can serve only those few who are able to go successfully through the full course of technical studies and training, but not those many who may have to be content with such knowledge as may be acquired by undergoing only a part of the course. The latter are required in much larger number than the former for industrial service in subordinate grades. They will certainly render more effectual service than those who are totally ignorant of any technical knowledge. A local institute alone could bring into existence this class of workmen. The

tendency of every civilised nation now seems to be protection of home-made articles and the boycott of foreign manufactures. I am afraid that it may end in the closing of foreign institutions against Indian students.

To make India independent of technical education in foreign lands and of foreign machinery, and to procure locally a decent supply of high class skilled labour, the opening of first class technical colleges in important centres similar to those found in Europe, Japan and America, is an imperative necessity. The contemplated Tata's Research Institute may go to some length to meet the existing wants. But we cannot be sure of this, until we see the scheme of instruction and training to be given therein, finally settled and the institution opened. Research being the main object of the proposed institute, it is open to doubt whether it will help us to the extent required, with the practical knowledge needed for the construction and repair of machinery and for the use of the chemical and mechanical processes in all manufactures. The weaving industry which is most important, next to agriculture in India, demands the earliest and most earnest attention. Agriculture happily attracted the attention of Lord Curzon's Government. Improve-

ment of the weaving industry deserves the best consideration of the Government of India. I need hardly say that this much-wanted and urgent improvement cannot be secured without opening colleges of technology in which all industries are taught to perfection. At least one first class technical college with the necessary library, laboratory, museum and workshop should be opened in some central part of India. It may require an initial expenditure of not less than a crore of rupees and an annual expenditure of at least a lakh of rupees. It may be made an All India Institute, being open to British subjects and the subjects of Native States and financed by the Government of India and Native States and also by the nobility of India in the same manner as the contemplated Tata's Research Institute which is to receive financial aid from the British Government and the Mysore Durbar to supplement Tata's princely munificence.

I would most earnestly urge upon the first Industrial Conference the necessity of taking into their serious consideration, the proposal I have herein made, and of adopting measures to secure for Indian students of technology, a well-equipped local institution, worthy of this great Empire.

## INDUSTRIAL WORK IN INDIA.

By Mr. ALFRED CHATTERTON, Superintendent, School of Arts, Madras.

INDUSTRIAL India has of late years developed rapidly, as a reference to the trade returns will show, but the work has been done by foreigners and to imported capital, and the profits accruing therefrom instead of accumulating in the country are remitted abroad so that the people of India benefit by the establishment of these prosperous undertakings only to the extent that a certain number earn wages in subordinate positions or by doing cooly work. The management and direction of such enterprises are not in their hands, and no fund of experience is being accumulated in the country which will enable further progress to be made. For nearly a century, in industrial matters stagnation has prevailed, and enterprising Europeans and Parsees have been allowed to monopolise progressive methods of working, with the result that now, when Hindus begin to realise the necessity of doing something, they find all points of vantage occu-

pied and they are either appalled at the difficulties which confront them, or go light-heartedly into foolish ventures which can only end in failure and the loss of their capital.

Time was when India was practically on a par with Europe in industrial matters, but now it is a long way behind, and in the little that has been done the great mass of the people of the country have taken no part. Thoughtful members of the community recognised this 20 years ago, and by the spread of technical education they were encouraged to hope that a remedy could be found. As much technical education has been provided as the country could assimilate, but it has resulted in nothing. Other careers offered fairer prospects to intelligent and adventurous youths and only those who were likely to be hopeless failures in other walks of life sought for technical instruction, and they have profited little by it. Of late, however, it is possible to discern a tendency to better things. The Government services, the legal pro-

fession and the mercantile offices are no longer able to provide employment for the ever-increasing number of educated youths who, year by year, are discharged from our educational institutions. The industrial problem has been agitating the community greatly during the last few years. Much has been talked and written and a little practical work has actually been done. One result has been to raise enormously the status of those that are engaged in manufacturing industries in the eyes of the rest of the community.

The most encouraging feature of the situation to-day is the fact that both the Government of the country and the educated classes fully recognise the necessity of doing something. The Government of India by their system of technical scholarships, which are freely granted to promising youths in all parts of the country, are endeavouring to supply, by providing the means for going abroad, the lack of experience which has already been mentioned. All over the country industrial schools are maintained by Government or receive Government assistance, and although so far it cannot be said that they have achieved any noteworthy result, yet they are a preliminary step in the right direction and it is possible that later on the proper function, which they should discharge, will be discovered. In the South of India, the Government of Madras have gone farther than elsewhere and have practically established a department, the avowed object of which is the improvement of Indian industries. New industries have been started and old ones taken up and worked experimentally with a view to ascertaining the possibility of introducing improvements.

The details of our work in this direction would be too technical and too complicated for me to discuss within the brief limits of this note, but it seems to me that it may be a useful contribution to the deliberations of the first Industrial Conference, if I endeavoured to briefly set forth the principles which underlie the apparently disjointed work which we are now carrying on.

A survey of the condition of the indigenous industries of this country reveals the fact that no attempt has ever been made to render them more efficient by reorganising them on modern lines or by placing at the disposal of the workers the practical applications of modern scientific discoveries. As their forefathers worked, so do the artisans of to-day; without capital, without organisation, without machinery or mechanical assistance, and with only the tools and appliances in common use

before the modern manufacturing era began. Each man works for himself or at the most is associated with other members of his family, and the advantages of the sub-division of labour are either not appreciated or beyond the reach of artisans who being without capital might yet combine together, but have so little faith in one another that only rarely do they unite to achieve a common end.

That the indigenous artisan has managed to survive under such adverse conditions is in itself an encouraging fact to those who think that in India something may yet be done to create native industrial enterprise on an extensive scale. At the same time, it has led to the establishment of very erroneous ideas regarding the efficiency of native methods of working. The cheapness of native labour has been greatly exaggerated, the possibility of training it much under-estimated and the people generally credited with conservatism and dislike to changes which has no real foundation in fact.

For three years at least we have been engaged in experiments on lifting water for irrigation from wells and minor sources of water-supply by oil engines and pumps and though it has been conclusively proved that the work can be done for at least one-half the cost of the best native methods of working, yet there are few who accept the fact or think how great a revolution it is bound to produce in the agriculture of the country.

In the Aluminium Department which was our first industrial venture we started with no innovation on native practice except the introduction of the new metal. Experience showed that the cost of production was very excessive and by degrees new methods of working were introduced. The men readily took to them and easily adapted themselves to a system of manufacture based upon intelligent sub-division of labour. Improved tools and machines were introduced only when it was certain that they could be effectively employed and the artisans rapidly acquired dexterity in using them. The final stage of evolution was a factory fully equipped on modern lines supplemented by skilled hand labour to an extent impossible in countries where the rates of wages are much higher. The Aluminium industry is now in the hands of a local company in Madras and although the Directorate is mainly composed of Europeans, from the Workshop Manager downwards, everyone engaged in the manufacturing departments is a native of this country and it may be confidently asserted that the cost of production is as cheap there as anywhere in the world.

The natives of India have been credited with conservatism and stupidity mainly because they were wiser than their would-be instructors. The reluctance of natives to use appliances imported from abroad may almost invariably be ascribed to the fact that they were unsuited to local conditions. For instance, English ploughs and English agricultural machinery are, as a rule, unsuited to native conditions, and they have met with just the measure of success they were entitled to; but the sewing machine which can turn out work much cheaper than by hand is to be found in almost every native village and no serious difficulty has been experienced in using it and keeping it in order although it is a complicated piece of mechanism. Examples of the general adoption by natives of what to them were novelties which proved suited to their requirements are extremely numerous and as typical illustrations may be cited (1) the substitution of kerosine oil for locally made vegetable oils, (2) the almost universal adoption of iron sugar mills in place of the old native wooden mill, (3) the extensive use, where capital is available, of such machines as the modern cotton gin, the rice-huller, the screw press for extracting oil, and in the South of India, at any rate, the wealthy natives have discovered that a small hand pump can be used with great advantage to distribute water over their houses. Briefly within the limits of my own experience I have not found the native of India in the least degree averse to adopting improvements when he is convinced that they are real improvements and that he can adopt them profitably.

No very long time has elapsed since we introduced chrome leather as a material eminently suited for native requirements. We had to learn how to make it ourselves first and were perhaps somewhat precipitate in placing it upon the market. The result was that a certain amount of defective leather was undoubtedly sent out. Yet that did not deter people from trying it, and now that it has been in use sufficiently long to have proved beyond cavil that it is suited to local conditions, the demand is rapidly increasing. The success in this direction is so marked that I confidently anticipate it will take but few years to practically displace the inferior vegetable tanned leather now in general use.

Again, in the matter of irrigation by oil engines and pumps, the initial difficulties to be overcome and our total lack of experience in the matter were so great that the surprising fact is not that

so few have been installed by private enterprise, but rather that so many have taken them up.

I have dealt with this matter at some length, because it is extremely desirable that erroneous impressions regarding the enterprise of people in this country should be done away with. I do not claim that I have found them as go ahead as Europeans or Americans, but I do contend that there is, among the 300 million people of this country, a small percentage who are endowed with as much energy and vitality as will be found among the Northern races. A very small percentage of such a vast number is absolutely a very large figure and till all these have been put on the right track and their latent capabilities fully utilised we have but little right to discuss the indolence and lack of enterprise exhibited in India. To a large extent the qualities of the modern educated Hindu are the result of his environment and system of education. The latter has been moulded too much on literary lines and has been designed to produce what it has actually turned out. If you want men of a more practical turn of mind, give them a more practical education, study the systems which have been evolved in Europe and America and introduce greater variety into the curricula of the schools and colleges in this country, and the result will be a class of men capable of dealing with the industrial problems which at present confront us. Any change of this kind, however, must be the work of time, and for the present it is more important to devise measures for immediately making use of such material as is available.

A survey of the past history of industrial undertakings in the South of India shows that there has been a good deal of misdirected enterprise. Companies have been formed and capital has been found for undertakings which from the beginning were doomed to failure. The unwary investor has been caught by the shares and joint-stock enterprise has justly earned a somewhat evil reputation. Unfortunately in India, that fund of practical experience to which I have already twice alluded is not available and has never been applied to the resuscitation or improvement of indigenous industries. It is practically impossible for the enterprising individual with capital to obtain disinterested advice and assistance regarding any undertakings he may be desirous of starting. Few study the conditions under which the native works sufficiently to be able to give him competent advice and those who have the necessary knowledge are generally not in a position to

do so. Nearly every day schemes of this kind are sent to me for an opinion as to the probability of their turning out commercially successful and it is easy to deal with the majority of them because they are hopelessly impracticable. I may, therefore, perhaps claim to have done some useful work in dissuading a considerable number of people from embarking on ill-considered ventures.

When a law suit is in the air it is well understood that funds must be forthcoming to pay for the best legal advice obtainable and the dignity of a suit and the pleasures of litigation are much enhanced when persons of repute and eminence can be retained by the rival parties. This is a very satisfactory state of things for the lawyers, but in matters appertaining to industrial enterprise, the people of this country have not yet been educated up to the advantages of obtaining the best expert assistance in working out the details of industrial undertakings. In time they will doubtless come to realise it, but in the meanwhile it may, I think, be within the province of the Government of this country to do what it can to demonstrate the necessity for such help.

In each province it might be made part of the duties of specially selected officers to deal with applications of this kind, and if the work were well done it would establish confidence and encourage enterprise. In the Madras Presidency, this has to some extent been recognised and the services of expert officers can usually be obtained by *bona fide* applicants. To distinguish those who really mean business from those who do not is a matter of some difficulty, and under the prevalent undivided family system it is practically impossible to determine whether a man has to command the resources which are apparently at his disposal.

Comparison with other countries shows that India, and here, let it be clearly understood that I am speaking of indigenous India, avails itself but little of the various sources of power which modern engineering science has placed at the service of man. The scale on which work is done has hitherto been too small for the profitable application of such methods of working, and, even where it was otherwise, capital was lacking. Where neither of these objections existed progress and improvement were barred by inability to appreciate the advantages of any change in time-honoured methods of procedure. Within the last few years there has been concurrently a great change in the attitude of the people of the country towards such improvements and a marked advance in

the value and adaptability of the sources of power and their modes of application. Recognising this, the Government of Madras have rendered it comparatively easy for many people to avail themselves of modern improvements by a liberal interpretation of the Agricultural Loans Act. If a man has land suitable for intense cultivation and a supply of water adequate for its needs, he can apply to Government for a loan to purchase an engine and pump. The scheme is reported upon by experts and if it is likely to prove satisfactory a loan sufficient to enable it to be carried out is sanctioned, and the actual supervision of the installation is carried out by Government officers free of expense. A fair number have already taken advantage of this liberal policy and there is no doubt that the success of the pioneer installations will, in the near future, lead to an enormous extension of this method of obtaining water.

Already it has been found difficult to provide sufficiently trained men to take charge of such machinery and to get over this obstacle which threatened to prove a very serious one, a school of engine driving has been started and boys from up-country villages are received and put through a course of training in fitters' work and engine management sufficient to enable them to be safely trusted with the running of these modern motors. All that it is at present attempted to do is to train a man or boy to look after an engine, to attend to its various needs and to keep it clean. He is not supposed to undertake repairs, as if anything gets out of order and the engine works unsatisfactorily a staff of specially trained men are maintained in Madras for the purpose of putting such matters right. By adopting this plan the natives of the South of India will gradually become accustomed to the use of machinery and probably in time they will freely avail themselves of it.

It will thus be seen that in Madras our contributions towards the industrial development of India have taken the form of introducing into India materials and methods of working unknown in the country but perfectly well known among more advanced communities where progress is more rapid. The success we have met with in the past and that which still remains to be achieved in the future depends entirely upon the accuracy with which we have gauged the requirements of the people. Aluminium working was first introduced with the object of creating for it a sufficiently large market to warrant the establishment of

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It will thus be seen that in Madras our contributions towards the industrial development of India have taken the form of introducing into India materials and methods of working unknown in the country but perfectly well known among more advanced communities where progress is more rapid. The success we have met with in the past and that which still remains to be achieved in the future depends entirely upon the accuracy with which we have gauged the requirements of the people. Aluminium working was first introduced with the object of creating for it a sufficiently large market to warrant the establishment of

factories in the country for the production of the metal from the raw materials which are known to exist. The industry is making steady progress but the goal is still far off and the demand for aluminium wares will have to be at least five or six times as big as it is, before we can hope to make the industry independent of imported metal. There is no doubt that India could easily absorb with advantage a great deal more metal than this and it will be interesting to watch how the Swadeshi movement affects the success of one of the pioneer attempts to improve the native industries.

The chrome leather industry is likely to prove very much more important than that in aluminium and its successful introduction will materially increase the visible wealth of the country. The exports from India of raw hides and skins and of half-tanned materials, as you are aware, amount to many crores of rupees and it may be, with some approximation to truth, asserted that the internal consumption of leather in India is at least equal to the value of the export trade. Most of the leather produced in India for internal use is a shameful waste of valuable material. For Indian requirements chrome leather can be produced in the country much more durable than anything produced by the vegetable tanning processes. It, therefore, follows that exactly in proportion to the amount of chrome leather manufactured in India so will surplus supplies available for export increase. Moreover, we are fortunate in being able to find in Europe and America an unlimited demand for anything we have to spare. It may be urged that we are only at the beginning of the chrome leather business and that to some extent I am counting chickens as yet unhatched. But, as a matter of fact, the main difficulties connected with the inception of this enterprise have been overcome and there is ample evidence to justify our anticipations.

Again in the matter of oil engines and pumps we are only adapting to Indian requirements something that is well known and much used elsewhere. In this case we cannot yet say that final success has been achieved; but the prospects are very hopeful and I am certain that it only requires patience and continued application of scientific and engineering skill, aided by the invaluable provisions of the Agricultural Loans Act, to enable us to achieve an important revolution in agricultural methods. Of the irrigated area in India fully one-fourth is dependent upon wells for water-supply, whilst the average value of the crops on

land so irrigated is at least 50 per cent. greater than those grown on lands irrigated from other sources of water-supply. It is only of late years that the value of well-irrigation has been fully realised, but till lately the ryots have been left to flounder in their ignorance and the resources of modern engineering science have not been called in to assist development. The average area irrigated by wells in the Madras Presidency does not exceed 2½ acres, mainly because cattle labour is such a feeble source of power. It is too early yet to say what will be the average area under selected wells where oil engines and pumps are used to lift the water to the surface, but it will certainly not be overestimating it to put it at ten times the present area.

Any extensive adoption of machinery to assist agricultural processes will lead to important changes in the industrial conditions of the country and must of necessity produce an expansion of internal trade. The cultivators taking advantage of these new methods of working will have to go in for intense cultivation to make them profitable and they will have to grow produce which they can sell in order to purchase and pay interest upon the engines which they employ and the fuel which they use. Agriculture is by far the greatest industry in India and upon this industry the success of all others ultimately depends. It is, therefore, obvious that in any attempt to deal with industrial development, agriculture must receive in the first instance the lion's share of attention. With capital and skill the possibilities seem immense, but I must leave it to touch lightly upon one other industrial question before I bring this note to a conclusion.

The subject of hand-weaving in India will be brought before this Conference by my friend Mr. Havell, the Superintendent of the School of Arts in Calcutta, whose advocacy of the claims of the fly-shuttle loom has done so much in Bengal to prepare the ground for the revival of interest in indigenous industrial development which has given rise to the Swadeshi movement. In Madras we have experimented with hand-weaving for nearly five years and the conclusions we have arrived at and the measures necessary to make any further advance were the subject of a special report which was submitted to the Government of Madras in September last. This report was communicated to the Press and has been widely circulated and commented upon in all parts of India. I, therefore, do not propose to go over the same



ground again, but I would like to draw your attention to the very complex nature of the problems to be dealt with and to emphasize the fact that no single factor is of supreme importance.

The modern power-loom in its various forms exemplifies in the highest degree the skill of the mechanic and the tendency is to construct a simplified and lighter form of power-loom which can be worked either by the arms or more frequently by the feet. This, to my mind, is no solution whatever of the problem and the work which is going on in this direction is doomed to be an egregious failure. Assuming, however, that a really good hand-loom is produced, and I think there is no doubt whatever that it will be produced, we have only one factor in the problem which has been eliminated. The question of producing good warps is undoubtedly much more important than the question of the hand-loom. The problem has been solved in regard to the power-loom weaving industry and as a last resource the same solution can be applied to the hand-weaving problem. In the weaving factory, which we are about to start in the Madras Presidency, we are going to attempt a solution of this problem on somewhat novel lines; but if we do not achieve success, by working on a big enough scale, we can always fall back upon the slasher-sizing machine which has proved so satisfactory in power-loom factories.

Hand-woven cotton goods enjoy a reputation for durability which is usually attributed to the merits of the hand-weaving process, but in reality the hand-loom contributes but little to the final result as, the superiority of hand-woven goods is mainly due to the superiority of the native sizing processes. The native weaver with the brush sizes his yarn in a way that no machine can do and I very much fear that in our hand-loom weaving factories we shall ultimately produce what are practically power-loom goods.

I am personally of opinion that the hand-loom weaving factory will ultimately prove a very powerful rival to the power-loom factory, but to what extent it will improve the present condition of the weavers is so extremely complex a question that no certain answer can be returned. The lot of the weaver in most parts of India is so very miserable that a worse fate cannot possibly befall him. But it is possible that any extensive establishment of hand-weaving factories, with their superior equipment and immensely increased rate of output,

may completely deprive of employment large numbers of weavers who still manage to eke out a miserable existence. These people will have to find new employments and other sources of livelihood and it is probable that in the process of transfer much hardship may be experienced. On the other hand, it is by no means impossible that the hand-loom weaving factory may be able to regain ground and compete successfully against the power-loom in certain classes of goods. This would undoubtedly mean increased employment for hand-weavers, a considerable rise in wages and a general amelioration of their condition.

In conclusion, I feel bound to express the opinion that here in Madras we are working on lines which are likely to bring about industrial development in India by the people of India and for their own advantage. Capital must be forthcoming to establish these industries and the brains and the intelligence of the country must be devoted to carrying them on. Huge schemes involving lakhs of rupees of capital will be difficult to start and must almost inevitably come under European management. For the small factories, which it is our aim and object to establish, capital should be readily forthcoming and in their management and working there will be a wide field for the employment of considerable numbers of the educated classes. The constant tendency towards increase in the scale of manufacturing operations which is exhibited in its most intense form in America is to some extent counter-balanced by the increased facilities which we now possess for the generation and distribution of power, and I am certain that if the people in this country are but properly educated, the extremely low cost of living provides a means whereby they may meet the competition of both labour and capital in countries where the necessities of life are more numerous and much more expensive.

**New India or India in Transition.** By Sir Henry Cotton, K.C.S.I. Price Rs. 2-12.

CONTENTS:—India's political problem. Indian opinions and aspirations. The increased bitterness of race feeling. Indian land problems. India's economic problem. Administrative reform. England and India. Political reconstruction. The social and moral crisis. The religious tendencies of India. *Appendix*:—Hindu joint family system.

G. A. NATESAN & Co., ESPLANADE, MADRAS.

# THE ORGANISATION OF CAPITAL IN INDIA.

By Mr. REGINALD MURRAY, Chief Manager, Commercial Bank of India, Calcutta.

**U**NDERSTAND that your flattering invitation to me to address this important meeting is due to my having published sundry pamphlets entitled "Advance India," "Wealth in India," and "A Gospel of Credit," and to my having given more evidence therein of having studied the theory and practice of credit, according to its evolution in the United Kingdom and some other European and American countries, and of having endeavoured to stimulate what I regard as a creative force for the better development of the industrial, agricultural, and trade finance of this great country. You do not, therefore, I imagine, desire from me any further elucidation of the theory of credit, but only such practical suggestions as I can make for establishing or encouraging the organisations necessary to give practical force to my recommendations.

The object in view, as I understand it, is to tap the capital wealth of India and create a constant flow of money for the benefit of the capitalist and those by whose labour, skill and intelligence wealth is increased. It may happen, and does occasionally happen, that the industry, application and knowledge of a capitalist enable him to apply these qualities directly to works of importance and profit, but even in his case, which is exceptional, there must always be a residue of capital lying idle, which if deposited in a good distributing concern would at once become active.

Two important principles are here involved—  
(1) the active distribution of unused capital;  
(2) the relegation of the act of distribution to experts.

For the organisation of this system the form of financial concern which has best proved its soundness and utility is the Joint-Stock Bank. You have seen on the last page of my pamphlet "A Gospel of Credit," the reasons why everyone should deposit their savings (or residue) in banks. I think they will bear repetition on this occasion. They are as follows:—

1. If money is kept in a private house it attracts thieves. If thieves come to take money they may take lives as well.

2. If money is kept in a house or in a hole in the ground, the possessor earns no interest. On all money deposited with banks a depositor receives interest which is paid half-yearly.

3. Money deposited in banks is more readily available and gives the owner less trouble than money kept in a house or buried: because if he wants to make a payment, instead of opening boxes and counting coins and notes, he writes a cheque and the bank takes all the trouble for him. Similarly, if a depositor receives payment by a cheque, instead of going a journey and collecting the money himself, he sends the cheque to his banker, who saves him the trouble without charge.

4. Keeping money on deposit with a bank costs nothing, but, on the contrary, yields a bi-annual return. Money kept in a house or buried costs much time and trouble, and if strong rooms or vaults are built or iron safes purchased, the expense is considerable.

These are reasons which apply to every holder of money, whether the sum be great or small. Their practical application can of course only have effect when there is a bank within reasonable distance. We therefore see at the outset that the first step towards organisation of capital is the multiplication of banks.

The system of Joint-Stock Banks is better than that of private banks, because they offer more certain security to the depositor, and are less partial and more consistent in their method of distribution. Their greater security lies in the publication of their bi-annual audited statements; in the fact that these accounts are critically checked and examined by professional auditors, nominated not by the management but by the shareholders; by the supervision of Directors, also nominated by the shareholders, and by a system of checking and book-keeping which, if properly superintended, ensures a correctness which is almost automatic.

Leaving for later review the formation of Urban Banks and Co-operative Societies, I will

first enumerate the principal considerations in the organisation of Joint-Stock Banks. The foremost of these is sufficiency of capital. It is a great mistake to open a bank with a small capital. A bank to be an efficient collector and distributor of credit must be in a position to command, not solicit, credit. It must be in a position to lend large sums of money on loan if it expects to attract large sums of money on deposit. The Joint-Stock Banking system would show no advantage over the Private Bank system if it did not tend to lessen the cost of finance. The yield per cent. on the capital alone will not cover the cost of establishment and charges. Just as an industrial concern depends upon the extra working capital acquired by loans, debentures, or accumulation, for making its profits, so a bank must have deposits in order to yield profits. Moreover, the prime object of a Joint-Stock Bank is to utilise the unemployed cash balances of the community; or, in other words, to so organise itself as to attract such balances in the form of deposits. Modern banking has formed deposits into two kinds,—those payable on demand, and those fixed for a period. In a fully-developed banking system as is met with in the United Kingdom, it is unusual for banks to allow interest on current deposits, the employment of banks for collecting bills, storing money and making payments being almost a necessity, and if you look at the reasons as mentioned above why everyone should deposit their money in banks, you will find that the convenience and security thus afforded are strong arguments, apart from national finance considerations, in favour of allowing no interest on current deposits.

I wish particularly to impress upon you that there is nothing to lose in keeping money with banks, while in convenience and security alone there is much to be gained. Indirectly the benefit is very great. By the deposit of daily surpluses in banks a fund is accumulated of money which would, if it remained in the hands of the depositors, be earning nothing. In the hands of a Joint-Stock Bank, it represents a sum of money of which part must still be kept unremunerative, but secure, and the balance is available for investment.

The proportion available for investment and the method of investment are necessarily regulated by local circumstances and must be rigidly controlled by expert management. It would take up too much of your time were I to go into

the details of bank management and it will be sufficient for the main purpose of this address to state that it consists of a perfect system of checking and control, the Auditors checking the Directors, the Directors controlling the Manager, and the latter controlling the office, which again is under a graduated system of checking through the Accountant and heads of department.

I think I must have now clearly demonstrated the advantages offered by the Joint-Stock Banking system for the security and employment of unused capital. You will now wish for some demonstration of the advantages which the system offers for distribution.

The advantages I claim are, impartiality, continuity, and cheapness. A Joint-Stock Bank cannot, or certainly should not, engage in trade of any kind. No applicant for accommodation can or should come under disobligation by reason of the trade he is conducting. The only disobligation a bank can or should recognise is the applicant's bad character, want of means or the insufficiency of his security. If the bank is satisfied on these points, it can or should be no respecter of persons.

A bank must have a large capital and large deposits in order to efficiently fulfil its mission as a distributor of finance. It must be able to satisfy all reasonable applications for the finance of current trade at any time. Given sufficient working capital every merchant, manufacturer, dealer, broker, or private financier should be able at all times to arrange his business with the certainty of being able to supplement his financial requirements by the deposit of marketable security, and also of being able to draw money from or remit money to other commercial centres without the trouble, risk and delay of counting, packing and transmitting coin or notes. Hence the bank as a distributor facilitates and, consequently, stimulates profit-making employments and increases the communal sum of profits.

The terms of accommodation are regulated by the proportion of a bank's reserve of cash to its liabilities, or to use expressions hitherto employed in this address, by the proportion of the unused balance of its working capital to the total sum. The more a bank is recognised by all classes as a convenience and a safe custodian, the cheaper must become the terms of accommodation. Let some capitalists may imagine that such cheapness would be an advantage to the active profit-maker only, I would draw attention to

the fact that in every prosperous and progressive place, the capitalist who owns house and landed property gains largely by the increasing value of that property, and moreover with progress many new lands may be brought into profitable use and new industries become possible, all of which offer advantages to the capitalist.

It is therefore in every way in the interest of capitalists that Joint-Stock Banks should be started where they do not already exist, and that capitalists should lead the way in encouraging the employment of existing banks and in establishing new ones in populous centres which are at present unprovided or insufficiently provided. Only, I would again repeat most emphatically, that a bank to do any real good must be strongly capitalised. It must not be promoted like a joint-stock industrial or mining company by a number of subscribers who sign applications with the intention of selling at a profit before allotment or repudiating their obligation if they cannot do so. The right sort of shareholders of a Joint-Stock Bank are capitalists or genuine investors, whose concern is rather for the general advantages to be derived hereafter from the bank's existence, than for the dividends likely to be paid in the near future. The indirect advantages to capitalists of a strong and efficient bank through the cheapening of accommodation and the increase of communal profits are infinitely greater than a difference between 5 and 15 per cent. in the dividends paid by the bank. With such a class of shareholders, the first consideration of the management would be the cheapening of the accommodation and the extension of business. There would be no hurry or necessity to play up to the depositing public by means of premature high dividends, nor would the shares for some time at least go into speculative hands. When a bank is once well established and thriving, the class of its shareholders becomes of less importance, but, in my opinion, it is of the first importance that, during the first few years of a bank's existence, the shareholders should be investors who can afford to regard dividends as secondary to the general purposes for which the bank is established.

There is only one more point that I would ask you to regard as important in the conduct of Joint-Stock Banks. It is absolutely necessary in order to secure a bank's dominating position in the world of credit and establish undoubted confidence in the honesty of its management, that no one of its employees shall be engaged in

any trade or calling outside the bank, shall receive no dasturi or consideration money or commission directly or indirectly from the public in any form whatever, and also shall not individually enter into transactions for purchase of securities or property on his own account involving the borrowing of money to complete the same. Men of brilliant intelligence and high financial abilities are not required to man the offices of banks, but men of ordinary abilities are sufficiently competent provided they are honest and industrious. The scale of salary should consequently be such as to provide not only subsistence but as much more as will enable an ordinarily careful man to put by a sum each year and thus render him free from the temptations which poverty provokes. A bank's service does not offer a fortune to any of its employees, and its chief attraction is the respectable and often influential position which a bank appointment gives. That the public should so regard bank officials is most desirable in the general interests of a bank, but high reputation and uncorruptible honesty must be paid for, and they are worth it.

As Joint-Stock Banks assist only those who have large or moderate monetary transactions, there remains to consider the vast population of working men whose wages seldom admit of their having any surplus in hand above their daily wants. The latter are more often in the position of requiring money than having money to put by. When they have any surplus, the Government Savings Bank offer fair interest and undoubted security, and I cannot conceive any better organisation than the Government Savings Bank for small savings. But the latter does not assist the agriculturist, artisan or clerk who wants to borrow, and who cannot offer the security which a Joint-Stock Bank must by its constitution demand. This difficulty has been met with considerable success in Europe by the formation of mutual help societies of various kinds, and as you are aware the Government of India has taken the subject in hand with considerable vigour by passing the "Co-operative Societies Act of 1903" and by authorising advances from the treasury to a limited extent in support of such institutions.

The application of the Act to Co-operative Credit Societies in towns as well as villages is so fully described in Sir Denzil Ibbetson's speech on the occasion of the introduction of the Bill to the

Viceroy's Council, that I cannot do better than forward you a copy, and with this I also send you the report of the Committee on the Establishment of Co-operative Credit Societies in 1901 and the draft of the Bill as finally passed in 1903. For any further explanation regarding the formation of these societies you should apply to the officer in your province holding the position of Registrar of Co-operative Credit Societies as under any circumstances no such societies can be formed to obtain the benefits of the Act, until approved and registered by him. Moreover, that officer should be in the best position to know and understand your local requirements and to advise you as to the form and rules most likely to be applicable to your communities.

Personally I can only write with experience of Joint-Stock Banking, but I firmly believe that much benefit is derived from Co-operative Credit Societies and am much interested in hearing of their success.

In conclusion, I cordially wish success to the objects which your Conference has in view and I shall look forward to its being the precursor of many similar meetings not only in the fine old city of Benares but in other wealthy cities of India. I rest in the hope that however small my voice may be, the cry of "Advance India" may find an echo among those who have position, influence, and national aspirations, and will repeat it with a more far-reaching, sound and practical effect.

## EDUCATION & INDUSTRIAL DEVELOPMENT.

By Rao Bahadur R. N. MUDHOLKAR, B.A., LL.B.

**T**HE object of this paper is to deal with education as it bears on industrial development and to consider it in relation to the conditions obtaining in India. In a speech delivered by H. R. H. the Prince of Wales some two years ago, on his return from a tour to the Colonies, he exhorted the British nation to "wake up" to the exigencies of its present situation, and to brace itself for the keen struggle of competition with the other advanced nations in the field of industrialism, by a proper system of national education. England still occupies a pre-eminent position amongst the progressive nations of the world as a manufacturing and exporting country. She is still one of the richest—if not the richest country. In the preparation of textile fabrics and machinery she continues to lead in the van. But because her supremacy is threatened, and other nations, who only a generation ago were far behind her, are now coming up close to her, her leaders are urging her to quicken her pace and to strengthen and qualify herself for effecting this object. If such admonition, if this waking up is found necessary for England, how much more imperative is it in the case of India? With all her vast natural resources, her advantages of climate, soil and situation, a sober, thrifty and industrious population, India is one of the poorest

countries in the world. While England has an annual average income of £45 per head, India has an income of only £2, and this according to the most optimistic calculation. Things were not so always. Not many generations have passed since the fame of India's riches and the superior qualities of her manufactures attracted foreign nations from afar to her shores. The country, however, whose finely woven fabrics used to go by ship-loads to Europe, is now dependent upon others for the supply of the greater part of the cloth which is needed by her own children for their every-day wear. From an exporting and manufacturing nation we have become an importing and agricultural one. Possessing the raw materials of manufacture, instead of being able to prepare the requisite finished articles ourselves, we send out these raw materials to other countries and depend upon them to give to them the shape which would fit them for our use. It is a fact admitted by all well-informed persons that the present poverty of the Indian people is in the main due to the decline of her manufactures and the decadence of her old industrial system. The report of the first Famine Commission of 1880 explicitly points out that the phenomenon of ever-recurring famines is due to the disappearance of the industries which maintained in former times a considerable portion of

the population and to over four-fifths of them being thrown entirely on land. The escape of the country from this deplorable condition depends upon the revival and rehabilitation of that varied industrial system, which enabled her in former times, in spite of foreign invasions, internal unrest and political upheavals, not only to supply all the wants of her children to give them "home-made" all the things which minister to the comforts and conveniences of civilised life, but to send enormous quantities abroad and acquire riches thereby. The industrial question in India is a question of life and death. Not only the progress, but the very existence, of the nation depends upon the establishment of a diversity of occupations, which will remove the pressure on the land and enable a substantial portion of the population to earn their livelihood otherwise than by precarious agriculture.

It is foreign to the purposes of this paper to go into the political causes which brought about the present situation. Accepting facts as we find them, it has to be considered whether it is feasible to remedy the present state of things and to establish and develop industries in India. The consideration of this problem is facilitated by the fact that there were other countries which were in a manner reduced to the same predicament as ours and which have now achieved their salvation.

The close of the Napoleonic wars found the countries on the Continent of Europe reduced to a very low state with their resources exhausted, their population diminished, their manufactures dead or decayed. In many states agriculture was the only source of income left. England was the one country the manufactures and trade of which were in a flourishing condition. The working classes were, indeed, undergoing extraordinary privations on account of high taxation, an unsound financial and economic policy, and by dislocation of business caused by the substitution of machinery for manual labour. But the country as a whole occupied a post of vantage. The labours and discoveries of Arkwright, Watt, and Crompton had given an impetus to her manufactures which secured for her a commanding position. For many years after the peace she retained almost exclusive possession of the improved machinery employed in the cotton, woollen and linen manufactures. The continental countries found barriers placed in the path of their progress by regulations which rendered penal the enlistment of skilled English artisans for employment abroad, by prohibitive tariffs which either forbade the import

into England of foreign-made goods or imposed high duties on them. The export of spinning machinery to foreign countries was prohibited until after the accession of the late Queen Victoria. To effect freedom from dependence on England these countries set about systematically. To facilitate the introduction of the improved methods and appliances on which the supremacy of English industries rested, they established a carefully worked out and elaborated system of national education—general and scientific; and by raising to a high level the general knowledge of their peoples and their scientific acquirements, they not only succeeded in achieving their emancipation, but have carried their technical efficiency so high as to compete with England on terms of equality in neutral markets. It is true that Germany and some other countries give adventitious aids to their manufacturers by a system of close protection and bounties. But neither protective tariffs nor bounties would have been of any avail without the almost universally prevailing high standard of general education and the extraordinary cultivation of the mechanical, physical and chemical sciences—theoretical and applied. New industries like those of sugar prepared from beet, or aniline dyes prepared by synthetic process, have been created and are obtaining ascendancy everywhere. It was the labours of M. Pasteur, who applied his scientific researches to purposes of trade that preserved the silk industry and the wine industry of France from the destruction with which they were at one time threatened. France, Germany, Holland, Switzerland not only prepared articles of merchandise from raw materials available in those countries or brought from abroad, but they prepared their own machinery for turning out these goods. German and French machinery is prepared both for use at home and for export abroad. All this is due to education and education of the proper kind. The case of America is even more remarkable. Fifty years ago the United States of America were, as compared to England, hardly anywhere in the field of industry. The advance they have now made is so great as to produce alarm in England itself. The reports of Mr. Mathie in 1884 and of Mr. Mosely's Commission in 1903 demonstrate that the extraordinary strides which all industries have made in America are due to the spread of education—general and scientific. Probably nothing should be more convincing to the Eastern mind than the achievements of Japan. As Mr. Alfred Stead says:—"In the history of the world there has been no such wonderful development in so

short a space of time as that of Japan." Roused from her slumber of centuries by the visit in 1853 of the American men-of-war under Commodore Peary, Japan found that she was nowhere in the scale of nations and that if she was to maintain her independent existence, she must bring herself in a line with the countries of Western Europe, and raise herself to their standard of efficiency. An almost purely agricultural country only 50 years ago, she is now one of the most active and powerful in the field of industrialism; and this position she has attained by the establishment of a most carefully thought-out system of national education. The progress of Japan in arts, industries and trade is specially instructive as she was not on account of the peculiar circumstances under which she was placed at liberty to invoke the aid of protective tariffs.

In the countries of the Western Continents it is now an accepted axiom that there is very close connection between education and the progress of industries and trade. In India the importance of this great truth has yet to be carried home to the people. Even among persons deemed to be educated there is often displayed a latent scepticism about the importance of education in securing industrial development. Half-instructed persons indulge in sneers about the unsuitability of education in promoting crafts and trade. Indeed, some minds still hug the exploded notion that science and art have no connection with each other and that education unfits a man for industrial pursuits.

The report of the Royal Commission of 1884 on technical education contains the acknowledgment that even at that time the continental manufactures displayed the remarkable development of their material resources which had been effected by those countries, and that industrial establishments in France, in Germany, in Belgium and in Switzerland had attained as much perfection as those in England. "Much machinery of all kinds," say they, "is now produced abroad equal in finish and in efficiency to that of this country and we found it in numerous instances applied to manufactures with as great skill and intelligence as with us." England had the start of them by over sixty years, and the Royal Commissioners state that within less than fifty years Germany had made such progress as unquestionably to have taken lead in some branches of industry, more especially those requiring an intimate acquaintance with organic chemistry.

It is not possible to state within the limits of a paper like the present what the study and cultivation of natural science has done to create and develop industries. Even before the discovery that steam and electricity can be made to subservise to the wants of man, considerable advances had been made by the application of mechanics to industrial operations. The spinning jenny and the spinning frame, the utilisation of water and wind power might be mentioned as instances. This substitution of machinery and of natural agents for hand-labour, which began a hundred and fifty years ago, has been proceeding by leaps and bounds. Steam has been harnessed now, annihilating toil and abridging time and space in a way truly marvellous. The conquest made by steam and its general rule in processes of production and distribution are now obvious even to the Indian rustic. But all the same it has to be impressed upon our people, over and over again, that unless modern inventions and recently discovered scientific truths be brought to constitute essential factors in the development of Indian industries, Indian productions will never be able to hold their own in the markets of the world except in a very limited extent as curiosities. The general cry is that the latent natural resources of the country ought to be utilised, that the numerous raw materials of manufactures like cotton, linseed, hides and skins which leave the country every year to the value of 40 or 50 crores of rupees, ought to be turned into finished articles of trade in the country. But this is only possible if we adopt the processes and methods by which the Western nations have brought about a diminution of the cost of production.

It is not to be supposed that it is meant that the mere study of the natural sciences and knowledge of the methods of their application to industrial purposes is sufficient for solving the economic problem. Capital is as great a *sine qua non* as knowledge and moral grit is an equally essential factor. But, as matters stand, the motive power in achieving industrial progress is afforded by the applied sciences. Say the Royal Commissioners on technical education: "In whatever degree the technical instruction of our continental rivals may have trained them for competition with ourselves, in their own, in neutral and to some extent in our home markets, much of their success is due to more painstaking, more pliancy and greater thrift; and also to the general cultivation, the knowledge of modern languages and of economic geography possessed by continental manufacturers."

The economy of labour, time and material effected with the help of scientific discoveries has brought within the means of ordinary persons articles of comfort, convenience and luxury which, only a hundred years ago, were available to the rich alone. Articles which never existed before have been brought into existence. The yield from land has been increased. Natural products which for ages remained unutilised have been made available to the service of man. It must, in fairness, be admitted that even those who show scepticism about the importance of education in the furtherance of industrial progress, do not deny the significance of the only too palpably visible facts around them. The great value of the possession of high scientific knowledge and technical skill in the captains of industries is admitted. The importance of research is not denied. What has to be impressed in India is that education, both general and special, is imperatively needed not only by the commanders and superior officers of the Industrial army, but by the rank and file and the subordinate and non-commissioned officers also. The working-man and the artisan whose brain has been developed, whose eye has been trained, and whose hand has acquired deftness by the proper kind of general education and who has grasped more or less the principles of the craft which he follows, the tools which he handles, and the materials he works upon, is a far more efficient workman than he who has only received the traditional training in the practice of his profession without any general or scientific education. A few men of genius might be able to accomplish extraordinary results without the help of any *regular* instruction. It is not on such exceptional cases that rules applicable to the mass of ordinary persons can be laid down.

No better objective lesson of the effect produced upon national wealth by the development of the natural sciences and their application to practical pursuits exists than the progress of the cotton industry in Europe. The cotton plant is indigenous to inter-tropical countries and its earliest home is India and the countries adjacent. While Europe was submerged in barbarism and ignorance, the cotton manufacture in India had reached a very high state of perfection. Up to the end of the 18th century, it might be said, Europe was dependent for cotton goods on the Indian supply. In England the manufacture of cotton was established in the 17th century; but little progress was made in obtaining hold even on the home market till the mechanical inventions of the latter quarter of the 18th cen-

tury enabled English factory owners to get done by ten men work which formerly required four or five hundred. The Indian manufacture did, it is true, maintain for some years an equal combat against the products of the new power-driven machinery protected by high tariff walls. So late as 1814 the number of cotton pieces imported into Great Britain from the East Indies numbered 1,266,608 pieces, while British cotton manufactures exported to India measured only 818,208 yards, or about 40,000 pieces. But the fight could not last long. The finely woven superior stuffs of Dacca and Masulipatam could, for a considerable number of years, defy the competition of machinery; but in the case of the cloth ordinarily worn by the middle classes, while the Indian stuffs could not be sold in England at the prices at which machine-made stuffs of the same kind could be sold, the latter began to flood the Indian bazaars and to drive the products of the hand-looms of India from their home markets. Within seven years of 1814 the number of cotton piece-goods imported into Great Britain from the East fell down to 534,000 pieces, while British cotton manufactures exported to India rose up to over 19,000,000 yards. America is the other country which was the home of the cotton plant. Till the end of the 18th century America possessed no manufactures except for domestic production and family use. By the end of the Napoleonic wars we find that they have with their characteristic energy established mills which gave work to 70,000 people. But in spite of the fact that the finest cotton was grown in their own country, these mills could be kept working only by the protection afforded by the tariff laws which imposed import duties of 16½ and 27½ per cent. on foreign goods. This protection against foreign competition served the useful purpose of increasing the manufacture. Power-loom works were everywhere erected in large numbers; the most approved processes both in spinning and weaving were adopted. After the close of the Civil War we find that in 1869 the number of spindles was 6,763,000 and in 1875, 9,539,000. The Continent of Europe shows a similar phenomenon. Dependent almost entirely first on the East Indies and then on England for the supply of cotton-yarn and piece-goods, it was only when they were in a position to establish and maintain factories worked with the aid of the latest scientific inventions that they could turn out the products required for home consumption. By 1875-76 Germany had 5,000,000 spindles, France the same num-



ber, Russia and Poland 25,000,000, while Switzerland and Austria had each between 1,500,000 to 2,000,000. The total number of spindles at work in the various manufacturing countries of Continental Europe was in 1875 A. D. 19,440,000; and the number in Great Britain was 39,000,000. Thirty years ago England was thus ahead of the whole Continent of Europe and the United States of America put together. Since then the relative positions of these countries have been greatly altered. The table given below will show how, during the last twenty years, the consumption of cotton in the United Kingdom has increased only by 1,750,000 cwts. On the Continent it has gone from 9.17 to 22.27 million cwts. and in the United States from 6.13 to 18.92 million cwts.

Period.	United Kingdom.	Continent.	United States.	Total.
1876-80	11.20	9.17	6.13	26.50
1881-85	12.88	11.76	7.66	32.30
1886-90	13.75	13.98	9.05	36.78
1891-95	14.11	17.02	11.26	42.39
1896-00	15.05	20.11	14.03	49.22
1901	14.32	21.30	15.80	51.42
1902	15.07	22.10	17.83	55.00
1903	13.90	23.69	16.53	54.12
1904	13.99	22.27	18.92	55.18

Japan has the same tale to tell. At the Restoration in 1867, Japan was practically an agricultural country pure and simple. Even taxes were paid in rice. Judging properly the real sources of the power of the Western nations, she was convinced that the establishment of an industrial system conducted on the latest and most advanced principles was necessary both from the political and economical point of view, and she proceeded with the thoroughness characteristic of her to lay the foundation of her industrial greatness. In 1877 the total trade of Japan with foreign countries amounted to only 50,000,000 yen, or about 4½ crores of rupees. In 1902 the value had risen to 530,000,000 yen. The writer of the article on "Commerce and Industries" in Japan by Japanese states: "In 1890-91 the weaving industry did not make any marked development and the value of goods woven was about 30 or 40 millions yen, but recently, aided by the progress of applied chemistry and also of technology, the industry has made considerable

progress, and in 1899 the weaving capacity reached 150 millions yen. Now with the cotton-yarn industry it has become one of the principal industries of the Empire". The cotton-spinning industry originated in 1880-81 and developed gradually, till in 1890 the number of spindles was 277,895; in 1901 the number went up to 1,181,762. Similar progress was made in the trade in silk tissues, pure and mixed. In regard to mining the writer just quoted says:—"Thanks to the progress of the art of mining, all branches of this industry have gradually developed in recent times, except sulphur and antimony."

The advantage conferred by the application of science to industrial purposes is manifest not only in manufactures but is also apparent in agriculture. Wheat land in the North-West Provinces of India now gives an average yield of 840 lbs. an acre. For the whole of India the average yield of wheat per acre is 700 lbs. In England it is 1,700 lbs. The average yield of cotton per acre is 62 to 70 lbs. in India as against 200 lbs. in America. Rice is 800 lbs. as against 2,500 lbs. in Bavaria. To quote again from the Japanese writer: "Primitive methods have succeeded in the past because of the industry and sobriety of the people (Japanese) as a whole and because of lack of foreign competition; but with the desire to keep abreast of Western farmers, or possibly to lead, the necessity of modern scientific agricultural knowledge has been recognised by the Imperial Government, and where put to practical test has resulted in increased production per acre."

The value of establishing industries in a country for preparing its raw materials into articles of commerce will be properly estimated when we consider facts like those disclosed in the table given below from the report of the Tariff Commission, Volume II.

	Raw cotton (per lb.)	Yarn (per lb.).		
		All kinds.	Grey.	Bleached.
	d.	d.	d.	d.
1876-80	6½	12.82	..	..
1881-85	5½	12.28	..	..
1886-90	5½	11.05	10.53	13.42
1891-95	4½	9.94	9.52	12.05
1896-00	4½	9.75	9.45	11.16
1901-04	5.24	..	11.13	11.65

Though England has to import cotton from America or from the East, the price of yarn is double that of the raw material. That of woven fabrics is considerably more. India exports cotton to the value of about 14 crores of rupees. She imports piece-goods of the value of 33 crores of rupees and yarn worth about 2½ crores. What important addition would be made to the wages fund if we are able to prepare our own piece-goods? Raw hides and skins of the value of 8 crores and seeds of the value of 14 crores are exported. All these are capable of being turned into the articles of use prepared from them with the proper kind of appliances and scientific methods. Some years ago it was estimated by a competent authority that if India only worked up her raw materials, there would be an addition of from 50 to 60 crores to the wages fund and the profits on capital.

The explanation of the wonderful progress of the industries of Continental Europe is given by the Royal Commissioners on Technical Education. "Half a century ago when the countries of Continental Europe began to construct railways and to erect modern mills and mechanical workshops, they found themselves face to face with a full-grown industrial organisation in England which was almost a sealed book to those who could not obtain access to its factories. To meet this state of things these countries established technical schools and sent engineers and men of science to England to prepare themselves for becoming teachers of technology in those schools."

Technical high schools now exist in nearly every Continental state, and are the recognised channel for the instruction of those who are intended to become the technical directors of industrial establishments. Many of the technical chemists have, however, been and are being trained in the German universities. The Commissioners believe that the success which has attended the foundation of extensive manufacturing establishments, engineering shops and other works on the Continent could not have been achieved to its full extent in the face of many retarding influences, had it not been for the system of high technical instruction in these schools, for the facilities for carrying on original scientific investigation, and for the general appreciation of the value of that instruction and of original research which is felt in those countries. All these schools have been created and are maintained almost entirely at the expense of the several states, the fees of the students being so low as to constitute only a very

small proportion of the total income. The buildings are palatial, the laboratories and museums are costly and extensive, and the staff of professors is so numerous as to admit of the utmost subdivision of the subjects taught. The Commissioners were greatly impressed with the general intelligence and technical knowledge of the masters and managers of industrial establishments on the Continent. They have found that these persons, as a rule, possess a sound knowledge of the sciences upon which their industry depends. They are familiar with every new scientific discovery of importance, and appreciate its applicability to their special industry. They adopt not only the inventions and improvements made in their own country but also those of the world at large, thanks to their knowledge of foreign languages and of the conditions of manufacture prevalent elsewhere.

Under the polytechnic schools come the technical schools for foremen. The theoretical instruction in these schools is similar in character but inferior in degree to that of the great polytechnic schools. On the other hand, considerable attention is devoted in these schools to practical instruction in laboratories and workshops which is not the case in polytechnic schools.

Side by side with the general polytechnic schools are institutions for specialised instruction, such as weaving schools, miners' schools and schools for workers in iron and steel industries; etc., which are intended mainly for developing the qualities required in the foremen, managers and masters. Most of these schools in Germany are founded or maintained by the manufacturers. There are schools for giving the instruction requisite for those who enter the commercial and banking lines.

Numerous societies exist for the purpose of development of technical education among workmen and other persons engaged in industry, by means of lectures and by the establishment of schools and museums of technology. These associations are supported mainly by merchants, manufacturers, and Chambers of Commerce.

The facilities which exist in England for what might be called the training of supervisors, directors, leaders and organizers of manufactures, trade and commerce are said to be even ampler and of a superior type. But the one thing in which the Continental educational system is superior to that in England is in regard to the provision for the education of workmen and artisans. Primary education is compulsory and every boy has to attend a

school from the age of six till the age of fourteen. In some countries both primary and secondary education is free. And it is not only in regard to writing and simple rules of arithmetic that instruction is given in elementary schools, but drawing—both freehand and by measurement—and manual instruction form part of the curriculum. The greatest importance is attached to drawing as a training of the eye and as teaching exactness. Value is given to manual training as developing dexterity of the hand. The possession of these qualities is considered as necessary for those who are intended to adopt literary pursuits as for those who go in for industries and art. The great importance of drawing and manual training is now recognised in England also.

The American system, while adopting the superior methods which are shown to be desirable and necessary by eminent educationists and practical men, and which the experience of the last two generations justifies, seeks to give them a still more practical turn. The aim of the American Universities in their departments of science and commerce is to turn out businessmen who are conversant with the theory of their respective callings.

The report of the Commission which under the initiative of Mr. Mosely visited America with the object of finding out how far the phenomenal development of American industry can be attributed to education—general and technical—reveals several most instructive facts. They state that the most flourishing mechanical and electrical establishments seek after the services of graduates. In fact, the demand of scientific graduates exceeds the supply. It would be well to bear in mind, as the Commissioners point out, that in America there are one hundred and ten thousand graduates in every million of the population. The faith of the Americans in education, as the true basis and qualification for all useful pursuits and occupations, is so intense as to partake almost of religious fervour.

The great effort of all the leading Western nations is to train up the entire body of their citizens for the callings they may have to adopt in life. They have assimilated the grand truth that the object of education is not so much to stuff the head of the child and the youth with more or less diversified book-lore, but to cultivate his faculties, to train his brain, eye and hand, to develop his reasoning powers, to stimulate observation and to encourage construct-

iveness. It is recognised to be a sacred duty of the State to devote its funds to the preparation for life of its juvenile and adolescent population. It is stated that some of the American States devote nearly half their revenues to purposes of education.

The spread of education in the leading nations of the West will appear from the facts given below:—The total population of Germany was in 1900-1901, 56,367,000. The number of pupils in primary schools was eight millions. The number of primary schools was 60,000 and of teachers 125,000. So far back as 1875 education was so widely spread that out of 139,855, the total recruits of that year, only 3,311 or 2.37 per thousand or 2½ per cent. were unable to read or write. In 1898-99 the number of persons recruited was 252,382, out of whom only 173 or seven men out of ten thousand were returned as illiterate. The number of secondary schools—classical and real—is 1,076. Those in Prussia alone numbered 578 and contained about 148,500 pupils. There are 21 universities in Germany which in 1898-99 had 33,500 scholars and 2,802 professors and teachers. Persons receiving higher technical education were 13,000. In addition to technical high schools there were three academies of mining and eight of forestry and there are agricultural schools (of the status of our colleges) attached to several of the universities.

In England with a population of 32½ millions the average daily attendance in elementary schools was 4,666,000 in 1900. The secondary and higher schools and the universities have for generations been well attended. Their number has been largely increased, and what is more important, their modern and scientific side has been vastly developed. During the last 20 years technical instruction, secondary and higher, has made great progress and technical schools have been multiplied. The whole system of education is being overhauled and drawing, clay modelling, manual training in wood and metal and science teaching are becoming more and more an established part of the primary and secondary curriculum. Manchester spent three hundred thousand £s, equal to forty-five lakhs of rupees, over her new technical school. The Leeds higher grade school, which has the three departments of (I) the classical or professional, (II) the modern or mercantile, and (III) the science or technical, has accommodation for over two thousand pupils. Manual instruction and workshop practice forms part of the compulsory course for

boys in every standard. The physical laboratory, the chemical laboratory, the manual workshop and the gymnasium are superbly fitted. The provision for the proper instruction of girls is equally well thought-out and in place of the manual training prescribed for boys, girls are taught cookery, needle-work and cutting-out, dress-making and calisthenics.

It is not to be understood that in the desire to promote the spread of scientific and technical knowledge and skill, the importance of the study of the humanities is overlooked. Literary education, the pursuit of philosophy and of the mental and moral sciences generally receive their due attention. There are secondary and higher schools maintained for this branch of knowledge, and the universities show their proper appreciation of them. The result is that though it cannot be said that perfection has anywhere been attained, these countries are striving might and main to evolve a harmonious system where each youth will develop his aptitudes.

The educational system in Japan is based on the most approved Western methods. Count Okuma states: "The Emperor, with great foresight, determined that the system of education of the Western world should be adopted, so that Japan could learn enough to beat the foreigners in their own grounds, and thus preserve their country for themselves." It is laid down by law that all children must attend school on reaching the age of six. A clear sweep was made of the old education system and new schools conducted on modern ideas took its place. It is stated that more than 90 per cent. of the school population are at present receiving the prescribed course of instruction. And though the education in the higher primary schools is not compulsory, 60 per cent. of the graduates of ordinary primary schools pass to the higher primary schools. No fee can be charged for primary education, unless under special circumstances and subject to the approval of the local Governor. Instruction in morals forms a portion of the school course both in primary and secondary schools. Instruction in the sciences and in drawing forms a necessary portion of the upper primary and secondary curriculum. Placed in a situation very similar to that of the Indians the Japanese insist upon the great necessity of studying some modern European language.

Above the secondary schools are the higher schools and the universities. The aim throughout is to equip the different classes of the people with the mental and moral requisites, the literary

culture and the scientific and practical acquirements suited to their different stations. The education of girls is regarded as essential and due provision is made for it.

If India has to obtain a proper place in the scale of nations she must adopt the methods which the experience of these countries has shown as most suitable. Both in the matter of provision for education and the nature of instruction imparted and the manner of imparting it, we are very far behind the European nations and the Americans and the Japanese. The total population of British India is some 23 crores: out of these only about 40 lakhs are under instruction; 36 lakhs of these are boys and only 4 lakhs girls.

Taking the population of the school-going age to be one fourth of the entire population, there are only seven out of 100 boys and girls who receive some kind of instruction. The revenues and receipts of the Government of India aggregate to about 124 crores of rupees; out of these only four crores are spent for all purposes connected with education. The direct expenditure on education from public funds is about three crores. The efforts made and the money applied for promoting the arts, industries, and commerce of the country are exceedingly meagre. The universities modelled on the ancient traditions of Oxford and Cambridge have severely let alone such important branches of applied science as mechanical and electrical engineering, mining, metallurgy and bacteriology. Of recent years, thanks mainly to Dr. Thomson, some provision exists in the College of Science at Poona for giving instruction in mechanical engineering. The Engineering College at Roorkee aims mainly at supplying the instruction which is required for officers of the Engineering and Telegraph Departments. The one technical institute fitted up to give instruction in mechanical and electrical engineering and textile manufacture owes its origin and establishment chiefly to the public spirit and munificence of the citizens of Bombay. There are only two agricultural colleges with sixty scholars in the whole of India; seven schools of art with about sixteen hundred scholars and 75 industrial schools with some 4,500 pupils. In the most advanced and populous presidency—Bengal—which contains one-fourth of the total population of British India, there was till the other day no agricultural college, only 300 scholars in the schools of art and 900 in industrial schools. The industrial schools themselves were, as the Government of India were constrained to

say, wanting in definiteness both of methods and objects and produced small impression either upon industrial development or upon industrial education.

Apart from the existing system being like its models mainly literary and classical, it had the further defect that even in the departments of mathematics and science, to the extent that they received recognition in the arts colleges, the curriculum and the test of examination were so determined as not to give adequate importance to their highly practical character. The methods of instruction have been, like those which prevailed in England till recently, very faulty. The colleges and high schools turn out mostly people with literary proclivities, men who are only fit to be teachers, clerks, or officers in Government service, or lawyers. The fault is not of the men but of the system of education and the methods of instruction.

It would be outside the purpose of this paper to go into the whole question of general education, secondary and higher, or to enter into the controversy of the value of the classics in a general scheme of education. Confining ourselves to the strict limits of the subject before us, we have to consider what alterations in our educational system and methods are demanded by the exigencies of our economic situation.

The first thing that has to be done is to recognise the fact that some education is necessary even for workmen and artisans and that our industrial development cannot be said to be established on a solid foundation unless the mass of operatives on whose labours it would depend are better fitted physically, intellectually and morally for their work than at present. The Government have in India the same duty and responsibility in regard to the instruction of the masses that they have in England, and we are justified in appealing to them to take here the action which is deemed absolutely necessary in Great Britain. The money required for this all-important object ought to be forthcoming and the cost ought to fall in equitable shares upon the general revenues and the local funds. In England the expenditure on public elementary schools amounted in 1900 to 12,453,000.£s, which is more than four times the sum spent in India for all kinds of education—university, secondary, primary, general and special. The course of study and the methods of instruction must be brought in a line with those which have been now demonstrated to be the right ones. Beginning with kindergartens, where the infantile intellect

is drawn towards constructiveness and familiarised with objects by brick-building, paper-cutting, drawing, &c., the children in the primary schools should be made as conversant with natural objects as with reading and writing. Drawing should be introduced from the very beginning and should form an essential part of education—primary and secondary. Manual work on wood should come in the 10th year and clay-modelling a little before it. It need hardly be said that the simple rules of arithmetic and rudimentary grammar and geography and the salient facts of history must form part of the primary course. As in the Swiss, German and Japanese schools bifurcation will have to be introduced from the 10th or the 11th year, according as the pupil is intended for a literary course or an industrial course, and according as his education in regard to either of these lines is to end with the primary school or is to be continued in the secondary and higher schools. The subjects and the hours assigned to them must vary; but the main thing which has to be borne in mind is that mere reading, writing and arithmetic and a smattering of geography and history is not real education, and can confer but inadequate help either to workers or leaders in the keen industrial struggle which is going on. All the discoveries of science were made by men who had an inquisitive mind, who observed and watched keenly all that went around them and how it happened, who were accustomed to question Nature and to obtain a reply from her. These persons may or may not have possessed literary knowledge. Their achievements were due to their powers of observation and their taste for experiment. These powers, absolutely necessary in the case of the directors, organisers, and leaders of industries, are also of very great value in the case of the ordinary workers. The pace of improvement is certainly thereby accelerated. From the industrial point of view, therefore,—as also from every point of view—the great object of education should be not merely to familiarise the pupils with certain facts of history and other subjects or even of the occurrences of Nature and her operations, as to build up a healthy well-regulated mind, trained to observe, to reason, to judge and to construct. The present system, especially in its primary and secondary stages, no way helps towards the formation of such a mind. If strong men have arisen in England or India or elsewhere, they have arisen in spite of the system, not on account of it. The ability to read and write is of course an immense help to an inquisitive artisan who knows his

business, to learn what is happening elsewhere and to improve himself in that way. But what he was taught at school went but a small way to fit him up to be an efficient artisan.

The whole educational system existing at present will have to be greatly modified both in regard to the subjects of instruction and the manner of instruction.

It is not proposed to lay down here curricula for the different grades of schools or collegiate institutions. What has to be emphasised is that the principle insisted upon, as applicable to primary schools, ought equally, if not more, to govern secondary and higher education. The possession of a healthy physique and a high character are as necessary for foremen, masters and managers of factories as for men in other walks of life. Drawing and manual work must also form a part of the course they have to undergo. Our schools should give the same kind of instruction in the theory and application of the different sciences, the same kind of laboratory and workshop practice as is insisted upon in the corresponding institutions of Great Britain, Germany and the United States of America.

The advance of India requires that there should be at least one secondary technical school for each district corresponding to the high schools on the literary side: one superior school or college for each of the minor provinces and two for each presidency and one polytechnic academy and institute of research for the country. The superior schools or colleges for this kind of education should be of the same status as arts colleges teaching up to the B. A. standard in the matter of general education. The polytechnic academy and institute for research should provide for post-graduate study. For a long time to come it would be necessary to make liberal provision for sending some of our best young men, who have received the scientific instruction available in the technical colleges and academy existing here, to prosecute their special studies in the institutions of Great Britain, Germany, France, or the United States. The Government of India have already established some scholarships for this purpose; but their number will have to be increased.

The main thing to be kept in view is that action has first to be directed towards developing those industries which would give the largest employment to our people and to work up those products which constitute the raw materials of articles consumed in large quantities. Agriculture is the

chief occupation of the majority of the people and will, even when manufactures are established, give employment to more than half of the population. The importance of increasing the productive capacity of land by the application of science is manifest.

The technical education given in public schools cannot be expected to endow the pupils with the full dexterity of the qualified operative or foreman, or the resourcefulness of experienced managers. These are developed only by practice and experience. The value of the technical education advocated consists in laying a foundation for the development of superior skill and business capacity. Its object is to teach these various classes working in the production of national wealth, the principles which underlie their various callings and to show their application.

The proposals put forward require a hierarchy of qualified teachers. Those needed for primary and secondary schools will have to be trained up in the country. Those wanted for collegiate institutions and the academy of research will, in the beginning, have mostly to be brought from abroad. But even in regard to those institutions the aim should be eventually to have as professors and directors of research qualified Indians who have acquired the requisite knowledge in the best institutions existing in the advanced countries of the West.

It is not only in schools and for young boys and girls that provision for instruction has to be made. The majority of the people in India are in such poor circumstances that a lad of 12 or 13 lies under a compulsion to begin to work for earning his living and helping his father in the support of the family. Such a state of things is not, however, peculiar to India, and, as in Germany, Switzerland and other countries, this difficulty should be met by the establishment of continuation schools, evening classes and regular courses of public lectures and demonstration.

Owners of large factories and industrial establishments in Europe and America find it profitable to their own interests to make arrangements in some such wise for extending the mental vision and knowledge of their operatives. Mechanics' institutes, libraries, museums, laboratories have exercised in those countries an immense influence in bringing about the present high level of general advance.

It need hardly be said that these things are not asked to be introduced all at once. Progress to be real and permanent must be gradual.

But the example of Japan demonstrates that it is entirely wrong to say that progress can only be achieved at a snail-slow pace.

The Government of India do not seem to be wanting in their appreciation of the importance of industrial development and the close connection which scientific and technical education has with it. But their performance in this direction is hardly commensurate with their declaration. Indeed, the latest Government Resolutions on this subject lay down propositions which are far from reassuring. They find fault with the educated classes, that they go in only for literary and classical education. On the other hand, there is the injunction issued to the Local Governments that members of higher or educated classes are, as a rule, not to be allowed to receive the benefit of the facilities suggested to be afforded for the extension of technical education. The proscription of English and the direction that the vernaculars are to be the vehicles of instruction show that it is not secondary and higher technical instruction which is proposed to be encouraged. The utter inadequacy of the action proposed in the Government Resolution is obvious. After what has been said before it is not necessary to give the assurance that the importance of creating a class of trained and educated operatives is fully recognised. But it must be stated that the most potent factors in the increased production of national wealth would, in the case of India at least at present, be the leaders, managers, directors and supervisors of industries. It is the skill, capacity and training of generals and captains which determine victories more than the bravery and steadiness of the rank and file of an army.

To put the matter in brief :—

We stand in need of a system of national education which will cultivate the brain, train the eye and give deftness to the hand, which will develop the powers of observation and experiment and create a general taste for the study of Nature, a desire to understand the working of her powers and utilise them for the benefit of mankind. The system must aim to produce a class of qualified workers, qualified supervisors and qualified directors and leaders. In other words, there must be universal primary education, widespread secondary education, and sufficiently ample provision for the study of the higher branches of science and the promotion and encouragement of research. Such a system is possible only if there is active sympathy and support of the State.

While gratefully acknowledging our indebtedness to the British Government for the enlightened and wise spirit in which it has on the whole dealt with the question of education since 1854, it must be confessed that what has been done till now though by no means of small value and benefit in itself cannot but be deemed to be little when we bear in mind the immensity of the task that has to be accomplished. It will be necessary for Government not only to devote as large a portion of the public money as they have been doing but to multiply the allotments many times. Primary education must be made compulsory. Every boy ought to be made to attend some school from the age of six to the age of twelve. Compulsory attendance in a school necessarily implies the provision of free instruction in every village and town. The burden should be equitably divided between the general revenues and local funds. Scientific and technical education must receive far larger attention than has been given till now. But it is not on Government alone that the responsibility of accomplishing these objects rests. We have an equally heavy duty to perform. Men of light and leading, men who are blessed with the good things of the world lie under the obligation of co-operating with Government in the vast task that has to be performed. We must ever bear in mind that no nation can achieve its salvation unless it is actuated by a high sense of duty and is prepared to sacrifice considerations of self-interest, personal ease and comfort, for the promotion of the general weal. Heaven helps only those who help themselves.

It is not by indulging in idle dreams or vague longings or empty talk that any result can be achieved. It is sustained action and strenuous efforts nobly conceived and wisely directed, that are required. We must have faith in work, and firm reliance on the immutability of the principles of justice and righteousness which under the supreme intelligence govern the universe.

Trust no future, how'er pleasant!  
Let the dead past bury its dead!  
Act, act, in the living present!  
Heart within, and God o'erhead!

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# INDIAN AGRICULTURE.

By Mr. LALUBHAI SAMALDAS.

## IMPORTANCE OF AGRICULTURAL INDUSTRY.

THE vast importance of agriculture in this country is evidenced by the fact that the agricultural population including both the actual workers and dependents is about \* 65 p. c. of the total population. Agriculture thus supports some 19 crores of people in the whole of India including the Native States; and it well may be called the backbone of Indian industries. The diversion of the agricultural population to other industries has very often been suggested as one of the chief remedies to alleviate the sufferings due to recurring famines. This is true so far as it goes. But how small a percentage of the agricultural population can thus be diverted, will best be seen by studying the import figures of the chief article of import, viz., cotton piece-goods and yarn. The amount of these imports in 1903-04 was worth 19 millions sterling, i. e., about 29 crores of rupees. The number of persons employed in the cotton mills of this country in the same year was 186,271 and the production was 578,381,000 lbs. of yarn and 158,747,000 of woven goods. Taking the price of yarn at 3 lbs. a rupee and that of woven goods at 2 lbs., the average production per man comes to about Rs. 1,200. The cotton piece-goods proposed to be manufactured, to take the place of Manchester piece-goods, will have to be of finer counts, and will have in many cases to be bleached and dyed; the average production per hand will therefore be less. Taking it at, say, Rs. 1,000 per hand, the number of persons who will be supported by this new industry—if the whole imported amount were produced here—will be at the most 3 lakhs, or, including the dependents, 6 lakhs of people, i. e., about  $\frac{1}{2}$  per cent. of the agricultural population. Even granting that the starting of such industries will have other social and economical advantages and also that the persons employed therein may thereby gain higher wages than they used to get as agriculturists, it is rather wide of the mark to talk of this diverting of 3 lakhs of people—to take the instance of the most important industry

\* Lord Curzon in his last speech, while referring to his own work for the masses, spoke of the peasants as forming 80 p. c. of the total population. I do not know what authority his Lordship had for making such a statement. I depend for my figures on the statistical abstract relating to British India from 1894-95 to 1903-04.

—as having any determining effect on the general condition of the agriculturists. The comparative importance of agricultural industry can be estimated in another way also. The land revenue of the country was about 19 millions sterling in 1903-04. The incidence of land revenue to gross produce varies from 5 to 33 per cent. in different provinces. It would be fair to take the average at 10 per cent.; the gross produce from the land can be put down at 190 millions sterling\*. If, by improving the methods of cultivation, the agriculturist can grow not the proverbial two blades of corn but merely a blade and a quarter instead of one, the country on the whole will be richer by about 50 millions sterling, which is only a little less than the total imports of all articles into this country. Those who therefore want to see this country take its place amongst the civilized countries of the world should try their best to see that suitable improvements in the methods of cultivation are introduced and that the condition of the agriculturist is thereby bettered.

## COMPARATIVE LOW STATE OF INDIAN AGRICULTURE.

That a great deal remains to be done to improve the methods of cultivation in this country can best be seen by comparing the average production per man and per acre in India and in Great Britain. The total farming product in India has been put down by Mulhall at 400 million pounds; the agricultural population in 1891 was 172 millions; from which it would appear that the farm products average 46s. per head; say £10 a year for each adult male peasant. In the United Kingdom it is £91 per head. The high prices fetched by agricultural produce in that country may account for part of this difference, but the rest must be due to the smaller production per acre. This is borne out by the fact that the produce of wheat was 9 bushels per acre in India while it was 32 in the United Kingdom. Making allowance for the differences in soil and climatic conditions, it must be acknowledged that part of this defect is due to inferior methods of cultivation.

## THE AREA UNDER CULTIVATION.

India is said to be over-populated, and this is true so far as the productive area per head of the

\* Mulhall puts it down at 320 millions sterling. If these figures are accepted, the case becomes much stronger.



actual population is concerned. While the cultivated area per inhabitant is more than two acres in other countries, in India it is one acre only. The utmost limit to which this can be extended is about 50 per cent. if all the culturable waste be brought under cultivation. The net area sown with crops does not show a marked increase during the last ten years. It was 196 millions in 1894-95, fell down to 177 millions during the famine year of 1896-97, came up to the former level in the next two years and again fell off to 180 millions in the famine year of 1899-1900. There has been a steady rise in the cultivated area thereafter, it being less marked in the first two years following the famine year while it is more than 4 per cent. in the next two years. The most hopeful sign, however, is the increase of the area under irrigation from some 24 million acres in 1894-95 to about 34 millions in 1903-04.

A study of the estimated area under principal crops and their yield shows that while rice and wheat are sown in almost the same area, and indigo has suffered the most, the area under cotton cultivation has been steadily increasing. The same improvement is noticeable in the case of tea, while coffee shows a small falling off. The import duty on bounty-fed sugar which was expected by the Government of Lord Curzon to assist the indigenous sugar-cane plantation has had no such effect. On the contrary, the area under sugar-cane has gone down by some two hundred thousand acres. The effect of the two great famines is seen in the shortage of area under wheat in Bombay, Central Provinces, Berar, and Rajputana. In Bombay, wheat was grown in about 2 millions and a half of acres in 1892-93 and the following two years. In 1896-97 it was sown in only a million and a half acres, while in the great famine year of 1899-1900, the area went down to a million and a sixth. The yield per acre in that year was less than a half of what it is in an ordinary fair year. The area under wheat has slowly been increasing since then, but it is still, *i. e.*, in 1904-05, about half a million behind the maximum acreage of 1894-95. The figures of the Central Provinces tell the same tale; while those for Berar are much more heart-rending. The area under wheat which was about a million acres in 1892-93 dwindled down to about 18,000 acres, *i. e.*, less than two per cent. of the former area in 1899-1900. The recouping process has set in, but even in the past year the area under wheat was only half of what it was in

1892-93. This is, however, partly due to the province having taken to cotton-growing. In the Punjab and the North-West Frontier, though the area was reduced during the famine year, it has again reached the former high level while the total yield—owing most probably to better irrigation facilities—has increased appreciably. Cotton, one of the other staple crops, is gaining ground in the Punjab and the North-West Frontier provinces where the area has almost doubled in the last decade and also in the Central Provinces and Berar. Bengal shows a steady falling off in cotton cultivation, but that is compensated for by an increase in jute cultivation. The fate of indigo plantation, the area under which has fallen off to about two fifths in the last decade, is one more proof of the apathetic attitude of Government towards agricultural industries. There is no reason why the artificial synthetic indigo should have driven the natural indigo out of the field, if the latter had at its disposal the same scientific knowledge that the former has had in Germany.

#### THE NECESSITY OF SYSTEMATIC INQUIRY INTO THE METHODS OF INDIAN AGRICULTURE.

The first Famine Commission in their report say that "the defect in the efforts made by Government to instruct the cultivator has consisted in the failure to recognize the fact that in order to improve Indian agriculture, it is necessary to be thoroughly acquainted with it and to learn what adaptation is needed to suit modern and more scientific methods and maxims to Indian staples and climate." Mr. Wallace and Dr. Voelcker who came out as experts to study the condition of Indian agriculture and to make recommendations for improvements therein, laid stress on a systematic inquiry being undertaken 'not in a hurried way but by patient watching and learning without which no really sound knowledge will be obtained, nor any great improvement be intelligently inaugurated'. Partly on account of the vastness and complicated nature of the agricultural problem, partly on account of the hands of the local officers being full of routine and other work, partly on account of the want of sufficient funds for this work, partly on account of the feeling created by Dr. Voelcker's report that the Indian *raiyat* is quite as good as and in some respects the superior of the average British farmer, but chiefly on account of the ease with which the land revenue was recovered, Government have been apathetic towards the wants of the agriculturists. The famine of 1899-1900

was an eye-opener to all. It was felt that if lakhs of lives were lost merely on account of one famine year, there must be something radically wrong with the condition of the agriculturists; and now, after a lapse of some ten years since Dr. Voelcker submitted his report, there is a prospect of such work being taken up by the provincial departments of agriculture in concert with the Imperial experts and at the same time of the provincial departments being brought into closer touch with the agriculturists—at least, the Agricultural Board at their meeting held at Pusa in the beginning of this year have decided to adopt such measures.

**THE PROBLEM NOT MERELY AN AGRICULTURAL ONE BUT A SOCIAL, ECONOMICAL AND POLITICAL ONE.**

The Hindu Law of Inheritance requiring a sub-division of the parental property into equal parts, is one of the chief causes of the smallness of the holdings in this country which constitutes a limit to the possibility of agricultural improvement. The Bombay Presidency excluding Sind is divided for revenue and administrative purposes into three divisions. In the Northern Division, more than half the number of holdings are under five acres. In the Central and the Southern divisions where land is not as rich and fertile as in the Northern Division, the holdings are larger—the average acreage of a holding being 29 and 18 acres in the Central and the Southern Division, respectively, as compared to 10 acres in the Northern Division. With the increase in population there would be a greater sub-division of land, as ordinarily the agriculturist sticks to his land till he is driven away by circumstances and then he usually degenerates into an agricultural labourer or emigrates to a city or town and becomes a mill-hand or an ordinary labourer. The social customs and habits prevent ready emigration from a thickly to a sparsely populated area and they also act as a deterrent to an agriculturist following any other calling than that of his father. If these barriers be broken and if facilities are granted for the shifting of population to places having large culturable wastes, pressure on land will be relieved in one quarter, while more land will be brought under cultivation in other quarters and the total wealth of the country will be increased. The total irrigated area in 1903-04 was 34 millions of acres, out of the net sown area of 208 million acres; that is in some 84 per cent. of the area under cultivation, the agriculturist can grow one crop and must depend upon the

rains for getting his harvest. The greater facilities of irrigation, therefore, means dependence upon that uncertain factor—the reasonable fall of rains. The Irrigation Commission have come to the conclusion that no heroic measures are possible but that much good work can be done by providing well-irrigation. The first thing in this connection is to find out the presence and depth of sub-soil water. At present the cultivators depend in this matter upon persons who are reputed to possess the natural gift of finding out the presence of sub-soil water. That there are such men, I know from personal experience. They, however, do not disclose their methods. The more scientific method is, however, the test by boring apparatus; and the free supply of such apparatus in places where they are needed would prevent the waste of money in digging useless wells. In ordinary years, the agriculturist having no irrigation facilities has not to work for more than eight months a year while the females of the house have not to work for even that length of time. The rest of the time is passed by the family in practical idleness. If means can be provided by which they can do some work during this period and earn some extra money, their condition will be improved to that extent. The work must be such as will not be considered derogatory to the social status of the agriculturist and must not at the same time require an outlay of capital beyond his means. The small holdings in Guzerat have proved advantages in one way. The proprietor is able to pay more attention to his small farm and as he has to obtain his living from the same, he is obliged to have recourse to high agriculture. As a result, they have reached such a stage of careful cultivation as led Mr. Voelcker to say "certain it is that I at least have never seen a more perfect picture of careful cultivation, combined with hard labour, perseverance and fertility of resource than I have seen in many of the halting places in my tour." There is, however, a corresponding disadvantage, for improvements that are practicable in the case of large farms cannot be undertaken on small farms and the problem of agricultural improvement in their case becomes much more difficult.

The improvements in the methods of cultivation depends largely on the resources of the cultivator which are wellknown to be very poor in this country. The Agricultural Board have had to acknowledge that "one reason for the slow progress which could only be hoped for in

India, was that the Indian cultivator was not a capitalist. The agriculturist here cannot without any extraneous assistance undertake experiments or introduce improvements requiring an outlay of capital—and it is the duty of Government to render such assistance". The Vice-Chairman of the British Cotton-Growing Association in his letter to Lord Curzon says: "We would also suggest for your Lordship's consideration, the possibility of some form of financial assistance to the native cultivators on the security of their crops as in Egypt and the United States, and as in the case with the indigo and tea planters in India, so as to ensure that a reasonable interest is charged and that better profits accrued to the farmer than hitherto." The Government of India have adopted the above recommendation and sanctioned a grant for the purpose. The question, however, is why Government did not take any active interest in the matter till they were reminded of their duty by a powerful body in England and why they have not extended a similar policy to other crops also. The motives underlying the request of the Cotton-Growing Association or of Government's acceding to the same do not matter much so long as the expected result is for the good of the agriculturist and one which may prove advantageous to mill-owners also. What ought to be insisted on is that Government having adopted the principle of making grants for improvement in the quality of one staple crop, should not stop there, but must extend similar patronage to other staple crops, although these may not be backed up by equally powerful associations. On the same principle, the agriculturist should be assisted with capital for other agricultural improvements also, e.g., the digging of wells, the purchase of labour-saving appliances and better quality of seed, better manures, etc. Mutual co-operation is another method by which the agriculturist can find cheap capital. The Co-operative Credit Societies' Act has been passed for that purpose and a few societies have already been started in different presidencies but they will take time to grow and to command the capital required for large and permanent agricultural improvements. When they arrive at that stage, they will be in a position to supplement the efforts of the Government, or if they thrive still better Government may withdraw its assistance from the work altogether. But till that stage is reached it is the duty of Government to render such assistance to the agriculturists.

#### THE NECESSITY OF TYPICAL VILLAGE INQUIRY.

Dr. Voelcker in his report says—and Lord Curzon gave expression to a similar sentiment in one of his speeches—"that even were the Government demand for land revenue remitted by one-half, it would not result in the production of that which Indian agriculture requires most of all, viz., more manure to put on the land . . . . . nor can a better system of land tenure directly produce an increased yield of a single bushel per acre, nor can it provide wood to replace cowdung and so set free the latter for the right use upon the land." Those of us who are asking for reductions in assessments or appealing to Government for a reform in the land tenure know very well that the former will not produce manure, nor the latter directly produce an increased yield per acre; but they also know it for certain that reduction in assessment will mean more money in the *raiyyat's* pocket, which he may use to procure more manure; and that a better land tenure will increase the *raiyyat's* interest in his land and will act as an incentive to improve his land so that he may get more out of it than he used to do. It is of course open to the other side to say that the *raiyyat* will use the extra money on drink or in marriage and funeral expenses and that under a more secure land tenure, the land will pass into the hands of the money-lenders. Education is the only remedy to prevent the agriculturists from misusing such advantages. Unless Government do their duty by the agriculturists, by providing cheap—if not free—primary education for the masses, it does not lie in the mouth of Government officers to cry down the proposed reform on score of the ignorance of the *raiyyat*. The real point at issue is being lost sight of, while the two parties are indulging in mutual recriminations, the one side putting down the peasants' impoverished conditions to high assessments and to the periodical revision of survey settlement, and the other attributing it to the *raiyyat's* crass ignorance or to his being the tool of the sowcar. The truth, as is usually the case, lies somewhere between these extremes; and the best course to find that out is to have a typical village inquiry as suggested by the Famine Union. We are familiar with the reasons given by Lord Curzon's Government for declining to grant such an inquiry. They are far from convincing. About the time the reply of Government was published a few gentlemen in Bombay undertook such an inquiry on their own account. The

late Mr. J. N. Tata and a prominent Native State gave the Committee all the necessary assistance for holding such an inquiry. After studying the results, it was seen that the inquiry to be useful should be conducted by experts in the line under orders from Government. Very often the chief sources of information are in Government records, and these are not available to non-officials. Then the *sowcar* whose books may have to be examined will produce them only before a Committee appointed by Government. Thirdly, the Revenue officers of the Government having more technical knowledge than non-officials, will be able to conduct the inquiry much better. Moreover, if the agriculturist tries to give an exaggerated account of his poor condition, these officers will be in a position to verify his statements. Again, if the inquiry were conducted by non-officials alone, Government will not pay much heed to their conclusions. Lastly, there is the question of funds. Government alone can supply the funds for such an inquiry throughout the whole country. It will, of course, be necessary to have a strong non-official element on such a Committee. The members selected should be gentlemen who have studied the subject and who are fair-minded enough to treat the question as an open one till the inquiry is complete. Such an inquiry if properly conducted will not raise false hopes in the minds of the agriculturists and will bring to light many facts, hardly dreamt of by either the official or the non-official class. If after the past era of commissions, committees and conferences, the Government of India do not feel inclined to appoint another Committee, Local Governments can very well undertake such an inquiry on their own account within their own territories; and may introduce necessary reforms in the light of the results of such an inquiry.

#### LAND TENURES.

The incidence of land revenue on fully assessed area per acre varies in different provinces. This may largely be due to the difference in soil and other natural conditions, but it is rather strange that the incidence per acre in permanently settled areas is, as a rule, lower than that in the raiyatwari tracts. *Prima facie*, there is thus reason to believe that part of the difference in the incidence is due to the increase in the assessments at the periodical revision settlements. It is true that at the revision settlements after the great famine year of 1899-1900, assessments have been lowered in some districts

in the Bombay Presidency. But, as a general rule, the tendency of the Settlement officers as well as of most of the local Revenue officers is to make much of the so-called general progress of the districts that are being settled and to raise the assessments on this ground. In the permanently settled tracts, Government show their anxiety to look after the interest of the raiyats as against the Zamindars by passing Tenancy Acts. In the raiyatwari tracts, where Government is the final judge as to the propriety of proposed increases in assessments, it would naturally be chary of allowing another tribunal, a judicial one for instance, to decide between itself as the supreme landlord and the raiyat. In 1902 Mr. Romesh Chander Dutt and some other retired Indian Civilians submitted a memorial to the Secretary of State asking for some degree of uniformity and certainty in the existing land revenue rules. The memorial was referred to the Government of India and Lord Curzon, after consulting the Provincial Governments, issued a resolution on the general land revenue policy of the Government, trying to prove that there was no necessity of such reform. If the agitation in favour of the demands of the memorialists is to be continued, it should not be based on theories only. To be effectual it should be based on facts and figures. We the non-official educated class owe it to our poor brethren the agriculturists to make personal inquiries into their condition, to find out the causes that have led to the same and either to take remedial measures ourselves or to suggest them to Government. Even those of us who are not agriculturists themselves can assist others in forming district agricultural associations, in studying the question from a general standpoint and in guiding their deliberations. Some of us ought to devote a portion of our time in studying the statistics relating to agriculture and land revenue and getting information from the district associations and then representing the *raiya's* case to Government. Let us shew by practical work that we care as much for the "patient, humble, silent millions" whom Lord Curzon charges us with too often forgetting, as for the advancement of the educated classes. Let Government differentiate if they will between the masses and the educated classes. With us, the duty of looking after and promoting the interests of the former must be as sacred as that of guarding and advancing the cause of the latter.



# NOTE ON AGRICULTURE IN INDIA.

By Mr. HAROLD K. MANN, D. Sc., Calcutta.

IT is perhaps a truism to say that the prosperity of India is bound up with the success of its agriculture. Such a statement would apply to any country. But more than in almost any country in the world is this true in India. A larger porportion of the people live on the land and by its cultivation, than is the case in any country comparable with it, except China, and if any disaster happens to agriculture, it not only means a period of stress and strain for the people, but absolute and complete ruin.

In face of this fact, as one travels round the country (and my experience is, I am afraid, limited to Bengal and Assam) two things strike the attention. The first is the extreme industry with which primitive methods of agriculture are carried out, and the second the slight use which has been made of the advances in agricultural knowledge, during the last fifty years, by the cultivators of the country. With regard to the first point, I must say I can never restrain my admiration at the work done by the Indian *raiya* in Bengal. Without appliances, without capital, without manure, he succeeds in obtaining crops which, though small compared with those which could be obtained, are yet marvellous, simply by the untiring industry which makes use of every inch of land, and of every month of the year.

This being the case, I always think that if the same energy could be applied in directions indicated by advances in knowledge elsewhere, the present prosperity of agriculture in Bengal could be increased many fold. And, as a result, I come to feel that the present greatest need of agriculture in India is that of bringing the knowledge we already have to the notice of the cultivators.

But how? We are all too apt to expect the Government to fill all our public needs in India; but, in this matter, Government can do little. In some provinces they are already doing all they can. They are, however, usually far too much suspected by *raiya*s, as having some ulterior revenue motive, to be able to work directly in the matter, and, though help may be received from Government, yet the bulk of any work in bringing better methods to the knowledge and use of the actual cultivators must be done by others. In fact, it is a case in which I think the enthusiasm

of the landed proprietors and others of the people who have the interests of the country at heart, should lead them to stand out and use their money, their influence, their organizing power, to bring before the eyes of the *raiya*s the advantages to be derived from adopting more up-to-date methods in their work. May I illustrate what I mean? A friend of mine took up some land in Assam to cultivate for ordinary country produce. Trained as a farmer, he at once adopted methods which appeared strange to the ordinary cultivators of the locality, but which cost little or nothing to do. As an illustration, he changed the method of yoking the oxen to the plough which considerably increased the work they were able to do. At first the surrounding *raiya*s laughed and ridiculed: within a year they had adopted the same method. He has modified the methods of planting rice, enabling the same labour to plant more land, and here again it appears probable that the *raiya*s will follow suit. I could give other illustrations, but this is sufficient for my purpose. No Government interference: no Government support: practically no capital required beyond that of a cultivator himself, and, gradually, improved methods will be adopted in that district.

The same thing can be done, and more, in nearly every district. In the Central Provinces it is being done. Mr. Sly, the late Director of Agriculture for those provinces, succeeded in rousing the enthusiasm of the local men of influence, and now dotted all over the districts there are a multitude of demonstration plots, certainly subsidised by Government, but under the supervision of local committees,—which are bound gradually to alter the antiquated methods hitherto adopted. Such plots illustrate improved varieties, say of cotton in a cotton district, and so on: they show the effect of a quantity of manure within the means even of a cultivator: they indicate the advantages of improved methods of cultivation, and the ultimate result of their presence cannot remain doubtful. These local committees do more. They arrange on quite a small scale exhibitions of produce, and the advantage both in crop and quality of the improved methods is manifest.

Is not a system like this possible everywhere? Changes will not be introduced at one swoop, and it will take many years for the cultivators, who are rightly conservative, to become convinced

of the worth of the alterations. But improvements will come and with those improvements the value of the crops of India will be increased twenty, thirty, even forty per cent. The working out of all this, however, *must* fall on the people in each locality, and I can hardly believe that with the matter put plainly before them the zemindars, the rich men, the more educated and better informed men of our rural districts will fail in this matter, so vitally important to the future of the country.

I can only refer to one more point in this connection. It has often been put to me that all improvement is impossible without capital, and capital is precisely what the Indian raiyats have not got. In very large measure I own this is true, and for long the difficulty has seemed almost insuperable. Government has recently, realising the difficulty, established a system of agricultural banks, which may in some places solve the problem. But I, myself, am very much more inclined to rely on co-operation under the guidance of the best local men available. The system of co-operative corn banks which he calls by the very suggestive name of Dharma Gola, founded by Rai Parvati Sankara Chauduri, one of the zemindars of Bengal, on his estates, is to me one of the finest moves in this

direction of which I have got any knowledge. Its growth being entirely Indian, and not a European abortion, opens to me a future possibility of which one can hardly see the end. This is one means of dealing with the question of lack of capital—there may be many more. Once let us recognise that the knowledge in connection with agriculture at present in hand must somehow be brought to the notice of the raiyats, and questions of this sort will be settled in each district by its own methods and in its own way.

Knowledge will still increase: methods will still improve: better varieties of our cultivated staples than any yet in existence will be found: new and more profitable crops will be discovered. A network of experimental stations is springing up all over the land. It remains for the better educated, the influential people of the land, each in his own corner of the country, to bring to the knowledge and impress on the minds of the people the information already available, and to themselves meet, each district in its own way, the difficulties which arise in their application. Then, and then only, shall India, dependent as she always must be primarily on her agriculture, stand forth and take the position, which her population and the character of her people warrants, among the nations.

## AGRICULTURE IN THE UNITED PROVINCES.

By Mr. W. H. MORELAND, I.C.S.

I have much pleasure in acceding to the flattering request of the committee under whose auspices this Conference has been organised that I should contribute a brief note dealing in general terms with the position of the agricultural industry in these provinces; and I regret that circumstances prevent me from attending the Conference in person and that I am thus deprived of the advantages of hearing its proceedings.

The agriculture of the provinces is at present in a state of transition: this central fact is too little realized. Not so very long ago each district, I might almost say each village, produced all or almost all that its inhabitants required; and it produced very little more. Thus villages in Oudh grew cotton because their inhabitants needed cotton for their cloths; and villages in Hamirpur grew sugarcane because the people wanted sugar to eat. But the opening up of the country, and the extension of communications both by land

and sea, are working a great though gradual change, and each agricultural area is tending more and more to produce those crops which are most suitable to the soil and climate, and therefore most profitable to the grower. Already the Oudh cultivator grows much less cotton, because he can buy what he wants; and the Hamirpur cultivator no longer struggles to raise a crop of sugarcane in conditions entirely unsuited to its growth. In either case the land is now put to a better use than was formerly the case, because it is made to bear the crops for which it is suited. There is little doubt that this process of specialization is destined to develop further, and that its progress will be steady though not perhaps rapid; and the point must be carefully borne in mind in all discussions of the future of the industry.

Now if this process were at work only within the provinces, or only within the whole of India, it would still be important; but its immediate practical interest lies in the fact that it is in ope-

ration all over the world ; every country, every locality almost, is struggling to find out what it can produce most profitably, and having found this out to offer that article in all other markets. Thus you find Austria, Java, Mauritius and other countries sending sugar to India, America sending tobacco, and so on ; and if the goods they send are—price for price—of more use to the consumer than those we produce, the consumer will certainly buy them, and our own produce will be left with a restricted market. Those of us who are merely consumers benefit, but those who are producers lose. It is folly to suppose that people will not buy the best article they can for their money : foreign sugar is sold, I suppose, in every bazaar in Benares and foreign cigarettes are smoked in almost every street : and there are only three courses open to the producer, that is, the cultivator, who finds this market diminished. He may acquiesce, and turn to some crop that still pays, though not so well as the last crop formerly paid : he may change his methods so as to compete with the foreign article on equal terms ; or he may grow some new crop in which he finds he has an advantage. The first course means agricultural degradation : the second and the third mean agricultural improvement. Let us take as an illustration the concrete case of sugar, which is produced so largely in this neighbourhood, and let us suppose that the cultivators find they can no longer make a profit from the crop. They may cease to grow it, and put the land under some other ordinary crop : or they may improve their processes to such an extent that sugar is still profitable : or they may find some new crop that will pay them better. In either of the last two courses there is improvement : in the first course there is not.

Speaking generally, then, we may conclude that so long as existing circumstances continue, the agriculture of the provinces must move with the times, or, in the alternative, it must decay. Let me in passing make it clear that we are discussing no exceptional phenomenon. It can hardly be said that agriculture is stationary in any part of the world that is in easy communication with neighbouring countries. Everywhere methods are changing, and while some countries are rapidly improving, others are on the down-grade. It rests with the people of these provinces to decide in which category they shall be classed.

What, then, is meant by agricultural improvement ? The term is often used somewhat vaguely,

and without a very clear appreciation of its significance ; but when used carefully it means simply that a larger net income is obtained from the land. The term raises up many visions : we may think of American implements superseding the country plough ; of steam being passed into the service of the cultivator ; of wheat displacing gram, or sugarcane displacing wheat ; of neatly fenced fields, and of a hundred other ideals. These may or may not be improvements in any particular case ; and the criterion is do they, or do they not, increase the net income of the cultivator who adopts them ?

Now, in considering the possibility of agricultural improvement in this sense, it is essential to bear in mind the economic state of the country, which determines, in the most rigid way, the limitations of effective action. The country is one of small holdings and high interest : the cultivator himself has little or no capital, and the rate of interest is prohibitive. There is no use in trying to convert small holdings into large : such a change would run contrary to the whole social organisation of the people, and would, probably, not increase income on the whole ; we must, therefore, make the best of our small holdings. These remarks may seem to be truisms, but they have a very distinct and practical bearing on the question of agricultural improvement, and it is the main object of this paper to state briefly the results that follow from these premises.

In the first place, it is at present a waste of time to compare these provinces with countries such as the United States or the British colonies, where agricultural science and agricultural practice have made a marked advance in the last few decades. It has been well said that while the Indian cultivator has ample skill but little capital, the farmer in a new country has usually sufficient capital but little skill. The advances that have been made in these new countries are undoubtedly great, but even now it would be rash to assert that the average American or Colonial farmer knows his own business as well as the Jat or the Kurmi. The former's main advantage lies in the fact that he can afford to use the information that is placed at his disposal, simply because he can command the necessary capital.

In the second place, we must conclude that it is of no use to suggest expensive improvements to the cultivator so long as the cost of capital remains prohibitive. This conclusion for the present excludes from the ranks of practical improvements in this country many of the changes that have

been so successful elsewhere: to name only a few, all expensive implements, all mechanical power, all artificial manures: and if we consider carefully the advances in agriculture made, say, in America during the past twenty years, and exclude from them all that are founded on these facilities, we will find that the remainder is not so great as might be thought.

Thirdly, it follows that the provision of cheap capital is very much the most important agricultural improvement that can be suggested, simply because it is the condition precedent of improvements of other kinds. Go among the cultivators themselves, and ask each man what it is that he wants in order to make a larger income out of his holding. You will find that nearly every answer is a request for capital in some form or other. One man wants a well, but cannot afford to make it: he wants capital. Another man wants more or stronger cattle: he wants the capital to buy them. Another wants to hold his produce till the harvest-glut in the market is over: capital is again what he needs. Another would grow wheat instead of gram if he could afford the seed: another would grow sugarcane if he could pay for the labour needed: another would grow potatoes if he could get the manure. All alike are tied down by the want of capital which compels them to make an inadequate use of their holdings.

Thus quite apart from the advance that is to be hoped for from the applications of agricultural science to this great industry, the fact stands out that capital is the great need; and so long as the cultivator cannot find money to realise his existing ideal, it is of little use to try and enlarge his ideal by the introduction of new elements that need still more money for their realisation. You are aware that the Government of India has decided to increase largely the expenditure on the Agricultural Department; but this policy can meet with full success only if the supply of capital is organised at the same time. And here let me pause to warn you against looking for large immediate results from the activity of the new department. It is not going to work a sudden revolution in agricultural practice; its work may be described as mainly a study of existing practices in the light of agricultural science, to see in what details they can be improved, and what adjustments they need to meet the new conditions involved by the increase of communications and the resultant widening of the market. You will

see, then, that the departments will be learning rather than teaching for some years to come, but that, as time goes on, they will be offering more and more improvements for the benefit of the cultivators, some capable of realisation without capital, but the majority requiring a somewhat increased capital for their successful adoption.

Here, then, is a further need for cheap capital, for much of the labours of the Agricultural Department will necessarily be wasted if capital is not forthcoming to enable the people to realise their results. So that the supply of cheap capital stands out clearly as the central factor in the problem of agricultural improvement at the present time.

It would be beyond the scope of this brief paper to discuss in detail the methods by which capital can be brought within the cultivator's reach, but a few governing conditions may be briefly stated.

*Firstly*, the capital required by the individual cultivator is small; but, *secondly*, the aggregate amount required is very great; while, *thirdly*, the supply must be made promptly and on terms that the cultivator can accept. It follows that a very complex organisation is required to control a large capital and distribute it in small sums among a great number of individuals with due regard to the character and competence of each. These conditions make it impossible for the need to be met by banks working on European lines, and to my mind at least—they make it equally impossible to rely on the action of Government agency. In a word, the necessary organisation must be built up among the people who are to share its benefits.

As you are aware, an attempt is now being made to create the beginnings of such an organisation in India. The economic side of the co-operative movement will no doubt be dealt with fully by other speakers of this Conference: it suffices for my present purpose to point out that either it, or some other equally effective form of organisation, is a necessary preliminary to any considerable improvement in the agriculture of the country; nay more, it is necessary to prevent the progressive degradation of our greatest industry.

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# THE N. ARCOT AGRICULTURAL ASSOCIATION.

By Mr. JOHN KENNY, Honorary Secretary.

To begin with, our Association recognises two main difficulties :—(1) that we have much to learn, and (2) that there are immense obstacles in the way of enlisting recruits to get the ryots to combine. Our chief aim at present is to bring landlord and tenant together to exchange ideas and to show both that in combining, they do so for a common good.

We do not advocate new ploughs and new methods of agriculture, but endeavour to supply the wants that are actually felt, confident that if this be done with advantage to the farmer, the road to further reforms will be easier and certain, that no good will come of our efforts unless we practically prove that we can do good.

Now in this district, and it appears to me the same holds good for a great many parts of India, the difficulties that beset agriculture are a want of sufficient water and an absence of cattle manure. The *Madras Mail* is having the question of field irrigation threshed out in its columns, and we, as other associations, are watching the matter with interest. If it can be clearly proved that the oil-engine and pump are the most economical, our efforts will be directed to co-operation for the purchase and use of such necessary aids. But *festina lente* is our motto. The next question is the one great difficulty that will shortly be solved, viz., that of manures. All over the country the people know and appreciate the value of cattle manure and their knowledge of the virtue of various leaves is astonishing. But both these are badly wanting, and it is plain to the naked eye that year by year fields are less productive. It is true that in India the process of decomposition goes on more rapidly than in cooler climates, but for the very reason the soil

appears to be more rapidly robbed, till lands become absolutely worthless owing to their total deprivation of plant foods. As natural manures fail, concentrated fertilizers must take their place, and it is our endeavour to accustom the people to the use of these and show them that their harvests improve and the land, far from being hurt, is greatly benefited by their application. With Dr. Voelcker we believe that the ryot has not much to learn from Europe. Where deep ploughing is required, as in the stiff rich clays of Cuddapah, the heavy plough of the country is used. Where deep ploughing would denude the soil, the ordinary plough scratches the surface. With these no interference is advisable. But where the peasant says a manure is not good because there is no unpleasant odour attached to it, we must by practical experiments correct his notions, as the ideas of the peasants in Europe were changed in this respect not long ago. If the ryot can be persuaded to this an immense benefit will be done to him and to the country and only when he sees an increase in his crops far above the money value of the manures purchased, can the next stage be entered upon, viz., trials at introducing new varieties of better paying crops and combination to effect this and similar objects.

We do not think it wise to tell the ryot that his ancestors for thousands of years were all wrong in their ideas of ploughing and sowing and agricultural work in general, nor can we tell them their manures are faulty; but we can help them to a knowledge of such concentrated fertilizers as will take the place of the old manures that are now difficult to obtain in sufficient quantities, and on demonstration farms we can show that other and perhaps more paying crops can be

introduced into the district and grown with advantage to the people. This we are doing. There is a model farm on the spot belonging to Messrs. Parry and Co., and there the ordinary crops of the district are grown without manures, with the ordinary manures used by the ryots and with complete concentrated fertilizers, new cottons and other crops are thriving and all interested in agriculture are invited to visit the farm. During our meetings all these matters are discussed as well as the treatment of insect pests, and representatives from the various parts of the district where the lands are rich and poor, give their experiences and their difficulties in farming. It is so far not an ambitious scheme. We do not make many learned experiments as to what may or may not be grown in pure sand with

various additions of single manures. All this is done by learned people in Europe.

From the result of their experiments we endeavour by the use of complete fertilizers to bring home to the people the utility of manuring and the profit to be derived from it. We do not classify varieties of plants but endeavour to get a better crop from each of the indigenous ones, and in introducing foreign species we attempt to show that they can be grown with profit. Later on co-operation for purchases and sales will follow, and I believe a co-operative credit bank is already in course of formation in this district. The programme is not large nor very ambitious, but it suits the simple people of this district, and if it does a little good, it will justify the existence of the North Arcot District Agricultural Association.

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## TECHNICAL EDUCATION IN INDIA,

By MR. T. R. A. THUMBOO CHETTY, C.I.E.

§ So far back as 1868, when I took part in a debate on the subject of *Popular Education*, in the Bangalore Bowring Institute, I dwelt on the paramount obligation that devolved on the State of diffusing general *useful* knowledge to the masses of the people, and of imparting such practical technical instruction as was likely to develop and promote the various branches of manufacture and industry peculiar to each village or locality, as well as those old professions, however small, to which the villagers were accustomed as a sort of hereditary occupation. I also advocated the introduction, in school, of a system of *practical teaching in the principles of agriculture with improved appliances*.

Eight years later on, when addressing the students of the Bangalore St. Joseph's College, majority of whom were European and Eurasian lads, I exhorted them to *learn some useful art, or*

*industry, by choosing some particular branch suited to their taste and capacity.*

Recently, in 1901, when presiding at the celebration of the Madras Christian College Day, I remarked that it was a matter for regret that, with the progress education had already made, little or no *aptitude was shown by the Indians for scientific work or research*, with a view to the rich resources of the country, in metals, minerals and agricultural productions, being more properly and profitably improved and developed, by being brought under the power of machinery.

In Mysore, under the enlightened direction of the present ruler and of his illustrious predecessor, much has been done in the direction of railway extensions, in the establishment of industrial schools and experimental farms, at certain stations, in the introduction of improved ploughing instruments, and in starting large irrigation projects, and in the successful installa-

tion of the Cauvery Electric Water Power Scheme. In the way of general agricultural improvements, encouragement of technical education and development of industries generally, the Mysore Government is doing much; but what I would wish to urge for consideration is the strengthening of our principal village units, for promotion of general agricultural, industrial and commercial purposes. Our village communities, as remarked by Sir Charles Metcalfe, "are little republics having nearly everything that they want within themselves and almost independent of foreign relations." At the first meeting of the Royal Commission in England, for the collection of Indian exhibits, Lord Kimberley very wisely said:—"There is, perhaps, nothing more desirable for India than that its products and industries should be well known in this country, although we have much to learn from them than to teach them. Their beautiful manufactures, which they have produced for so many ages, have proved that there is a knowledge of many branches of art which it would be a thousand pities should be diminished under our rule. I have often been struck with the calamity of the introduction of our taste into Eastern arts and manufactures, for their taste is far better than ours, although we have, no doubt, English knowledge and skill and the command of capital, and I cannot conceive any advantage greater than that the two countries should be brought together." How England and India could be brought together, in the matter of science, industry and commerce, is the real question, on the proper solution of which depends India's future national prosperity. It cannot be denied that the ancient arts and industries of India attracted the Greeks even before the age of Pythagoras, and induced them to travel to India for instruction and to exchange commodities with the choicest productions and manufactures for which our country was celebrated. But the ravages of time, foreign conquest and the consequent cessation of encouragement and continuous improvement have caused such a neglect and degeneration, that, being sensible of the state of splendour and civilisation in arts and sciences which India once occupied and from which it had fallen off, every endeavour should be made to ascend to it again, this being practicable under the benign rule and protection of the British Government. The revival must commence with the village unit and be gradually developed with the combination of Western learning, invention and capital. Before we could reach the summit of a hill we must work from the

bottom, hew the rough stones and pave the way, slowly and smoothly, to climb up. The preservation of the village constitutions with proper training in commerce and agriculture must form the basis of technical education to start with. The improvement of agriculture and the commercial capabilities of each locality must commence with the village unit, so as to form the nucleus and preserve those elements necessary for the reconstruction of that grand Indian edifice of commerce and agriculture, and the formation of corporate bodies, to work with the object and on the principle suggested by Lord Kimberley.

There is, on the part of our countrymen, little temptation to invest capital, and still less to improve it. We want men likely to take interest in the improvement of capital, and to point out some of the most desirable modes of employing it usefully and profitably. But for this tame and unenterprising disposition of Indians, the rich mines of Kolar Gold Fields would not have fallen to the lot of European companies to work with and thereby to acquire enormous wealth.

With the development of the resources of each village unit, in point of agriculture and commerce; with the gradual formation of Indian corporate bodies; with the combined capital, energy and skill of England and India; with the removal of all those duties that press injuriously upon the industry of India; with the sympathy, support and co-operation of Government to give the initiatory stimulus to private enterprise and a start to the general expansion of technical and scientific education of a practical kind, the sources of India's wealth and prosperity will be increased and developed to the joint advantage of India and England, thereby affording the best security of the British Indian Empire.

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# CO-OPERATIVE CREDIT SOCIETIES

IN THE MADRAS PRESIDENCY.

By Mr. P. RAJAGOPALACHARI, C.S., Registrar of Co-operative Credit Societies, Madras.

## PRELIMINARY.

THE Registrar appointed by the local Government to administer India Act X of 1904 assumed charge of his duties in July, 1904. Fifteen rural and five urban societies have been registered till now, and they are in eight districts.

## POLICY PURSUED.

The policy pursued has been to allow the utmost freedom to organisers in each case to start their society on such lines as appeared to them suitable, provided that the rule framed did not contravene the Act in any essential matter. This being the policy, no selection of districts for operations was made nor were any rules issued by the local Government under the Act. It was apprehended that the issue of rules at an early stage might tend to stereotype societies in one or two forms and prevent that healthy development so essential to the success of the movement. In the earlier banks there was a pronounced tendency on the part of the organisers to frame their constitution on the lines of the Nidhis in the Madras Presidency, for a description of which please see Sir Frederick Nicholson's book on banks. The Madras Nidhis came into existence nearly half a century ago, and notwithstanding many failures and notwithstanding the fact that they have been hampered by an unduly rigid constitution, it is admitted by everybody competent to pronounce an opinion on the subject, that they have done good work in familiarising the people to co-operative action in matters of credit. Naturally, therefore, when operations under India Act X of 1904 commenced, the organisers of the first societies looked to the Nidhi model for guidance in preference to the models of the European societies which were held up to them for imitation. After anxious consideration, it was resolved to allow organisers to have their own way—provided that they kept within the Act—trusting to time and to experience to familiarise the people with the models of the Raiffeisen societies of Europe and to start societies on those lines. The Madras Government in some cases

even went further and registered certain societies under the special power vested in them by section 29 of the Act.

## RESULTS OF POLICY.

The above policy has justified itself by the results achieved. Not only have we succeeded in starting several purely Raiffeisen banks within the last six months, but several of the earlier banks—which at the outset were little more than joint stock banks—have gone on amending their constitution, till now there is very little difference between them and purely Raiffeisen societies. On the whole, two forms of banks are now developing. One set follow mainly the lines of Nidhis. The other set are wholly or almost wholly on Raiffeisen lines. The urban societies of Conjeeveram and Tanjore and the rural society of Kaveripak are close copies of the Nidhi model. Another urban society—namely that at Namakkal—and a few of the rural societies started at the outset, stand midway between joint stock banks and Raiffeisen societies, but the rural societies have been gradually amending themselves and approximating to Raiffeisen ideals. All the other rural societies have been from the outset mostly on Raiffeisen lines. We have an urban society at Madras, called the *Triplicane Urban Society*, which has a stores department attached to it as well as a credit branch, and which Government have registered on the ground that a society, the members of which are mostly men of limited means, and which aims at cheapening to them the cost of the necessaries of life in addition to providing facilities for credit, complies substantially with the requirements of the law. It may be interesting to know that the organisers of the Triplicane society say that they had in view the society at Poligny in France, described in Sir Frederick Nicholson's book.

## PROVISION OF FUNDS.

The question of providing funds gave some trouble at the outset, but of late the societies have not had much difficulty in getting all the money they required. Under the Notification of the Government of India, a rural society can be

granted a loan from provincial funds equivalent to the share capital and deposits put in by its members—provided, however, that such a loan shall not in any case exceed Rs. 2,000. In pursuance of the above order, a sum of Rs. 6,100 has been till now disbursed to four rural societies. Moreover, out of the sum of Rs. 5,000 placed at the disposal of the Madras Government by the Hon. Mr. D. M. Hamilton, a sum of Rs. 1,400 is about to be disbursed to four other rural societies. It is estimated that the aggregate working capital of all the societies (excluding the central bank) now in the Madras Presidency made up of share subscriptions paid, deposits received and moneys borrowed otherwise than by way of deposits—exceeds half a lakh of rupees. This will show how small a part the loans given by Government play in the financing of these banks. In view to the fact that a large increase in societies is anticipated in the near future and that we may then be confronted with difficulty in financing them, a central bank has been started in Madras with a capital of Rs. 25,000 to be amplified later on as societies increase whose sole object is to lend funds to co-operative credit societies in the mofussil.

#### LOANS.

Under India Act X of 1904, loans are admissible only to members. This provision is of course rigorously enforced as it is a vital one. In regulating the purposes for which loans are granted, however, there is considerable divergence of practice among societies. At the outset, not a single society would agree to concern itself in any way with the use made of the loans granted by it. But, after a time, several rural societies laid down rules to the effect that no loan should be granted except for productive purposes. In the case of urban societies, it has been found that most of the loans are taken to pay off prior debts. In the case of rural societies, loans are chiefly taken for cultivation expenses, for the purchase of cattle and for the payment of the kist due to the Sirkar or the rent due to the zamindar.

#### INTEREST.

The interest charged by the societies on the loans granted by them to their members varies from  $7\frac{1}{2}$  to 10 per cent. per annum. The usual rate is  $9\frac{1}{4}$  per cent. per annum, i. e.,  $1\frac{1}{2}$  pies per rupee per mensem. It has not been considered expedient to make loans too cheap at the outset. As the rate which the Madras ryot pays for the moneys borrowed by him is seldom less than 12

per cent. per annum, and as the average rate may be taken to be 18 per cent., it is obvious that 9 per cent. per annum is a substantial instalment of relief. For moneys borrowed by the societies (either by way of deposits or otherwise) the interest paid ranges from 6 to 9 per cent. per annum. The usual rate is  $7\frac{1}{2}$  per cent. per annum. Here, again, it has not been deemed advisable to give money to the societies too cheap or to introduce the element of philanthropy. It is considered that it will strengthen a society to accustom it from the outset to the view that it cannot get money from the market except at what may be termed business rates. The central bank rules provide that, on the moneys lent by that bank to rural societies, interest shall ordinarily be charged at 7 per cent. per annum.

#### THE MONEY-LENDER.

Probably, the most promising sign so far as this Presidency is concerned is the attitude of the money-lending class towards co-operative credit societies. I have seldom met with any opposition from this class; and in a great many cases they gave me active help in starting these societies to their pecuniary detriment. For instance, the chief organiser of the Kilacheri Agricultural Bank is a money-lender who has been getting, without any difficulty, 12 per cent. per annum for his money. He not only started the bank but financed it by lending it a portion of his money at between 6 to  $7\frac{1}{2}$  per cent. per annum, and what is more, in this organisation he has set up, he is after all only one member of a committee which is entrusted with the management of the concern. Then, again, in the last bank I started, that at Valur, four or five of the members are money-lenders who have not hesitated to throw in their lot with their fellow-villagers on the basis of unlimited liability, and as a great many of the other members are poor men, the risk run by the well-to-do members of the society is substantial. In regard to the attitude of the money-lending class, I cannot do better than quote from a speech of the present Director of Agriculture, the Hon'ble Mr. A. E. Castlestuart Stuart, to whose watchful care the co-operative credit societies of this Presidency cannot be too thankful:—"The fact that the rural money-lender and local Nidhis have shown themselves friendly to the young societies is encouraging, and there is not the least reason why they should be otherwise. In this Presidency, the large majority of money-lenders are not professional Shylocks unconnected with the land and

with no local interests; but are, for the most part, the leading agriculturists of villages who, by superior intelligence and enterprise, have risen to the position they hold as the financiers of their poorer brethren. The rates of interest they charge for loans are, by no means, as a rule, exorbitant; having regard to the security offered. The Madras Sowcar has played and is playing a useful and important part in village life, and there is no reason why he should not, as a member of his village Co-operative Credit Society, play an even more important part in the future."

#### GOVERNMENTAL ACTION.

The history of popular banks in Europe shows that these institutions sprung up in the Continent without any Government initiative or help and sometimes in the teeth of Government opposition. In India, probably Government initiative is inevitable in the beginning, but it has been recognised from the outset that special care must be taken to make it clear that these institutions are really private concerns—belonging to the people themselves—and not Governmental institutions. Under the notifications of the Government of India, co-operative credit societies are exempt from the payment of stamp duties and registration fees and income-tax; and under India Act X of 1904, they get free audit as well as free registration. And there is also the fact that Government is prepared to subsidise rural societies on very cheap terms—very much cheaper terms than they can ever hope to get in the open market. It seems to me—I speak from experience—that these concessions go quite far enough. Probably, after a time, it may even be found necessary to withdraw at least one of them, namely, the grant of loans to rural societies so that the societies may learn to depend on themselves. Particular care has been taken to explain to every society that a co-operative credit society is *not* a Governmental concern, that Government is *not* responsible for its solvency or management and that the obligation to audit does *not* include an obligation to look into the administrative details, etc. I think that it is a good thing that the Act does not provide any summary procedure for a society to recover the debts due by it. If it did, I fear that the extinction of these societies—as the result of excessive Governmental help—would be a foregone conclusion. While care is taken to make the managing committee of each society realise fully that *they and not us* are responsible for the good management of the society,

all societies are subjected to constant inspection, so that they may be kept up to the mark. To be brief, what is being done is to make the societies (by constant inspection) do their own work, care, however, being taken not to do any portion of it ourselves.

#### MANAGEMENT.

The management of rural societies is mostly gratuitous. In the case of urban societies, however—which work on a much larger scale than rural societies—it has been found expedient in some cases to provide that a portion of the net profits—a fourth or a third—shall be given to the board of management. It may, however, be noted that, in the case of the last urban society, that of Triplicane, the board of management have agreed to work gratis.

#### THE RESERVE FUND.

Most of the rural societies have enacted rules to the effect that the entire net profits shall, for all time to come, go to the reserve fund. Even the few rural societies whose rules provide for the grant of bonus to members, have also rules to the effect that such grant shall not be made till the reserve fund comes up to a certain percentage (the rate varies from 20 o/o to 50 o/o) of the liabilities and till the ordinary rate of interest on loans granted to members is substantially reduced. In the case of urban societies, the usual rule is that a third of the net profits shall year after year go to the reserve. It is a matter for satisfaction that, in every case, the organisers have realised the importance of building up a reserve fund and of keeping it intact to be drawn upon only to make losses good. Stringent rules to that effect have been adopted by all societies.

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# BOMBAY CO-OPERATIVE CREDIT SOCIETIES.

By Mr. LALUBHAI SAMALDAS.

**A**GRICULTURAL credit is lower than that of the ordinary tradesmen, not only in India but all over the world, because the ability of the agriculturist to carry out his obligations to the money-lender depends on an uncertain factor—timely and sufficient fall of rain; because the turnover in his case is a slow one, and because there is usually no money-market in which a small agriculturist is as well known as the ordinary trader. Referring to the Italian peasant, Giustino Fortunato says, "He has no credit because he is destitute, and he continues destitute because he has no credit; and so he moves on hopelessly in the same vicious circle from which there is no way of escape." The condition of the peasantry in Germany, France, and other continental countries was almost the same. The remedy for this state of things according to Raiffeisen, lay in democratizing credit. He thought that there would be no difficulty in finding money on the security of collective liability; the only thing to be done was to group the elements of security. Since Raiffeisen started his first bank, thousands of banks based on the same principle have been started in different countries of Europe, and they have done much to improve not only the material condition, but also the moral tone of their *clienteles*.

In framing the Co-operative Credit Societies Act, Government have generally kept in view the principles of the Raiffeisen banks. The work of starting such banks has been taken up in the different presidencies by the Registrars in concert with the local officers. In Bombay thirteen rural and two urban societies have been started up to now. While the United Provinces had a few agricultural banks in existence, and while Madras had its Nidhis and Kuttu Chit or Kuri Associations, we in Bombay had no such associations amongst us at the time of the beginning of working of the Act. This may partly be due to the ryotwari land tenure and to the individualistic tendency generated thereby. The absence of the idea of combining for depositing savings and for drawing money on the security of their savings, as well as that of their collective credit, necessitated the Registrars explaining to the *raiyats* the

benefits of co-operation in popular language. Leaflets were issued in English and the vernaculars for this purpose. Model bye-laws were framed and account forms prepared and before their issue non-official gentlemen in close touch with the agriculturists were consulted. The bye-laws for rural societies are on the lines of the model bye-laws issued by the Irish agricultural societies. In the societies started up to now these model bye-laws have in most cases been adopted without any alteration; where there have been modifications they have been very slight. In all the registered societies the liability is unlimited; the entrance fee is very small—eight annas to a rupee—and only in one case is capital raised by debentures. The capital is ordinarily raised by taking fixed deposits from members, bearing interest at the rate of 6½ per cent. and not repayable within five years. The more substantial members are the depositors, the amounts paid by individuals varying from Rs. 5 to Rs. 300. The total amount thus raised varies from Rs. 500 to Rs. 2,500. Government grants equal to the amount raised by the societies with a maximum of Rs. 2,500 have been sanctioned in the case of those societies that have applied for the same. The Government grant is repayable in twenty annual instalments and bears no interest for the first three years. The Registrar is satisfied with the working of the seven societies in Dharwar which he re-visited after they were started. In the city of Bombay we have started an urban society with a share capital of one lakh of rupees divided into ten thousand shares of rupees ten each. With the idea of giving an opportunity to poorer people to join the society we have decided to receive the share capital by instalments of a rupee each. The society has been started with the idea of assisting the small tradesman, the artisan and the mill-hand. It has been registered but lately, and began its work about a month back. The management will be a paid one as the society will have a large capital, over and above which it has the power to borrow an equal sum either from Government or from the outside public. If proper care is taken at the time of advancing money, and if the management is an efficient and an economical one, the society must prove a success.

It is also thought of starting an urban society in Bombay in order to supply a capital in small sums to rural societies. The gentlemen who have undertaken this work have done so from motives of philanthropy and the management naturally is a gratuitous one. As the capital of the rural societies will be limited to the sum raised from the members as fixed deposits, *plus* an equal grant from the Government, subject to the maximum of Rs. 2,000, and as this amount will not suffice to meet the requirements of the members, it will be necessary for them to have extraneous assistance. In the beginning their credit will not be recognised by ordinary banks or individual *sowcars*; and the proposed society will thus be able to render valuable assistance to such societies by lending them capital at 5 to 6 per cent. The draft rules of this society have been approved by the promoters, but as they are businessmen with little leisure, the society has not yet been registered.

The forming of such a society for the sole purpose of finding capital for the rural societies raises the question of the liquidation of the existing debts of the agriculturists. One of the chief objections raised by the patidars of Guzerat, who are considered to be the most intelligent agriculturists in those parts to these societies, was that as most of the agriculturists were more or less indebted to *sowcars*, it was feared that if these people began to have dealings with the newly-formed societies, their old money-lenders would become nervous about the recovery of their loans and would, in view of the priority clause, have immediate recourse to the civil courts and thus cause them trouble and annoyance. The remedy is to free the agriculturist from his existing obligations to the *sowcar*. The first part of the work, *viz.*, the finding of the money with which to pay off the *sowcar* will be done by the proposed urban society. The second part of the work, that of settling the existing debts by arbitration or otherwise, has to be done by Government. Such work was undertaken in the Central Provinces before the passing of the Co-operative Credit Society Act. Sufficient time has not elapsed to judge of the results of this work. There were some who were afraid that the *raiyats* will undo the good work by again involving themselves—perhaps to a greater extent. The fears of these alarmists have not yet been realized. When the number of persons concerned is so numerous and usually so ignorant, there is a probability of some proportion of the relieved agriculturists going wrong in their old way: there is,

on the other hand, an equal, if not a greater, probability of a large number of these persons improving their mode of life in view of their past experience of the money-lender and thus bettering their condition. A fresh feeling of hopefulness will be generated in their hearts, from which all hope and elasticity had been crushed by their impoverished condition; and they will under this new stimulus redouble their energies to reach the final goal—complete freedom from indebtedness. It is the duty of Government to give them a chance of starting in life without encumbrances, and if in spite of these advantages they will perversely continue in their old habits, then—no blame at least will rest with Government for having failed to tackle the problem. Unless this is done, the newly started societies will not be able to do much good.

The rate of interest for loans in the case of societies in the Deccan and Karnat is  $9\frac{1}{2}$  per cent. or half a pice per rupee per month. As the interest for fixed deposits is  $6\frac{1}{2}$  per cent. and as there is no interest to be paid for the first three years on the amount of the Government grant, the difference between the interest received from members and that paid on capital will suffice to pay the secretary a nominal salary for his work. It has been proposed to pay the secretary one rupee per month *plus* a quarter or half of the annual profits up to a fixed maximum. In Guzerat, where the people have the intelligence to work a society, the rate of interest at which persons of ordinary credit can borrow money, is lower than the rate obtaining in the Deccan and the Karnatic and consequently the number of societies formed in that province is much smaller than in other parts of the presidency. Moreover, the Guzerat agriculturist does not like to have the amount of his borrowings made public. He believes that his dealings with a *sowcar* are of a confidential nature, but fears that his dealings with a society will get known to the greater part of the villagers; and he therefore prefers to stick to his *sowcar*. In the Bombay Presidency the majority of the agriculturists either belong to the same caste or to castes that have the same social status; there is consequently no difficulty in the way of their working in unison. At Kaira in Guzerat the organisers of the society included Hindus and Mahomedans. It may be feared that the constant contact of these two factors will lead to conflict and bad blood. I, however, believe that if these communities continue to work together for a common object their racial antipathy will gradually fade away.



and they will begin to appreciate the good points of one another. We have, however, another difficulty arising out of the agriculturists belonging to the same caste and that is, the existence in a village of two or more parties opposing one another. It is believed that the working of such societies will lead to an increase of factious and party spirit, as those villagers who would not receive advances to the extent asked for by them, will bear a grudge towards the members of the managing committee and form themselves into an opposition.

These difficulties—some of them conjectural and some of them real—will disappear if the work is taken up with the faith and the earnestness of a Raiffeisen. When the societies have shown good work, Government should show their confidence in them by utilizing them at the time of granting *Takavi* at the time of famine, or loans under the Land Improvement Act. These societies will be in a position to know the actual requirements of their members and hence if the money is distributed through their agency, no time will be lost in making inquiries. The money will reach the hands of the cultivator when needed most and there will be less scope for corruption; again, if money is given for agricultural improve-

ment through the agency of the societies, being on the spot they will be able to see that it is used for the purpose for which it was lent. The confidence shown by Government will indirectly help the societies in another manner, as it will be sure to attract more deposits from non-members.

The ground has now been cleared, and the seed has been sown, but much still remains to be done to have good appreciable results. The Bombay Registrar has submitted his proposals to Government about the appointment of honorary organisers to educate the villagers from the explanation of the principles of co-operation up to the submission of the application for registration and the subsequent initiation of the committee into their duties. Here is work which ought to have attractions for all who have the good of the depressed masses at heart. Government could have done more in the same direction by following the example of Egypt and making arrangements with private banks, by granting them facilities for the recovery of their advances, for providing cheap capital to the agriculturists. That is, however, no reason why we should be deterred from supplementing the efforts of Government, and trying to make the working of the Act a success.

## CO-OPERATIVE CREDIT FOR AGRICULTURE.

By SIR FREDERICK LELY, K.C.I.E.

THE position I take to be is this. The cultivators as a body are dependent on borrowed money. They demand it, as the same class does in every part of the world, for their field operations, and in this country for the marriage of their daughters, for the obsequies of their relations, and in later days for the hire of labour and for buying comforts which their forefathers did without. Hence outside capital being necessary, one of the first of economic questions is where it should come from and under what conditions. There are many who urge that Government should supply it, and Government itself, by offering *Takavi*, admits its duty as a landlord to make advances for definite improvements and necessities. Many go further than that and ask in effect that it should finance on easy terms the

whole agricultural community. Dr. Murdoch, who is entitled to a respectful hearing on everything which concerns the welfare of India, estimates the amount required at 30 crores, which he thinks should be distributed from the public treasury in small loans by an organized department. We already have enough departments. They mean too often unscrupulous subordinates under imperfect control, and though they are sometimes necessary, I cannot talk with so light a heart as Dr. Murdoch of introducing a new swarm to buzz about the private concerns of every cultivator, and to have the handling of 30 crores of rupees. The result would be great gain both in numbers and force to that bane of all rule in the East—petty officialdom. I say nothing of that fatal tendency to relegate every economical activity to Government which should be strenu-

ously resisted by every friend of the people. If the State is to find the ryot in cash for buying seed and wedding presents for his daughter, it is not clear where it should stop until it has engulfed all those self-reliant qualities which go to make a nation of men.

A simple reason why Government should not intrude its capital on the market is that a sufficient supply already exists without it. Speaking generally, the village Bunnia draws upon his bigger brother in the town. Every town is in fact a reservoir of capital which flows into the villages during the hot weather and rains and flows back again when the crops are reaped. The channel is the Sowcar. I have no wish to rail at him. He is no worse, if no better, than the average man would be in his place; but he has inherited bad traditions, and hence the local capital instead of dropping as the gentle rain of heaven, upon the villager's land, comes to him diminished by usury and dishonest tricks and fraught too often with his ultimate ruin. It is not the duty of Government to supply capital when it exists already, or to oust the private investor, but it may be its duty so to regulate the flow that the borrower may not be unjustly used and may not be tempted to incur more debt than he can pay out of his income. It has been suggested, as one way of doing this, to set up a new type of Sowcar. Sir William Wedderburn and more recently my friend, Mr. Lalubhai Samaldas and others, proposed to establish a Joint Stock Company—a many-headed Sowcar—which begins by demanding concessions of a startling character. At the outset the ryot's existing debts are to be examined and compounded by a Government Commission. A substantial loan of public money at a low rate of interest is to be given, besides exemption from stamp duty, preference over all other private debtors, recovery of instalments by agency of Government officers, and audit by a Government staff. In return for all this we are to content ourselves with an undertaking by the Company not to charge interest above a certain limit and an amiable assurance that it will not sell up the ryot's land unless it is obliged to do so. To begin with, it is clear that these enormous concessions could not fairly be granted to one set of men only. They should be equally available to the village Sowcar and to other companies, provided they will make the same fair promises. Experience has taught there is nothing more easy to impose and more easy to evade than a restriction of the rate of interest.

Even if the Company honestly tries to keep within its prescribed rate, it is doubtful if it will be able to afford to do so. The village Sowcar carries on his business himself and knows the circumstances of every one he deals with. He has no expenses and makes few mistakes. The Company will have to work through agents who will often mislead it through ignorance if not through dishonesty. Hence bad debts which will have to be recouped by raising the interest or they will soon land the Company in bankruptcy. It is explained that many of the prospective shareholders are themselves money-lenders, but it is not clear how 20 men leagued together are likely to treat the ryot differently from what each of them would if alone. That Government should appoint a Commission to scrutinize the domestic accounts of millions of landholders including every entry of a petty loan, and haggle with creditors for an abatement; that it should pay the money down instead of leaving the debtor to fight his own battle; that it should collect the shareholders' profits for them—all this could do nothing but harm to the national character. It is not worth while to emasculate a people, even to pay their debts.

Underlying all these schemes is a misconception of the real need. It is not true that, in the words of Sir W. Wedderburn, "when capital once reaches the ryot he knows well what to do with it". It is not true that it will of itself induce him to bring on his land water and manure and make it overflow with spices, tobacco, with tea and cotton and jute. It will for the most part only entice him deeper into personal expenditure unless an automatic check on borrowing is provided, such as existed in the days before the land was made a salable asset, or such as is involved in co-operation. The Bill recently passed into law by the Government of India accepts the experience of Europe, and would unite the functions of borrowing and lending in the people themselves, inducing them to use their credit for getting money cheaply and their joint knowledge and influence for distributing it judiciously. The thing will be hard but it is worth trying, and there is much to encourage hope. The instinct of the Indian is to associate and combine—socially into caste, industrially into the Trade Guild, or Mahajan, politically into the village or Sabha. It is a land of tribes and classes and castes, all bearing within them the spirit of co-operation. The ancient village community to which many look back wistfully is impossible now. The

modern individual asserts himself and will not be content to share his right with others or submit his claims to a circle of elderly neighbours who may be—probably will be—swayed by faction or personal spite. Those who most admire the part would be the first to protest if it were revived in detail, if, *e.g.*, the whole of a modern village were held liable to make good stolen property which had been traced to within its bounds. Still for all that the germ of self-help is to be found in the village rather than in the artificial local board. As the old English guilds have been succeeded by the modern friendly societies, so from the village commune may arise a brotherhood which shall harmonize the modern sense of individual right with the need of mutual help. We are told how in the past the village lasted where nothing else lasted. It held together to defend itself against the marauder, against the evil-doer within the gates, against the rapacity of the Central Government. Why should not the

descendants of the same men close their ranks against the usurer? No legislation or Government action alone will do it, though it may enable and assist. Having got the law we want the men—not necessarily many men—for if one single pioneer can sit down with the better sort of villagers and work out a scheme with intelligence and patience—if he can get one village through the fence of conservatism and apathy, a whole province will follow. That, at any rate, was the experience of a few years ago in Guzerat where 300 provident societies—unsound though they were—were founded in two adjacent districts within a few months. The law itself antibiotics no definite scheme to be successful or unsuccessful. It contains no coercions, no pains, or penalties. It simply throws the arena open to the people and assures them of supervision against vagaries, honest and dishonest, and of kindly help if they will band themselves together in the spirit of their fathers and defend themselves.

## CO-OPERATIVE CREDIT FOR AGRICULTURE.

By Mr. J. HOPE-SIMPSON, I.C.S.

IT was with peculiar pleasure that I accepted the invitation to read a paper on my special subject at this session of the Industrial Conference. For the material progress and redemption of India lies, to my mind, primarily in industry, secondarily, only in politics, and so much can be effected by the former that it has always seemed to me a matter of great regret that hitherto the progressive party has sacrificed its best endeavours and energy solely at the altar of the latter. Progress in politics is bound to follow on the heels of material progress. It can never come as an antecedent. To the man who has to struggle year in and year out in order to gain daily bread for his family and for himself, it matters little under what form of Government he lives. All he desires is peace, and liberty to pursue his accustomed task. It is when the bare necessities have given place to some superfluous luxury, and when the acquisition of luxury has again left him some leisure, that the subject is at liberty and in a position to criticise the form and detail of Government, and to argue as to the steps to be taken for improvement. And reform cannot come from a

class. It must come in accordance with the desire of the mass of the people. Until they are in a position to understand and demand reform, the work of the progressive class is as the voice of one crying in the wilderness. The inception of this annual Industrial Conference is a proof that these views are gaining acceptance. If they can be translated into practice and conference into co-operation, the impetus which will be given to Indian industry, and the improvement which will be effected in Indian agriculture cannot fail to be momentous. If we believe that the salvation of India lies in the mill and in the farm rather than in the forum and the lecture-hall, it is incumbent upon each one of us to do what in him lies to improve the conditions and methods of agriculture and handicraft. To explain the method in which each man can assist is my object this afternoon.

It is of co-operation as applied to credit that I have been asked to speak to you. And in order to a right understanding on the subject, it is necessary that we should begin by an enquiry as to what credit actually is, and as to the part which it is called upon to fill in the economic organisation of this country. Credit has been defined as

a man's power of borrowing, that is, the extent to which he can command financial accommodation. It may be interpreted as the measure of confidence which the capitalist reposes in the borrower's honesty, and in his ability to fulfil his obligations. Credit cannot be dependent upon honesty alone, for honesty is frequently the companion of hopeless incapacity. Nor can it be dependent solely upon ability to repay, for that ability is sometimes wedded to dishonesty of the most flagrant type.

In the agricultural classes we find both honesty and capacity in a high degree of development. They should, therefore, be in a position to command credit at cheap rates. In fact, however, we find the contrary to be the case. Agricultural credit is notoriously expensive and notoriously insufficient for the needs of the class. The reasons for this state of affairs are somewhat obscure, and it is not the province of this paper to discuss them in detail. There is no doubt that they lie in part in the poverty of the people, in the fact that the individual amounts demanded are small, in the existence of the hereditary money-lending class, in the conservative traditions of the people and in their illiteracy. Something must also be placed to the credit of the precariousness of the seasons,—one rainless year being frequently responsible for the loss of enormous amounts of capital laid out by the money-lender at interest. Something must also be laid at the door of the troublous times through which the country has passed, in the days before the introduction of the Pax Britannica,—days still in the recollection of living men in large tracts of these Provinces. Since civil disturbance ceased, the rate of interest for agricultural credit has maintained an unequal fight with increased prosperity and consequent abundance of money, but artificial rates are still the rule rather than the exception, and there remains an ample and fruitful field for co-operative effort towards cheapness of financial accommodation for agricultural operations.

The part which credit is called upon to fill in the economic organisation of agricultural industry is, in this country, extremely large. Holdings are usually small, and the agriculturist has, as a rule, but a small amount of capital. He obtains advances for every conceivable description of expenditure. The poorer cultivator requires them for seed and for cattle, for manure for his fields and for payment of his labourers, for the payment of his rent, for food for himself and his family between harvests. There is scarcely any kind of

expenditure to meet which, at one time or another, the smaller cultivator does not borrow. It is then obvious that the provision of cheap credit is a matter of enormous importance to the agricultural community. Not only would cheap credit result in large savings on existing transactions,—it would permit of an extension of dealings on credit, of which the effect would be still more marked in the general prosperity of the country. It would enable the cultivator to hold his crop in order to ensure a better price than that obtaining at harvest, or to combine for the purpose of its advantageous distribution. It would enable him to purchase implements which are at present outside his financial range, but the possession of which would more than repay the outlay. It would enable him to use paying fertilizers which are at present out of his reach.

It is a matter of notoriety that co-operation increases the credit of the individual co-operator. That this must be so is, on consideration, obvious. Where a group of individuals combine to raise a loan, and where their liability is joint and several and their responsibility unlimited, the security for the loan is better than would be the security for a proportionate loan to any one of the members individually. In the case of a loan to an individual, however honest and capable that individual may be, there is an unavoidable possibility of accidental loss. The borrower may suddenly die, he may be overcome by calamity which it is entirely beyond his power to avert or overcome, his cattle may be stricken by murrain or his fields by blight. In the case of a co-operative loan, the possibility of loss to the creditor as a consequence of such untoward accidents is reduced to a minimum. If one of the members should die, or should fail, recovery can be made from the rest of the body, and it is in the very highest degree improbable that all of them or even the majority of them will be overtaken by unforeseen calamity.

It is because these facts are realised that the joint-stock banks in European countries habitually advance money to co-operative societies at rates much below those charged to individual borrowers, even of good standing. In Ireland, where the members of such societies are usually poor and ignorant, and frequently illiterate, societies are permitted to draw against a cash credit at  $4\frac{1}{2}$  per cent. per annum. The security offered is purely personal,—the joint and several responsibility of the society's members. It is no whit better than the security which could be offered by similar societies in this country. The only reason

why the latter are, at the present moment, unable to borrow at reasonable rates is ignorance on the part of the capitalist class of the principles of co-operation, and of the stability of co-operative societies.

The primary object of a co-operative credit society is the creation of credit for those of its members who have been hitherto unable to obtain credit at all, and the extension of credit for those who are able to borrow, but in insufficient amounts or at exorbitant rates. It is a link between the class which desires safe investment and that which is in need of financial accommodation, but of which the members are such small men that they are forced to deal with the local usurer. The reason for this compulsion is the fact that it would not pay the capitalist to lend the small amounts which the small man requires.

Apart from its primary object such a society has secondary results which are scarcely less important. It is a great educative factor in business methods. It is a premium on honesty. It is a discouragement to wasteful expenditure. It is also in one way a most important moral factor, for the immoral, the dishonest, the drunkard and the cheat are, owing to the provisions by which new members are elected, absolutely certain to be excluded from the society.

Societies of this general type can be organised to serve many ends. Village and town banks provide financial accommodation for their members. They are in many ways the most simple to work, and their results are usually obvious and tangible. Co-operative credit can, however, also be applied to the creation of seed-stores, to manufacture, to collection and distribution of produce, to insurance of life or of cattle, to provision for sickness or old age. It can be made to provide the necessities of wedding and funeral ceremonies, and in this country could thereby serve a most useful purpose in reduction of the expenditure upon them. There are a thousand directions in which co-operative credit can prove its usefulness, once the system of co-operation has been grasped in any one of its forms.

The history and results of co-operative credit in other lands are at once an important educative influence, and an inspiration to those whose duty or whose pleasure connects them with the movement in India. It is on record that the present position of Denmark, as with one exception the country with the richest population in Europe, is entirely due to agricultural co-operation. A

hundred years ago that country was the poorest in the European comity. It is notorious that the prosperity of rural Germany is in large part, if not mainly, the effective result of societies of the Schultz Delitsch, Raiffaisen, Haus, or other types. In Italy an economic revolution has been effected by Cavaliere Luzzatti, Dr. Wollenborg, and their disciples. In France, State interference has undoubtedly checked the progress of the movement, but hopes for the future are bright and success in the southern provinces has been obtained. In Ireland the last few years have witnessed a most remarkable and important extension of co-operative effort in the poorest parts of the country. Irish butter, produced by societies of the co-operative type, promises once again to reach its pinnacle of excellence, and farm produce from the distressful country, to compete on favourable terms with that from the continent. In England itself the movement has hitherto been generally confined to friendly societies, building societies, and distribution. Agriculture has been too conservative to avail itself of a remedy which has been found effective elsewhere. There are, however, signs that the days of this conservatism are numbered, and that those principles which created the Society of the Rochdale Pioneers, and converted that society into the Wholesale Society, with assets and outturn each running into millions sterling, can no longer be neglected by the agricultural classes.

It would be beyond the scope of this paper to describe at greater length the success which has attended the movement elsewhere. To those interested I would recommend for perusal Pratt's "Organization of Agriculture,"—(which can be obtained from Messrs. Thacker, Spink and Co., and doubtless elsewhere also, for a modest five rupees). Wolff's "People's Banks," and other publications by this writer, portions of Mr. Dupernex's book, "People's Banks for Northern India," and, above all, Sir Frederick Nicholson's invaluable report, the first volume of which was published in 1895, on the possibility of establishing co-operative credit societies in this country.

The idea of co-operation is to be found in India in various forms. It exists in very pronounced degree in the caste and in the village community. The same may be said of the idea of joint and several responsibility, which over enormous areas is a basic principle of land-revenue liability. It is strange, therefore, that the principle of co-operation for credit should be so conspicuously absent. Not that the indigenous Co-operative Credit Society is unknown. In Madras one finds the

a man's power of borrowing, that is, the extent to which he can command financial accommodation. It may be interpreted as the measure of confidence which the capitalist reposes in the borrower's honesty, and in his ability to fulfil his obligations. Credit cannot be dependent upon honesty alone, for honesty is frequently the companion of hopeless incapacity. Nor can it be dependent solely upon ability to repay, for that ability is sometimes wedded to dishonesty of the most flagrant type.

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The primary object of a co-operative credit society is the creation of credit for those of its members who have been hitherto unable to obtain credit at all, and the extension of credit for those who are able to borrow, but in insufficient amounts or at exorbitant rates. It is a link between the class which desires safe investment and that which is in need of financial accommodation, but of which the members are such small men that they are forced to deal with the local usurer. The reason for this compulsion is the fact that it would not pay the capitalist to lend the small amounts which the small man requires.

Apart from its primary object such a society has secondary results which are scarcely less important. It is a great educative factor in business methods. It is a premium on honesty. It is a discouragement to wasteful expenditure. It is also in one way a most important moral factor, for the immoral, the dishonest, the drunkard and the cheat are, owing to the provisions by which new members are elected, absolutely certain to be excluded from the society.

Societies of this general type can be organised to serve many ends. Village and town banks provide financial accommodation for their members. They are in many ways the most simple to work, and their results are usually obvious and tangible. Co-operative credit can, however, also be applied to the creation of seed-stores, to manufacture, to collection and distribution of produce, to insurance of life or of cattle, to provision for sickness or old age. It can be made to provide the necessities of wedding and funeral ceremonies, and in this country could thereby serve a most useful purpose in reduction of the expenditure upon them. There are a thousand directions in which co-operative credit can prove its usefulness, once the system of co-operation has been grasped in any one of its forms.

The history and results of co-operative credit in other lands are at once an important educative influence, and an inspiration to those whose duty or whose pleasure connects them with the movement in India. It is on record that the present position of Denmark, as with one exception the country with the richest population in Europe, is entirely due to agricultural co-operation. A

hundred years ago that country was the poorest in the European comity. It is notorious that the prosperity of rural Germany is in large part, if not mainly, the effective result of societies of the Schultz Delitsch, Raiffeisen, Haus, or other types. In Italy an economic revolution has been effected by Cavaliere Luzzatti, Dr. Wollenborg, and their disciples. In France, State interference has undoubtedly checked the progress of the movement, but hopes for the future are bright and success in the southern provinces has been attained. In Ireland the last few years have witnessed a most remarkable and important extension of co-operative effort in the poorest parts of the country. Irish butter, produced by dairies of the co-operative type, promises once again to reach its pinnacle of excellence, and farm produce from the distressed country, to compete on favourable terms with that from the continent. In England itself the movement has hitherto been generally confined to friendly societies, building societies, and distribution. Agriculture has been too conservative to avail itself of a remedy which has been found effective elsewhere. There are, however, signs that the days of this conservatism are numbered, and that those principles which created the Society of the Rochdale Pioneers, and converted that society into the Wholesale Society, with assets and outturn each running into millions sterling, can no longer be neglected by the agricultural classes.

It would be beyond the scope of this paper to describe at greater length the success which has attended the movement elsewhere. To those interested I would recommend for perusal Pratt's "Organization of Agriculture,"—(which can be obtained from Messrs. Thacker, Spink and Co., and doubtless elsewhere also, for a modest five rupees). Wolff's "People's Banks," and other publications by this writer, portions of Mr. Dupernex's book, "People's Banks for Northern India," and, above all, Sir Frederick Nicholson's invaluable report, the first volume of which was published in 1895, on the possibility of establishing co-operative credit societies in this country.

The idea of co-operation is to be found in India in various forms. It exists in very pronounced degree in the caste and in the village community. The same may be said of the idea of joint and several responsibility, which over enormous areas is a basic principle of land-revenue liability. It is strange, therefore, that the principle of co-operation for credit should be so conspicuously absent. Not that the indigenous Co-operative Credit Society is unknown. In Madras one finds the

Nidhi, which is a friendly society of a modified type, and which, unfortunately, seems peculiarly liable to offer temptations for fraudulent manipulation of its funds. In a recent report on the working of Act X of 1904, the Registrar of Co-operative Credit Societies for the Punjab has described a most remarkable indigenous co-operative society which had for its original object the prevention of diluvion in an unstable tract of a submontane village. The co-sharers for this object pooled the *shamilat* income of the village. As funds permitted, mortgages on shares in the village were redeemed, and mortgagees in possession ousted. The present state of affairs is most satisfactory. The mortgagors have been in many cases entirely, and in others partly, reinstated in possession of their shares, the precarious tract has been rendered safe from further inroads of the hill stream which threatened it, and trees have been planted which will, in a few years, represent property worth three lakhs of rupees. The Society's life was originally fixed at 20 years and at the end of that term its profits will be available for distribution. We may be permitted to hope that the Registrar will be able to prevent such an early dissolution. The Society is invaluable as an object lesson, and if only as an object lesson, should be preserved. Still more important is its preservation as a centre from which to propagate new societies, which will provide for other villages benefits of a like description.

Official connection with the movement in this country commenced with Sir Frederick Nicholson's report. It was further stimulated by the publication of Mr. Dupernex's book. Sir Antony MacDonnell took up the subject with characteristic energy, and in these Provinces some 200 societies of the Raiffeisen type were founded in 1901. Simla continues to interest itself in the question and last year saw the passing of Act X of 1904, the Co-operative Credit Societies Act, and the appointment of Registrars. The duties of these officers are of the widest description. Had they been confined to the registration of societies, it is probable that gratuitous registration would have proved an expensive matter for Government. As it is, the Registrar is a peripatetic individual, who might very accurately be described as a *khanabadosh* and entered in the list of wandering tribes. His duties include propaganda, and it is as propagandist that I appear before you this afternoon. It is the expressed intention of Government that the co-operative movement shall have every chance of success that Government can afford, and the

expenses which Government has already incurred, and is further prepared to incur, together with the privileges which it has accorded to societies registered under the Act, are an indication of the measure of importance which is attached to a full and free trial in this country of the principles of co-operation. This is as much as any Government can or should do. The action which remains necessary for success must come from the people. And you, gentlemen, are of the people from whom that action must proceed.

We may now assume that being convinced of the benefits which have attended co-operation elsewhere, being convinced also of the enormous advantages which must attend its extension in this country, some one or more of you desire to assist that extension by the exercise of your personal influence and persuasive powers. It is advantageous that we should, at the outset, consider the method to be followed in order to found a society, and the difficulties which must be faced and overcome. Many of you are, doubtless, in a position to found societies by force of order, in virtue of your status as land-owners or men of influence in your immediate neighbourhood. May I take the liberty of saying that societies founded as the result of an order, or of pressure from above, are bound to fail? Our experience of the last few years has proved this conclusively. The only satisfactory basis for the foundation of a society is conviction. And conviction can only be ensured by knowledge, and knowledge by teaching. So the first step is instruction. Choose some village where the agricultural community is comparatively free from feuds, and where, owing to its social constitution, or for some other reason, the members of the community would probably be willing to combine. Then go to the village and preach co-operation and combination. Listen to the arguments brought forward and answer them as best you can. Let the people go away and consider the question and then return and adduce any further objections they may have evolved. Meet those objections again, taking them all seriously, however frivolous, or, to your mind, ridiculous they may appear. It is a long and wearying process, tiring to the teacher, and trying, in the extreme, to the temper. But maintain the patience of Job. It may take a day, it may take three or four, or even longer, it may be entirely unsuccessful; but the probability is that, given conviction on the part of the propagandist, the



result will be, if not conviction, at least a new-born hope on the part of the taught. Then when they are willing to make their attempt, the villagers present should be asked to nominate three or four of their number, in whom they have confidence as leaders and honest men, to further discuss the subject and its details. When this has been done, progress is rapid. The next step necessary is to prepare a list of fifteen or twenty agriculturists of whose rectitude and honesty these leaders have no doubt. This done, those fifteen or twenty are called together, and the list carefully revised by them, any one, to the inclusion of whose name there seems the slightest objection, being ruthlessly removed from the list. When this has been done, you have in the small remaining company the nucleus of your co-operative society. But your difficulties have only begun. For, in order that the society may be a success, it is necessary, first, that it should be managed by the representatives of the members, and their business ability is frequently extremely minute; second, that the accounts should be kept, and, in many cases, where faith in co-operative credit is strong, it is accompanied by illiteracy; and third that, whatever the form of the society, sufficient funds should be raised at a comparatively moderate rate, to meet the requirements of the members for the first few years. The local Mahajan being unconvinced of the stability of the society and having a keen regard for his own usurious rates of interest, is unlikely to come to its assistance.

The first two of these difficulties can be met by careful choice of locality in which the experiment is initiated. It is at least as easy to induce the literate to co-operate as the illiterate, and those villages are numerous in which a cultivator with some slight knowledge of letters is to be found. In one of these the trial should be made. Finance may be found more troublesome. It must be borne in mind that Government is willing to lend free of interest, for three years and thereafter at 4 per cent., a sum equal to that which the members themselves subscribe. The promise of this advance usually results in a certain sum being raised within the society. Say, the requirements of the members are Rs. 500 and that Rs. 100 has been raised by deposits. Government lends a further Rs. 100. Rs. 300 is then the sum to obtain which the society must approach the capitalist. It will probably be found possible to obtain this sum at a reasonable rate of interest from some interested capitalist or friendly landholder.

The difference between the amount which the society pays for its accommodation, and that which it receives from its members on the amounts lent to them, represents the profit of the society. In order to attract deposits, the society must allow a high rate of interest, say, six and a quarter per cent., or one anna in the rupee per annum on fixed deposits for a year. It will also be found that money cannot be borrowed on behalf of the society at a lower rate than six per cent.; in many cases an even higher rate must be paid to obtain the necessary capital. In order that the reserve fund may grow rapidly, it will consequently be necessary, at the commencement, to charge a rate of interest on loans to members, which, although a large reduction on the usurious rates of the professional money-lender, is at the same time considerable. In most cases in these Provinces the rate charged by societies is  $12\frac{1}{2}$  per cent. per annum,—or two pies in the rupee per mensem. In one most successful institution it is three pies in the rupee per mensem.

Once the village society has made a fair start, further progress is simple. Experience proves that the example of one successful village bank is more powerful than unlimited precept. Each successful bank becomes the nucleus of a large number of similar institutions in the neighbourhood. Extension, however, brings its own particular difficulties. Each new bank, or other society means a repetition of the difficulty as to accounts and finance. Each institution means an addition to the duties of supervision thrown on the department of the Registrar.

An attempt to meet these difficulties and to provide an automatic means of extension has led to the adoption of the central bank system in certain districts of these Provinces. The system promises to be a success, and as it is simple in working and easy of supervision, a short description of the method will not be out of place. A central bank stands to the constituent village societies in a position almost exactly analogous to that which the village society occupies towards its members. Its functions are to raise capital on behalf of the societies, to grant them cash credits, to receive deposits made by their members, and to keep all accounts. By its means the difficulty of local account-keeping is overcome, and as it deals in thousands and tens of thousands of rupees, while the village society deals in hundreds only, it is in an obviously better position to approach the capitalist with hope of success. One of the

chief difficulties in obtaining money from a joint-stock bank in order to finance village societies lies in the smallness of the individual loans required. They are so comparatively minute that it does not pay a joint-stock bank to undertake the business.

The membership of a central bank consists entirely of representatives of village societies. Where the number of such societies is small, the members of their *Panchayats*, ex-officio, form the central society. Where their number is large, it is sufficient that the *Sarpanches* or heads of *Panchayats*, should be the ex-officio representatives, on the membership rolls of the central bank. By the by-laws of the village societies these representatives are empowered to pledge the credit of the societies they represent. The responsibility of the members of the village societies is thus twofold. Primarily, each member of a village society is jointly and severally responsible with each other member for all loans advanced by the central bank to his society. Secondly, each member is jointly and severally responsible with the body of members of all constituent village societies, for the whole of the loans raised by the central bank.

One very important advantage attaching to this system is that all profits are acquired by the central bank. This fact has two results: first, the reserve fund becomes very rapidly a valuable asset of security; second, it is possible to pay for professional account-keeping.

It is impossible in the limits of this paper to describe in detail the interior economy and management of a central bank and village societies. Leaflets on the subject and model by-laws have been prepared, and are available for perusal by any one interested in the subject. They are distributed free of charge to any who cares to apply to my office in Lucknow.

In addition to banks there are many other forms of co-operative credit which are applicable to agriculture. How to obtain good and reliable seed for his fields at a reasonable price is one of the continually recurring problems of the cultivator. It can be solved by the Co-operative Seed Society, in which the members raise capital as for a bank, invest that capital in seed, distribute the seed among themselves on *sawai*, and from the profits pay the interest and repay the borrowed capital by degrees, being left with a stock of good seed sufficient for the requirements of the society. Surplus stock can be sold, new seed bought, and deterioration in this manner avoided.

In Bengal there are *dharam-golas* for the maintenance of a stock of grain in the village. These are a most useful form of society, and to them the co-operative principle might well be applied. The profits which might be made by societies of this type are enormous, provided management be careful and honest. Recent enquiries into the possibility of founding such a society in the Gorakhpur district showed that a profit of over 14 per cent. could be ensured by storing grain at harvest and selling it a month later when prices again fall.

Land mortgage societies of the Punjab type or similar societies of types fitted to local conditions might be made to serve a very useful purpose in preventing property passing from the hands of the hereditary small shareholders into those of the professional money-lending class. One such society has recently been founded in this division, having for its object the redemption of usufructuary mortgages on fixed rate holdings. I trust that it is but the pioneer, and that it may be followed by many more.

For co-operative societies for the provision of capital to cultivators of sugarcane to enable them to dispense with advances from the sugar-boiler, and sell their produce in the open market, there is a wide opening. A further development is possible in providing the necessary machinery for boiling and refining, so that the cultivator might himself place his *khand* upon the market, and so obtain the profit which at present goes to the middleman. These are a few of the possible directions in which co-operation may assist agriculture. It is necessary to remember one great fact. The form that co-operation assumes is a very minor matter, as long as true co-operation be there. Once the idea and the principles of co-operation have been grasped, they will find for themselves new and appropriate channels.

Before closing this somewhat lengthy paper, I should like to draw attention to the possibilities of co-operation apart from agriculture. Its power is unlimited in every direction in which cheap credit is desired. The urban bank for small traders and officials, the provident fund for employees in offices and houses of business, the association of small producers with the object of placing their products on the market—all these are not only possible but easy. There is in this city at the present moment a most remarkable movement among the weavers, which has eventuated in the Benares Co-operative Silk-weaving Association. It is of a true *Swadeshi* and self-help type, and I

trust that many among you may show your goodwill and desire to assist in a truly practical manner by making purchases, and placing orders. The scope of the co-operative movement is, as I have said, unlimited. What it requires most of all is intelligent propaganda and sympathetic supervision. In both of these directions the non-

official is of more value than the official, for he is looked upon without suspicion by the people to whom he speaks. So I say to one and all—study co-operation until you thoroughly understand the principles on which it is based. Then go forward and preach, for co-operation once rightly understood, makes each man its missionary.

## SOME GENERAL OBSERVATIONS.

By Dewan Bahadur R. RAGOONATHA ROW, Kumbakonam.

**G**OD has blessed us with keen intellect. He has given us the best of religions. Its commandments require us to discharge our duties to self, to fellow-creatures and to God. We are asked to do everything to improve knowledge and secure real happiness. God has given us a magnificent sun, fertile soil, mines of precious stones and metals and large rivers which bring down to our cultivation its life and prosperity. These made our forefathers the famous people of the world. Our monarchs were great warriors, possessed of immense wealth, just judges, receivers of moderate taxes and fathers of the people. Our Rishis were repositories of knowledge, both profane and sacred, universally kind and forgiving and great instructors of sciences and religion. Our merchants traded with all the known parts of the globe and used to be found in several parts of the Grecian and Roman Empires. They crossed the sea, conveyed the surplus productions of the Jumboo-Dwipa to the provinces of these Empires, and brought from them what they produced. At home they cultivated the lands, owned domestic cattle and carried on local trades. They encouraged our industries. Thus Bharata-Varsha flourished from time immemorial to many thousands of years.

How are we now situated? Happily we are placed under a benign Emperor as good as our Manu of the Krita yuga. His people who wield immense political power in the administration of the countries under Him, are our good friends and always wish to make us as happy as possible.

Yet, we are poor and unhappy. Why so, is a question well worthy of consideration by all who wish well of Bharata-Varsha. The main causes of our unhappiness are that our Rishis have disappeared, our commerce has degenerated, our agriculture has been neglected and handicapped,

our industries have been ruined, our taste for foreign articles has increased and their non-substantialities are not thought of, and the prudence and forethought of merchants have disappeared. They export what they should keep in the country and import non-substantial articles which we need not purchase from other countries, but can produce in our own country. We can still produce corn more than we want for our consumption. We can produce cotton and secure wool from which we can make sufficient clothing to clothe ourselves and people in other countries. We can cultivate and obtain cotton of the finest staple as good as that of Dacca of olden times. We can manufacture fine and coarse woollen cloths. We were fine architects. Our temples' towers are still admired. Our hardwares and our jewels excite admiration. We have coal, diamond, gold, stones, sphaatika, etc. Yet we do not utilize them. Our artisans starve, our weavers die in thousands in famine. Knowledge used to be imparted by our Rishis and the enterprise of our merchants not being now in existence, we have been subject to these misfortunes. We should revive the knowledge of our arts and sciences, improve our agriculture, encourage our industries, love our productions and should not be beguiled by the apparent superiority of foreign goods. We should select our instructors, unite to follow them, acknowledge their authority, submit to their discipline and trust and follow them. No army, however numerous, can obtain victory without a general. In our successful days, we had heads for every department of our business. We obeyed them and conquered the world. We can do the same under similar circumstances.

What we should now do is—

(1) Improve agriculture by all the appliances both ancient and modern, and produce more food than now.

(2) Reserve a sufficient quantity for our use in the next two or three seasons, lest they may prove unfavourable.

(3) Export the remainder.

(4) Implore our rulers for aid if their aid is absolutely necessary for carrying out the aforesaid measures.

(5) Improve the cultivation of cotton in extent and quality, to compete with cottons of modern countries.

(6) Combine and form companies for the manufacture of threads and cloths from cotton and from wool.

(7) Work mines in different parts of our country.

(8) Utilize all appliances available for the development of our numerous industries, helping

the growing population of our country to earn their livelihood.

(9) Revive our old love for truth, bravery, industry, respect to our religion and kindness to our fellowmen.

(10) Give up bad and ruinous habits which have crept into our society.

(11) Become physically strong, active, enduring, morally great and religiously good, taking for our model the ancestors of our forefathers.

(12) Continue loyal, as we have always been, to our sovereign: thankful to our brethren who wish well of us and dutiful to the great Sovereign of the Sovereigns, the Creator of the Universe.

May He inspire us to make ourselves what we were when He once chose us to be so.

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## INDIAN COTTON INDUSTRY.

By the Hon'ble Mr. VITHALDAS DAMODAR THACKERSEY, Bombay.

**T**HE subject upon which I purpose shortly to address you is "The past, the present, and the future of the Cotton Industry of India." I have ventured to choose this subject as it is one with which I am tolerably familiar, having been personally engaged in the cotton manufacture from my earliest days.

And firstly the past. The manufacture of cotton dates from a very early period, for we find in Sanskrit records definite mention made of it as being used in India nearly 3,000 years ago. Coming to a later period, the time of Alexander's invasion of India, upwards of 2,000 years ago, the dress of the Indians is described as consisting largely of calicoes, pure white, or adorned with figures. In the year 73 A. D. Pliny, while enumerating the imports of Europe amongst them, refers to muslins and Indian calicoes, describing them as of superior excellence. Seventeen centuries ago it was Dacca that sent from its looms those wonderful tissues that adorned the noblest beauties of the court of Augustus Cæsar. The muslin known as "running water" formed the choicest gifts which Bengal could offer to its noblest princes or to its foreign conquerors. The fineness of the quality may be judged from an instance recorded that, shortly after the advent of the English, a piece of muslin 20 yards long and 1½ yard broad weighed only

14 oz. And yet another instance: a specimen of yarn, which Dr. Taylor examined at Dacca in 1846, measured 1,349 yards and weighed only 22 grs., which is in proportion of 250 miles to a pound of staple, working out on the present standard basis as 524 s. count of yarn,—a count which, even at the present most advanced stage of machinery, cannot be produced, and such as has led a competent judge to say that it is beyond his conception how this yarn, greatly finer than the highest number made in England, can be spun by the distaff and spindle or woven by any machinery. With such rude implements as they possessed the Hindu women almost rival Arachnes' fabled skill in spinning. European ingenuity can afford no parallel. So superior, indeed, were the productions of the Indian spinning wheel and handloom, to those turned out by the manufacturers of Lancashire in the middle of the 18th century, that not only were the Indian calicoes and Indian prints preferred to the British-made cloth, but the Manchester and Blackburn weavers actually imported Indian yarns in large quantities for use in their factories. The invention of machinery, however, was the turning point.

It was about the year 1771-1772 that the Blackburn weavers, taking advantage of the inventions and improvements of Arkwright, Hargreaves, and others, found themselves in a position to successfully produce plain cotton goods.

The invention of the mule jenny in 1779 was the commencement of a new era in the history of cotton manufacture, and subsequent improvements coupled with the utilization of steam power enabled Lancashire manufacturers not only to oust the Indian cloth from European markets, but also to undersell the native production in our Indian markets. It was deemed a great matter with the Lancashire manufacturers when, by the aid of mechanical and artistic skill combined with the potent agency of steam, they found themselves able to produce an article considered equal to that which the unlettered Hindu had manipulated in his little mud hut on the remote banks of the Ganges, and which had been produced of like excellence by their ancestors for many previous centuries. The year 1854 marked a second turning-point in the Indian cotton industry, for in that year the first cotton mill was erected in India, and within the first decade as many as thirteen mills were at full work. The following figures show the progress of the Indian cotton industry:—

Year.	No. of Mills.	No. of Spindles.	No. of Looms.
1865.. ..	13	285,000	3,500
1876.. ..	47	1,100,000	9,100
1886.. ..	95	2,261,000	17,500
1896.. ..	155	3,933,000	37,200
1905.. ..	197	5,163,000	50,100

It will thus be seen that within the last fifty years the industry has made giant strides. There are now working in India fifty lakhs of spindles and fifty thousand power-loom, giving employment to about two lakhs of hands with at least as many dependents upon them. We consume nineteen lakhs of bales of raw cotton, each weighing 392 lbs., which comes to nearly 60 per cent. of the cotton produce of India. Of yarn we produce about 58 crores of lbs., and of cloth 55 crores of yards weighing 16 crores of lbs. About half of this vast industry is claimed by the City and Island of Bombay, while if you include the whole Presidency the figures work out to 75 per cent. Let me now attempt to show you how this production of Indian mills is consumed. This subject necessitates the introduction of figures which on an occasion like this are generally considered to be very dry. But I shall confine myself to as few as possible.

Out of the total yarn production of 58 crores of lbs. that we produced last year, we exported about 23½ crores of lbs., or 40 per cent., to China

and other foreign countries, while we used in our own Indian weaving mills over 13½ crores of lbs., or 23 per cent.; the balance of 21 crores of lbs., or 37 per cent., is used by our hand-loom weavers and for rope and twine. If we deduct about 10 per cent. of this balance as used for rope and twine manufacture, we have left for the hand-loom industry fully 19 crores of lbs., against 13½ crores by power-loom. In addition to 19 crores of lbs. of Indian yarn consumed by hand-loom, a further quantity of three crores of lbs. was imported from Europe mainly from the United Kingdom for the use of hand-loom. The total quantity consumed by the hand-loom, therefore, comes to 22 crores of lbs., nearly double the quantity consumed by power-loom. So the hand-weaving industry is by no means a negligible factor, for its production in cloth is probably twice as much as that of the Indian weaving mills.

Next to agriculture, hand-weaving industry is still the largest industry in the country as the Census of 1901 showed 27 lakhs of cotton hand-loom weavers, besides dependents numbering 28 lakhs of persons. This ancient industry has suffered greatly from the introduction of machine-made goods, and though still possessed of considerable vitality, as the above figures show, seems to be steadily decreasing. It may be interesting to know how our production compares with the home demands of India. As I have mentioned above, the cloth production of power-loom came last year to 55 crores of yards against 216 crores of yards of cloth imported from foreign countries, approximately four times our mill production. While our mills produce the coarser cloth, say from yarn up to 30s. count, and in a few cases up to 40s., the bulk of the imported cloth is of the finer quality using yarn over 30s. count. The Indian weaving mills are obliged to restrict themselves for the most part to weaving coarser cloth owing to the inferior quality of cotton now grown in the country. I will not enter at present upon the causes which led to the inferiority of Indian cotton, nor upon the steps taken to improve its quality. Suffice it to say that all concerned are awakened to the importance of the question and Government are making every effort towards improvement of the staple, and this leads us to a short consideration of the future of the Indian cotton industry. The results of experiments conducted in Sindh under the superintendence of the Agricultural Department of the Government of Bombay of growing cotton from Egyptian seeds as irrigation crops are eminently

satisfactory, and great hopes are entertained of very considerable immediate improvement in the supply of our raw material. If, as is fully anticipated, India shortly produces between two and three lakhs of bales of this Egypto-Indian cotton and if, as there is reason to believe from the experiments conducted in Southern India, "tree-cotton" may be plentifully and successfully grown, it will revolutionize the whole cotton industry. As I have said elsewhere, it would enable the Indian mills to manufacture finer yarn and cloth for which there is an enormous demand in India, so clearly proved by the import figures I have already placed before you. It may be said that Europe would outbid us for this cotton, but who would doubt the capability of a country growing its own cotton and having a home consuming market at its doors to hold its own against any outside competition. I am in no way less sanguine of the prospects of our very important hand-loom industry, although I believe, there is a general impression that it is a small, moribund industry, inevitably doomed to be entirely crushed out by the power-loom. Let us not ignore its importance under this very mistaken idea. This village industry gives means of livelihood not only to an immense number of the weaver class, but affords means of supplementing the incomes of agriculturists, the backbone of India, who usually employ themselves on hand-loom when field work is unnecessary, and also when, owing to famine, drought, or excessive rains, agricultural operations are not possible. Now the apparatus

with which they work is nearly two centuries behind the times. Mr. Havell, Principal of the Calcutta School of Arts, and Mr. Chatterton, of the Madras School of Arts, and Mr. Churchill of Ahmednagar, along with many others, are doing yeoman service by taking keen interest in the question of supplying economical and improved apparatus to the hand-loom weavers. Mr. Havell has pointed out that in preparing the warp, our hand-loom weavers are incapable of winding more than two threads at a time, though the simplest mechanical device would enable them to treat 50 to 100 threads simultaneously. The latest European hand-loom which successfully competes with the power-loom in Cairo and in many places in Europe, can turn out a maximum of 48 yards of common cloth in a day. Mr. Havell is satisfied that the greater portion of the imported cotton cloth can be made on Indian hand-loom with great profit to the whole community. The question of immediate revival of the hand-loom weaving industry on a commercial basis demands the most earnest attention of every well-wisher of India, and evidence gives promise of a successful issue to efforts put forward in this direction. It will be an evil day for India, if by our negligence and want of support, we fail to place at the disposal of our weavers every improved and economical means of enabling them to profitably pursue their village industry on which directly and indirectly depend an immense number of our people, and drive them to poverty and distress. I commend this subject, therefore, to your most careful consideration.

## INDIA'S COTTON INDUSTRY.

By Mr. S. M. JOHNSON.

**I**T is right in a conference assembled to consider the agricultural and industrial interests of this great continent, and the measures which might be taken to further advance those interests, that those taking part in it should bring prominently to notice any disabilities under which either or both may appear to labour, or any dangers which may threaten or appear to threaten their welfare, and to put forward suggestions for the best means of removing them in the one case or averting them in the other.

One of India's greatest industries—if not the greatest—is cotton-spinning and weaving, and if

we reflect that, after food, clothing is our next greatest need, and that in India cotton fabrics form practically the sole raiment of all its millions, we must admire Nature's wonderful gift of the raw material; for not only can the people of the country grow their own sustenance, they can grow their own covering as well. With such conditions India should be not only the greatest cotton-producing country in the world, but it should also be the greatest cotton-spinning and manufacturing country in the world, and because it is neither the one nor the other that I am induced to ask you to consider the causes.

To-day I must confine myself to the industrial part of the problem leaving consideration of the

cultivation of India's great staple to some other occasion.

The cotton industry, we all know, is divided into two great sections—cotton-spinning and cotton-weaving. Cotton is now almost entirely spun in India by machinery: hand-spinning still survives in parts, but it is a moribund industry and does not require to be considered.

Weaving in this country is divided into two branches, viz., power-loom weaving and hand-loom weaving. The proportion of hand-loom to power-loom cloth in India is about 3 to 1, that is to say, there is about three times as much hand-loom cloth made in India as there is power-loom. There is no question but that power-loom cloth can be made possibly better, certainly cheaper than hand-loom cloth; but owing to the disability under which industries labour in India, and which I shall treat of presently, the power-loom is not worked to its full productive capacity; hence it has not outstripped the hand-loom in the same way as machine-spinning has outstripped hand-spinning, and that is the reason why the production of the one is three times that of the other. I know it will be said that, perhaps, on the whole it is good for India that it should keep to its hand-looms, but that is a proposition that is quite unsound. It is the same question that European countries have had to face before now, and as they have solved it so also will India solve it. If a man with the aid of certain contrivances can make and earn six or ten times as much as another without those contrivances, which think you will gain the day? If power-looms were worked to as great efficiency in India as they are worked in Western countries, hand-weaving would now be a decaying industry, hand-loom weavers would be finding more lucrative employment on power-looms, and India would be making more cotton fabrics and importing less from abroad than she does at present. These remarks bring me to the two great matters concerning India's welfare which we should ponder over. One is a present disability, the other a prospective danger.

The greatest disability which affects Indian industries is the poor quality of Indian labour. It is one which, perhaps, in the course of time will undergo alleviation, but the process must necessarily be a slow one; and unless we realize how great a disability it is and strive to remove it, the process must be slower than it need be. Until our labouring classes learn to value thrift, to value labour, and to value time, they can never hope to compete with Western nations. I have mentioned

these three attributes, because I think they may be considered as summarizing all that we care to find in labour. A man who is thrifty will always strive to improve himself as a wage-earner; if he values labour he will strive to excel, whatever his occupation; and if he values time he will strive to do as much as he can in the hours at his command.

These virtues you must all know are conspicuous only by their absence among labourers in India. Go where you will,—search where you may,—you will find everywhere the same complaint, and that is the poor quality of labour, and it is poor because the labouring man is not thrifty—he only values money for whatever it can give him at the moment without a glance at the future; he does not value work for work's sake,—to him it is unfortunately a matter of complete indifference whether his work is bad or good; he does not value time because his practice is not to do as much as possible in a given time but as little as possible.

With disabilities such as these, can Indian industries ever hope to compete with those of Western nations? I am afraid not. If we are ever able to compete it will be due to some circumstance, some factor which is so predominant that even the poor quality of our labour will not entirely outweigh the great benefit accruing therefrom.

To illustrate the position I will take the case of a cotton-weaver in Lancashire. A power-loom weaver there works single-handed from 4 to 6 looms, and will turn out from each an average of 78 lbs. of coarse cloth in a week of 55 working hours or 468 lbs. in all for a six-loom worker. A power-loom weaver in India looks after, as a rule, (at all events in the part of India I am familiar with) only one loom and all he can turn out of a similar cloth in a week is at the best 70 lbs. A hand-loom weaver on an improved hand-loom can weave barely 60 lbs. of very coarse cloth in a week; his outturn as compared with a power-loom weaver would probably be not more than 50 lbs. a week as against the power-loom weaver's 70 lbs. But comparing either with an English weaver I ask you to consider the wide difference: it is that a weaver in Lancashire can do the work of at least six Indian power-loom weavers and nine hand-loom weavers.

Do you think the Indian workman in whatever handicraft he may be employed can ever hope to compete with the European if the disparity between them is so great, if the efficiency of the one may be taken as six times that of the other?

And remember this difference is not due to any difference in machinery, the power-loom in India is similar to the power-loom in England, and cotton mills in India are as well equipped as cotton mills in England; the difference is due entirely to the quality of the labour.

India can never become a great industrial nation until its labour improves—it will never be able to utilize its vast stores of raw material until the Indian labourer is a better working man than he is at present. The disability our industries lie under is the poor quality of our labour and the great question is how it is to be improved. I have had many thousands of Indian work-people under my observation and the one invariable feature is that beyond a very limited extent and only in rare cases there is never any improvement—the man of 40 is generally not as good as the man of 30—the man of 30 not as good as the man of 20. What is wanted is to improve the condition of the lowest classes: it is not higher education that is wanted, nor the teaching of the well-to-do; it is the children of the cultivator in the villages and the children of the artisan and the cooly in the cities who require to be brought within the fold and educated so that they will not be divorced from the calling of their parents but sent back to it with all possible speed. The defect in our present system of education is, I think, that under it these classes escape: it does not reach the lowest stratum, and many of those who are taught are too old and are taught too much and their aims are misdirected. The elementary schools I refer to should never take a child under 7 and never keep him after 9: and he should be taught only the simplest elements, given plenty of physical exercise, and then allowed to go back to assist his parents in their calling and be trained in it whatever it is.

I believe if these preparatory schools—especially in cities—were established, and the absolute rule observed not to take a child over 7 or keep him after 9, that in a few years you would find the intelligence of the labourer really improved, and that this start once made would go on improving from year to year.

I have treated of a disability and now I will refer to a danger. The danger that appears to loom large in India's future is the danger that her destinies will be directed not so much by what is best for her, but by what is best for other people. I am not going to launch into a tirade against Government. Our Indian Government is, I suppose, the finest and most beneficent in the world, and

British statesmen and British officials are the most upright in the world, but Governments in India are ruled by the party in power in England and parties in England are entirely a matter of votes. When, therefore, you find British voters insisting on a particular policy you may be quite certain their representatives in Parliament will support that policy. It is some years now since an Excise duty was put on Indian-made cotton cloths: it was put on because an import duty was put on imported cotton cloths, and Lancashire said that, if an Excise duty was not put upon the local article, there would be unjust competition between the two.

The import duty was put on for Revenue purposes and not by way of protecting Indian-made goods, but remonstrance and protest were equally unavailing: it was of little use pointing out that there was no competition, since similar goods were not made in India; the electors in Lancashire insisted that there should be a duty and a mandate from the British Government was issued accordingly in opposition to the views and desires of British officials in and the people of India.

Though from year to year the campaign against Excise is carried on as vigorously as it is possible for us to do, there appears no prospect of relief, and now we are face to face with fresh trouble and this is the danger to which I ask your attention and which threatens the vitality of your industries. You have no doubt heard of the long factory hours recently practised in Bombay,—I have nothing to say in support or defence of a 15-hour day: the practice of these long hours brought down violent, not to say hysterical, condemnation in Bombay itself and they ceased to be practised; but the echo of them is now reaching us from Lancashire where the most determined efforts are being made to induce the British Government to interfere with the hours of factory-labour in India. The ground on which the Home Government is asked to interfere with our hours of labour are stated to be humanitarian, and there are loud clamours that the hours in India should be similar to those in Lancashire, viz., ten hours a day. Though ostensibly this interference is based on grounds of humanity, the real feeling among Lancashire work-people (and one had only to read its newspapers to see it) is that long hours of work in India mean undue competition with them, and for that reason should be stopped. Let us examine, therefore, these two pleas, first the humanitarian one, and then the undue competition one.



To those who know the conditions under which the factory-hand works in Lancashire, the plea of humanity appears a hollow pretence. Both men and women have to work there 10 hours from year's end to year's end except on Saturdays when they work from 4 to 6 hours. At 6 in the morning, summer and winter, they must be at their work or run the risk of losing their job: steadily so long as the engine revolves they must work—work—work; there is no rest, no cessation, no respite. At 8 they are allowed half an hour for breakfast and about noon one hour for dinner, but for 10 hours there must be steady, continuous, grinding work. There is nothing in India to compare with the life of factory-hands in Lancashire, and as to factory girls, their lot is, indeed, a pitiable one. In a recent Lancashire paper I read that for the loss of an eye a woman weaver got compensation at the rate of 2 shillings a week for 6 months: in the same paper there was a report of a case at Rossendale where a girl of 15 attempted to commit suicide because she was threatened with dismissal for not turning out enough work; and another case in the same paper at Elton where a girl of 14 was killed doing what in India would be a man's work. Similar cases are frequently reported, and reading them my profound conviction is that it is the factory-workers in India who ought to go to the rescue of their fellows in Lancashire, and claim, on humanitarian grounds, that the work there should not be so strenuous, that women should not be employed on men's work, and that intervals should be allowed for recreation.

Indian factories are built in spacious grounds where the workers have unlimited means of recreation, where they bathe, wash their clothes, eat their meals, sleep, and, in fact, *live*. The Indian mill to its workers is their home. Look at the other picture; land in England is so scarce and so costly, that actual building space only is, as a rule, taken up for a mill; the sides of the mills itself frequently forming the boundaries of the property, and the workers step usually from the mills into the street. That a hand in England should quit his machine to eat, to sleep, to bathe, to wash clothes, to smoke, is an unheard of thing: they are at work continuously from the time they step into the mill to the time they step out again.

Women by customs of caste and other considerations do not work in any part of a weaving mill out here, nor in any part of a spinning mill except the reeling room. In Lancashire they work everywhere: a woman weaver there is often better

than a man and does quite as much. Where does the plea of humanity come in?

As to competition it is not the Indian labourer who competes with the English worker: it is precisely the opposite which is true. If, under present conditions and working 72 hours a week, an Indian worker can turn out at the very best only 70 lbs. of cloth, while the European working 54 hours can turn out 468 pounds, what truth is there in the plea that the Indian competes with the European? Is it not the plain palpable fact that even now competition would be utterly—hopelessly—impossible but for some other predominant factor? In the case of cotton, it is because we have the raw material, but if that factor were to disappear and our industries so fettered by unjust labour laws that the Indian labourer was placed on the same level as a European labourer, then our industries would disappear as in a twinkling, and the people would have to go back to the land or emigrate. Let me give you an illustration. It costs in Lancashire the equivalent of 14 pices to make a pound of coarse cloth such as is worn by the lower classes in India. This figure does not include the cost of the cotton or the yarn, but simply the cost of making the cloth and all processes previous thereto including such items as wages, stores and coal. In India a similar cloth would cost at least 17 pices. But the cotton or yarn in these cloths is so much cheaper in India than in England, that the higher cost of production in India is more than made up in the price of the raw material.

That is one of the reasons why England cannot compete with India in coarse goods: but if this difference were to disappear, which it does as you get up to finer counts, then India could not compete at all.

If you take the cost of freight to India, landing and agency charges and all other expenses, and also include excise duty, you need only add at the outside 20 per cent. on to prime cost and in the case I have given you that would mean under 17 pices against 17 pices—so that but for the raw material European countries could at the present moment land cotton goods in any part of India cheaper than they could be made on the spot.

There are very laudable attempts being made to introduce improved hand-looms in India, and I see it stated by Mr. Chatterton, Mr. Havell, and others, that with improved looms the hand-loom woven cloth can compete with that from power-looms. But it is a vain hope: if the power-loom weaver could work even two looms,

he could nearly treble the outturn of the hand-loom; it is because he confines himself to one loom that he pulls the power-loom down to the producing power of the hand machine.

But notwithstanding this the cost of weaving on the power-loom is less than on the hand-loom. In a report to the Government of Madras the other day, Mr. Chatterton said that in Ahmednagar on some improved hand-loom coarse cloth had been made at a cost of about 19 pies per lb. The figures he gives, however, do not include cost of repairs and renewals, cost of general charges, management and the like. Nor did it make provision for the days when the looms would be idle. If hand-looms were worked together on a large scale, the cost of making cloth on them would certainly always be higher than the power-loom. Taking a similar cloth to that made at Ahmednagar, the cost of making it on a power-loom would be 17 pies as against the hand-loom's probable 21 pies, the equivalent of the English cost for a similar article being about 14 pies.

What our European rivals dread in India is not the hand-loom but the power-loom. If by any means—by curtailing factory hours—by interfering with adult labour—by excise duties, the latter could be crushed, then the hand-loom industry would be entirely at their mercy: nothing could possibly save it from rapid extinction.

If, therefore, the hours of labour in India were restricted so that the output of the labourer out here were made to be even less than it now is, it is obvious the factor of the value of the raw material would be a diminishing one: the point would be reached when the saving in cost of manufacture would more than cover the difference in cost of raw material: then what would happen? Your industries must disappear. If cotton yarns and cloths could be landed in India for less than they would be spun and made here, do you think cotton-spinning or power-loom or hand-loom weaving could continue to exist in India? They would disappear like the morning mist.

In interfering with the hours of factory labour in India, I am afraid Lancashire lays itself open to the charge of having one object, one aim, and that is to destroy India's cotton industry.

These, therefore, are what we have to bear in mind in developing or endeavouring to develop India's industries. There is first the disability we are under of having poor labour; until we make the Indian labourer a more intelligent and better workman than he now is, we will never be able to compete with European nations.

And there is second the danger of such interference by outsiders with our labour laws as will enhance the cost of our manufactures, and thus bring our markets within easier reach of the skill of Western nations.

## HAND MECHANISM.

By Sir HENRY COTTON, K.C.I.E.

**I**F it is true that indigenous manufactures, and especially cotton goods, have been paralysed by foreign and Manchester competition, what is the most practical remedy to which we must look? The difficulties are great in every direction. It is impossible that in these few words I can do more than touch on the fringe of these difficulties. But great as they are they are not insuperable, and I will offer a few suggestions on one point. It is to labour-saving appliances, to the action of machinery, that we must look for any considerable advancement in technical skill. But what sort of machinery? It will be long before the people of India are in a position to provide the capital of combination necessary for the establishment of manufacturing industries on a

large scale. That time will come, but meanwhile there are few opportunities for the development of large factories after the British model. The cotton mill industry in Bombay affords us encouragement and there are a few cotton mills in other parts of India, but their growth and expansion depend upon a large application of individual capital than is now available. Gradual progress will assuredly be made in this direction. But I do not expect it to be rapid. There is substantial foundation for the charge of wasted capital, but even with more capital employed in remunerative enterprise, progress will be slow. The question hinges, in a large measure, on the habit, character and training of the industrial classes. The workmen of India are in the habit of depending upon their

own small capital and have never been accustomed to work under large capitalists for bare wages after the manner of European mechanics. The immediate problem, therefore, which we have to face is the encouragement of sufficiently simple machinery among the masses of the industrial community. We want to improve the common spinning-wheel, the shuttle and the hand-loom. I recall what was done by Messrs. Thomson and Mylne in their well-known patent for sugar-crushing mills. The inventor made a fortune out of this patent, but the people of the country gained greatly by the invention. Can nothing on similar lines be devised for the improvement of the present simple spinning apparatus, something which by the aid of hand-machinery might double the daily outturn of a weaver's work? That is a practi-

cal suggestion I have to offer. There is a fortune, I believe, to be made out of it. But patriotic Indians will not look at the suggestion from that point of view. Let the landholders' associations, or benevolent individuals offer prizes or any reasonable encouragement for the discovery of such a cheap and simple mechanism, and I cannot doubt that it will readily be found. It does not seem necessary to go to England for such a purpose. There is surely enough mechanical inventive skill in India itself which would supply all requirements at a very small cost, and there must be many wealthy benefactors of their countrymen who would be willing to supplement the outlay from their own funds and so place the invention at the hands of those who could not otherwise afford it.

## INDIAN INDUSTRIAL DEVELOPMENT.

By Mr. H. J. TOZER, India Office, London.

**E**VERY one who desires the progress and prosperity of India must feel that the question of industrial development is of supreme importance. I therefore welcome with pleasure and hope the meeting of the first Industrial Conference. No fitter place of assembly could be chosen than the ancient sacred city of Benares, to which, for 3,000 years, millions upon millions of Indians have turned for light and guidance.

As a slight contribution to the work of the Conference, I may perhaps be allowed to summarise the results of my recent inquiries concerning India's manufacturing industries, trusting that, in my endeavour to be brief and practical, I may not appear dogmatic.

(1) Agriculture, for any time worth considering, must be by far the most important Indian industry. In order to increase the produce of the soil, and the profits of the cultivators, educated Indians might lend aid in popularising new staples and better implements, in encouraging the use of selected seed, and, generally, in advocating improved methods of cultivation. The advantages of co-operative credit societies might also be explained to raiyats and artisans.

(2) Hand-loom weaving, the most important industry after agriculture, still shows much vitality, in spite of the competition of steam machi-

nery. Although this ancient handicraft may ultimately be forced to give way under the pressure of competition, it is of importance socially that the process of decay should be gradual. The introduction of an improved hand-loom consequently appears desirable, but careful inquiry will be necessary to ascertain what kind of loom is best for ease and effectiveness of working. The purchase of the new looms might be facilitated by a system of advances.

(3) Industries closely associated with agriculture require the application of more scientific methods. Sugar-production and oil-pressing could be made much more lucrative by the adoption of improved processes and by the utilisation of by-products. There has been a regrettable decline in sugar-production. The cultivation and manufacture of tobacco are also susceptible of improvement.

(4) The production of manufactured articles of a complex character on a large scale by up-to-date methods requires—

(a) The choice of a locality in which raw material and fuel can be obtained cheaply, and from which the manufactured products can be readily transported to the consuming markets.

(b) An adequate supply of capital, so that production may not only be on a large scale, but on the best methods, and so that periods of depression may be tided over.

(c) Provision of the most recent machinery and fittings.

(d) Capable directors, possessing financial and commercial knowledge, aided by business managers with a complete grasp of technical details. European managers, even at high salaries, are most economical, until a race of Indian managers has been trained.

(e) Well-paid and skilful artisans, whose hours, on grounds of true economy as well as of humanity, should be carefully restricted.

Indians have done a good deal in the production of cotton and jute goods, and there are possibilities of expansion not only in these manufactures, but also in those of silk goods, leather and leather goods, iron and steel, paper, soap, &c.—attention being concentrated for the present on the simpler varieties of such articles.

Now that there is general agreement among educated Indians concerning the need of industrial development, it is to be hoped that practical work will soon be undertaken. Some failures are inevitable at the outset, but with courage, persistence, enterprise, and mutual confidence, a large measure of ultimate success is assured.

In conclusion, I would point out that industry is but one function of the social organism, and that for its free play and development conditions of a non-economic character must also be favourable. Thus social prejudices, differences of creed and caste, may impede industrial progress. These difficulties can only be indicated. Their solution must be left to those who have an intimate knowledge of Indian life and thought, enlarged by ideas imbibed from Europe, America, and Japan.

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## AN INDUSTRIAL BUREAU.

By the Hon. Mr. DAJI ABAJI KHARE, B.A., LL.B., Vakil, High Court, Bombay.

**W**HAT do we wish to achieve by the industrial movement? We desire, first, to open economic and industrial facilities and to produce economic good. How could we be able to do this by mere discussions or dissemination of any quantity of literature over it? We have to do many more things to make the movement really useful. If ever the movement should begin to produce effects in the economic and industrial world, then alone its proper mission will have been fulfilled. In India the problem embraces distinct activities, distinct directions of effort, all of which must be started coincidentally and, as far as possible, with proportioned energy and capacity. For instance, is it enough if, say, a hundred persons return from foreign countries after having mastered a hundred different arts and industries? The example of Mr. Wagle—N. B., the Bombay gentleman who returned an expert in glass manufacture, and ended in accepting Government service in Gwalior—ought to be full of meaning to us. If we go on merely encouraging scholarships, and importing hundreds of experts, we do not add a whit to the progress of the industrial cause, if we do not take previous care to afford sufficient scope for the employment of the acquired merits of our experts. So, also, the widest dissemination of literature will not in itself help in the least to

produce any tangible results. What we must have is—a well organised, continued, regulated effort—an effort capable of effecting a combination of intellectual forces, with those of capital and enterprise. How to achieve this, is the question. Let the Industrial Conference primarily keep before its view the end above set forth, which means that it must include essentially the following subjects to decide on:—

(1) An agency of work which would bring into increasing intimacy with the natural aspirations for economic success, the forces of the commercial and industrial world. We have to do with merchants, traders, manufacturers and capitalists when we propose any step of this kind. Even a skilled England-returned scholar of ours has, if he is to consummate the end with which he went to England,—first and last only to do with that class, the mercantile community. If we want to spread the knowledge of any manufacture, and make it productive, we must invite and deal with those who have the capacity to undertake it. Therefore, there must be some link, bond or channel by which the commercial and capitalist forces may be held in unison with the energies of the Conference or the movement in general.

(2) To rouse the attention of the commercial classes, the proceedings of the Conference or the agencies it might establish must be, as far as

possible, in the vernaculars. Even the pamphlets or papers or lists which might be issued should be in the vernaculars, appealing directly to the classes concerned, most of which are ignorant of English.

What sort of an agency must this be? I think that the Conference be asked to institute a Bureau—a permanent institution with a few officers devoted to this work—subject to the control of the Industrial Conference.

(1) The Bureau should constitute correspondents from several parts of the country, particularly members of the commercial and manufacturing classes.

(2) It should have a regular organ to voice its efforts to keep the agitation alive, to maintain correspondence with experts, mechanics and capitalists.

(3) The Bureau must ascertain what fields there are in the several parts of the country for development—fields in manufacture or commerce.

(4) It should, after having first consulted manufacturers or persons wishing to undertake or invest in manufacture, recommend scholars to be sent to foreign countries to learn that particular manufacture so as to afford scope and employment to these men after their successful return.

(5) It should, also, induce capitalists and others to start particular industries or manufactures, if found triable after proper deliberation.

(6) It should call forth information of foreign markets, of foreign fields of trade or industry for Indians and spread it among likely men of enterprise.

(7) It should ascertain what arts or industries or handicrafts are still valued by us or foreigners, and see what should be done to improve them or maintain them.

(8) It should ascertain what castes there are whose hereditary function has been mainly mechanic or artisan, what their condition is and what might be done to organise them or their Panches so as to assist their own progress and development.

(9) Its duties must embrace the widest activities, widest enlightening and organising agencies.

(10) It must keep alive a fund fostering, day by day, the Exhibition itself.

If the Conference should start such a Bureau, then alone some tangible work is possible. It might have a paid staff with itinerant secretaries. It might shift its head-quarters with the Conference or the Exhibition. You must mark that the Bureau is to be assisted principally by correspondents in different parts of the country. Such a Bureau is more properly within the scope of Government, but since Indian interests are not identical with British interests, we must have our own organisation. There is no other way of effecting economic salvation. Mere exhibitions and conferences will do nothing. The Bureau is manifestly intended to keep alive economic processes, to feed constantly the fires of living food for the country, to enliven industrial agencies, to vitalise the very soul of the people so that the industrial organisation will not rot, or grow faint nor grow monotonous.

## MINING, METALLURGY, MINERAL AND METAL WORKS.

By Rao Bahadur G. V. JOSHI, B.A., Head Master, Government High School, Satara.

THESE constitute an important department of national industry, and in any scheme of economic revival and reform, are entitled to a prominent place. They present a most fruitful line of effort, and suggest a boundless vista of possible development. Our mineral wealth is immense; and there is no sphere of industrial work in which the openings are so many, and the prizes so great. It was at one time a flourishing industry in the land, giving employment to a numerous section of the population. But it has since shared the fate of so many of our other

industries, and perished in the general economic cataclysm that has swept over the land, sending our minors to the plough, or forcing them into the ranks of landless and casual labour. The field, however, is there—vast and rich—open to our enterprise; and it rests with us to properly work and develop it. The economic need is imperative for the endeavour, and we have at present unrivalled opportunities which may not always recur. And now that there is such a national awakening to the economic situation in the country and its necessities,—there is, we submit, no more urgent or important question than can

engage the deliberations of the Conference than that which has reference to the rehabilitation of this ancient and glorious industry. As a humble contribution to such a discussion, it is proposed in the following pages to submit a brief general survey of the position as it at present exists, and respectfully offer a few suggestions with a view to practical action in the matter.

*Our mineral deposits* are rich and varied. We have diamonds and rubies, gold and silver, copper and lead, iron and coal, mica and aluminium, marble and lime-stone, and, in fact, every useful mineral we need for our purposes. As Mr. Bull puts it (*Ec. Geol.*, p. 1) "Were India wholly isolated from the rest of the world, or were her mineral productions protected from competition, there cannot be the least doubt that she would be able, from within her own boundaries, to supply very nearly all the requirements, in so far as the mineral work is concerned, of a highly civilized community."

(a) In India *diamonds* occur over three wide areas:—

(1) The eastern side of the Deccan from the Pennar to the Sone, (2) Madras, Cuddapah, Kurnool, Ellore, Kistna and Godavari basins, and (3) Chota Nagpur and the Central Provinces to Bundelkhand. They are found in alluvial deposits—in beds of sand and clay, in ferruginous sandstones and in conglomerates. The best diamonds are those from the Kistna District and from Panna in Bundelkhand. The matrices are still undiscovered. The surface workings in several parts of these areas show signs of exhaustion—and, indeed, large diamonds have not been found for years. Both practical and scientific opinion, however, leans to the view that rich beds lie below as yet untouched. Considerable tracts in the Madras Presidency of the diamond Banganapully conglomerate are still untried. There are, besides, large conglomerate beds in the Kistna District to which belonged the old mines of Collur and where the Kohinoor was obtained. The Ramallakotta and Banganapully mines are still worked, and yield a remunerative supply of small and rough diamonds. There are promising areas in the Nizam's Dominions which the Deccan Mines Company has recently had investigated and reported on by a distinguished expert. In Bundelkhand there are the Panna mines. The ground here consists of ferruginous gravel mixed with reddish clay which is washed for diamonds. The matrix evidently lies deeper. There is a still more important tract lying north-east of Panna where

large diamonds, though not of the first water, are obtained; and here, according to Pogson, "inexhaustible strata producing diamonds exist." Presumably as in South Africa, so in these Indian diamond tracts, the workings have hitherto been confined to alluvial deposits, sandstones and conglomerates, apparently the eruptive detritus of low-lying inferior rocks spread over the river valleys, and it would seem necessary to extend the search to greater depths and through "pans" or "pipes" running down into the inferior strata through which volcanic matter has forced its way to the surface bringing diamonds with it from some lower matrix. There can, however, be no doubt as to the vastness of the treasure that lies hidden here in these diamond fields; and science will guide effective search. Our gold deposits are even richer and more extensive.

(b) *Gold* occurs in India in the quartz reefs which traverse the metamorphic and sub-metamorphic series of rocks, in the alluvial deposits resting on these rocks, and in places in chloritic schists and quartzites and certain forms of gneiss. All along the foot of the Himalayas from west to east the tertiary rocks which flank the bases of the hills are auriferous, the gold obtained being all detrital, derived from the crystalline metamorphic rocks of the higher ranges. In the Punjab, most of the rivers and streams—whether rising in the higher or lower ranges—contain gold. In Assam, there are auriferous deposits of considerable economic value. Most of the streams contain gold-bearing gravel—the Subansiri and Desovi rivers particularly. In Chota Nagpur gold occurs in considerable tracts, the richest deposits being in the north of Singhbhum and the south of Manbhum in alluvial sands, gravels, and conglomerates. At Sonpet there is what looks like a fine quartz matrix. By far the most valuable deposits, however, are found in Southern India. In Malabar and the Wynaad the metal occurs in the reefs or large lodes of quartz, in the leaders or spurs from them and in the casing rock. Mr. B. Smith's report of 1879-80 mentions a tract here, some 510 square miles in area, in which there are 200 out-crops, richer and wider than in any portion of Australia. In Mysore, the Kolar Gold Fields are well known, and their success proves that gold exists in richly paying quantities in many of the lodes running through the Dharwar schists, and lodes of equal richness exist elsewhere, too, in the series. And, in the opinion of Mr. Foote, the mining operations at present in progress tap only to a small extent the gold-bearing

rocks of Mysore. Over the whole extent of the province from north to south run well-marked bands of Dharwar schists so rich in auriferous deposits. The Kolar band is only an out-lier of limited extent. Of the great bands traversing Mysore, the western is said by Mr. Foote to be the largest and least known, being covered by the dense forests of the Western Ghats. In the Bombay Presidency, the district of Dharwar is rich in auriferous deposits which are found in these distinct series of rocks. Lastly we have gold sands in so many of our rivers.

(c) As regards *copper* it is not an extensive deposit, but where it occurs, it is of considerable richness. It occurs both in the older crystalline metamorphic rocks and also in several of the groups of transition rocks, e. g., in the Cuddapah and Aravalli series. The most extensive copper deposits are in the district of Singbhum and the State of Dulbhum. Copper ores occur in the Madras Presidency in the districts of Cuddapah, Kurnool, Nellore, in Rajputana, in Ajmere, and in several Native States; in the United Provinces, in Kumaon and Gurhwal; and in Bengal, in the Hazaribagh District.

(d) *Silver* is a deposit of still more limited extent. It seldom occurs native, but is found alloyed with gold as in Mysore in some places, or associated with lead and copper. Argentiferous galena abounds in the districts of Cuddapah and Kurnool in the Madras Presidency and also in the Bhagalpore Division of Bengal. Native silver in small quantities occurs in the Kappalgade hill streams in Dharwar in the Bombay Presidency.

(e) Passing on to *iron*, we find our supplies of this most useful of minerals are of surpassing richness in extent in both the British Provinces and the Native States. Indeed, there is not a district in the country where iron ores are not to be met with in more or less abundance. In parts of the Peninsula, the deposit is simply magnificent—far even beyond the dreamer's dream. In the Salem District of the Madras Presidency, the development of the ore is on a scale of unparalleled magnitude, whole hills and ridges being formed of the purest varieties of it; the deposits are not lodes but true beds of marvellous extent and thickness, and the ore obtained is of the best quality and in quantities to be estimated only in thousands of millions of tons. In the Chanda District of the Central Provinces, the iron ores exhibit wonderful richness and abundance. Near Dewalgaon there is a hill named Khandeshwar which is 255 feet high and the whole mass is laden

with ore enough to furnish the whole of India with iron for years. The iron ores of the Raniganj field in Bengal occur in iron-stone shales 1,400 feet thick; and in case of iron works being established here, regular mining for years would not be necessary for a long time. Even in Sind we have masses of magnetite and bands of brown *hematite* of considerable richness. In the State of Gwalior remarkably rich deposits occur; and so do they in many other Native States.

(f) As to *coal*, India possesses extensive stores none belonging to the carboniferous period. The whole deposit as far as ascertained, occurs in the rocks of the Gondwana system; and the coal measures exist only in the Central and North-East Provinces, in Western Bengal, the Lower Provinces and the Nizam's territories. The coal area is estimated at 35,000 square miles, and the amount of coal at over 40,000 million tons. The most extensive coal-field is that of Raniganj situated on the rocky frontier of Western Bengal 120 miles from Calcutta, the available coal being estimated at 14,000 million tons.

Space does not permit of any more details being added here regarding these mineral deposits. Besides, the work of exploration is still incomplete, whole areas lying untouched, particularly in the Native States. Malwa and Kathiwar, Cutch and Bundelkhand, Rewa and the Nizam's Dominions are in this respect more or less still a *terra incognita*. Enough, however, it is hoped, has been said to convey some general idea of the practically boundless wealth we possess, hidden in the earth's crust. Broadly speaking, these mineral deposits constitute for us an underground store of capital of immense value (our coal deposit alone is worth 20,000 crore rupees). Nature's generous gift to us which, if we should only know where and how to find them and turn them to use, would prove a most important help to us in our future industrial developments. Iron and coal are the ground-work of England's material prosperity; in France and Germany, they are also the main foundation on which the new industries have been built up. In Australia, it is to their mineral resources that the colonies owe the proud position they hold in the Empire as the richest colonies. Here gold was first discovered in 1851; and from that year to 1899, 368 million pounds sterling worth of the metal was obtained. Silver to the value of 29 millions, copper 30 million pounds sterling, and tin 12, together forming a total mineral output during the period of close on 440 million pounds sterling: and an economist

remarks, the *development of manufacturing* and other industries in these colonies followed as a natural sequence to the acquisition of so rich a treasure. In India, our hidden heritage, to be sure, would not prove of less service.

So richly endowed by the bounty of Nature, India from the earliest times of which there is any record down to within a few years of the British occupation was one of the foremost mining countries in the world. She was able not only to meet from her resources her own local wants, but also sent to far-off lands some of the finest products of her mines. For centuries and up till 1727 when Brazil entered the market with its cheaper stones obtained from the mines of Minas Geraes, India alone supplied diamonds to the world. The Kohinoor of the British Crown, the Orloff in the sceptre of the Russian Czar, the Pitts diamond among the State jewels in France, and several others in the possession of the princes and magnates of Europe, are from our mines. China got her silver from us. Our iron was held to be of superior quality and was much sought after by the foreign merchants. Indian steel was highly prized for its fine temper and found ready sale in the markets of Persia and England. Firearms and swords damascened on gold and covered with gems passed across the frontiers. Our damascening on iron and steel as turned out even to this day commanded high prices. We had iron foundries in the country capable of turning out work like the wrought-iron pillar close to the Kutub at Delhi, the iron girders at Puri, the ornamental gates of Somnath, the 24-foot wrought-iron gun at Nurwar, which afforded a theme of wonder to succeeding generations.

Megasthenes wrote some 300 years B. C.:—"India has under ground numerous veins of all sorts of metals, for it contains much gold and silver and copper and iron in no small quantity and even tin and other metals which are employed in making articles of use and ornament as well as the implements and accoutrements of war." And so continued India for centuries afterwards. All accounts go to show that this mining and metal industry was in those days a large and flourishing industry in the country. We had a numerous population of miners and metal workers and every branch of the industry was more or less strongly represented. The work was carried on on an extensive scale and over large tracts; and our miners—though without outside light or guidance—whether working for diamonds or gold, copper or iron,

showed remarkable skill and resource in their processes and great boldness and expert knowledge in their operations, of the capabilities of the tracts in which they worked.

*Diamond diggings* were extensive in the diamond tracts. Traces of old workings are numerous. Pits in graves and shafts of varying depth with horizontal galleries are still to be seen. Even dredging was not neglected where necessary. There were diamond mines in the Cuddapah, Kurnool, Godavari and Kistna Districts in the Madras Presidency, in the Chanda District and in Chota Nagpur. In Kurnool up till within a few short years ago there were over a dozen places where we had both rock workings and alluvial washings for diamonds. Chenur and Cunnapurttee in Cuddapah, Manimadagu in Bellary, Collur, Partial, Meluvilly, Sambalpur, Jashpur, Panna were among the leading centres of the industry. There was diamond-polishing in most of these places also.

*Gold-mining* was perhaps—next to iron and lead—the most extensive branch of the industry, giving employment to numerous classes. Malabar and the Wynaad, Mysore, Dharwar, Chota Nagpur, Singhbhum, were among the chief seats of gold-mining. The miners quarried on the outcrop or sank shafts with adits. In Malabar they cut them in hard solid quartz, 60 to 70 feet deep, with smooth and plumb lines, and pounded the stone with hand mullers. In Jashpur, on both sides of the river Ebe, the tracts were simply honeycombed with shafts sunk by successive generations of gold-seekers. In parts of Chota Nagpur stone crushers are to be met with in numerous villages, which were used by the gold-miners. Amalgamation (and the use of mercury) was well known. Gold-washing was an important industry. In the Punjab, in Assam, in Orissa, in the Central Provinces and even in Kathiwar and Rajputana, and also in Chota Nagpur, large numbers lived by washing the sands of rivers and streams for gold. In Assam not long ago there were some 15,000 to 20,000 persons engaged in this gold-washing.

*Silver*.—There were numerous mines of silver in Southern India, in the districts of Cuddapah, Kurnool, and Malabar. Silver was extracted from argentiferous galena at Jangamrazpally in Cuddapah to a large extent. There was also some silver working in Rajputana and in the Bhagulpore Division in Bengal. There were silver mines in Assam too.

*Copper*.—It was extensively worked in Kurnool, in Bellary, in Nellore, where 'hills' of cop-



per-slag occur to attest the extent of old workings in Hazaribag in Bengal where countless mounds of slag are still to be seen and in Rajputana and in many Native States.

*Lead.*—According to Mr. Ball, from whose invaluable work on the Economic Geology of India these details are quoted, there is probably no metal in India mined and worked to so large an extent except iron,—and we have old workings scattered in so many parts,—in Southern India, in Rajputana, in Bengal, &c.

*Iron and Steel.*—This represents the largest department of our old mining and metal industry. There is not a district in India—scarcely a village—but had more or less iron smelting and iron work. In North Arcot, for instance, in 1885 iron ore was mined in every taluk and there was iron smelting in 86 villages. Bangalore was noted for both iron and steel. Steel-making at Nirmah in the Nizam's Dominions had a world-wide reputation. Narsingpur in the Central Provinces turned out excellent iron work. In Alwar there were numerous furnaces. In the Punjab there were large iron and steel works in several places.

*Zinc.*—In Rajputana, at Jawar, in the Udalur State, it was largely worked and so was tin in the Hazaribag district in Bengal—some 40 furnaces at the village of Naranga alone.

*Corundum.*—(Including ruby, amethyst, sapphire, topaz). It was extensively mined in the Bellary District, in the Hindupur Taluk in Madras and in the Native State of Rewah, where the supplies are said to be simply inexhaustible. Here the diggers had even to use light in underground operations.

*Emeralds* were mined at Ajmere; beryls in Madras; garnets in the Aravalli schists in the Kishengad State, where the outcrop was quarried for over a mile.

*Glass.*—India abounds in materials suited for the manufacture of glass; and beads and bangles, bottles and fancy articles were made at many places. At Kapadvanj in the Khaira District in Bombay, much good glass-work was turned out.

*Mica.*—It was mined in the Hazaribag District in Bengal and in the Gaya District in Behar, where at the village of Rajowli mines were worked yielding 400 maunds of mica (23,000,000 plates).

*Alum.*—It was largely made from alum shales in the Shahabad District in Behar, at Khetri and Singhana in Rajputana, and in Cutch and Sind.

In Cutch, before 1818, the export of alum amounted in some years to several hundred thousand maunds.

These brief notes will, it is hoped, suffice to mark the character and extent of the industry that once was ours in the days that are gone. It is no fancy-picture painted by some patriot's fond imagination, but a faithful portrayal based on authentic records. And so was India, not a fancied or fabled India, but the India of fact and reality, the land *par excellence* in the Old World of mines and minerals, of diamonds and gold, and silver and copper, iron and zinc, affording varied and honorable employment to numerous classes of her gifted and toiling people who were not then, as now, for the most part passed through the Procrustean process and reduced to the tillers of the soil, putting the seed into the ground and praying to the God of the Skies for rain for their crops.

And be it added, to the honor of our old miners, that a position of such strength was maintained in this important department of national industry in the face of heavy odds. The period was one of unrest and commotion, of change and strife, and the land had no peace and settled government. And it was due mainly to the energy of our workers that the industry, which might have possibly perished in the general crash, was preserved in the condition in which we find it.

Even so the position of the industry was anything but secure. Analysed, the strong and weak points might be thus stated. The strong points were chiefly these:—

(a) The hereditary skill of the workers, as shown in their mining operations, quartz-crushing and shaft-sinking with adits, &c., and in their metallurgical processes, amalgamation, steel-making, &c.

(b) Their accurate knowledge of the mineral deposits, of the tracts where they worked, the position, direction, thickness, dip and strike of the veins and lodes, a knowledge evidently acquired by years of patient search and prospecting.

(c) The force of habit and conservative tradition which led them to hold out under great discouragements.

(d) And their patient perseverance and energy.

(e) An assured market for their productions, there being no such competition from outside as now.

As per contra, the weak points were many and serious, these *inter alia* :—

(a) The industry was relegated for the most part to the lower classes, *e. g.*, aboriginal tribes in Chota Nagpur and Bundelkhand, the Kols and Gonds who did most of the diamond-digging ; the upper ranks, men of capital, intelligence and enterprise, holding aloof.

(b) The workers were mostly poor people, who worked on borrowed capital, and the money-lender dictated his own terms. And they had to be content with scanty earning, sometimes not more than a bare subsistence.

(c) They worked individually, each on his own account. There was no co-operative effort in any form or shape. They had their castes no doubt ; but they gave them only moral support, and were much like the regulated companies in England.

(d) They had no education whatever. They had only to trust to their intuitive perception, their traditional knowledge and inherited skill. They had not the aid of science. And geology was, in India, a science practically unknown. And their operations could not extend to any great depth, *e. g.*, in the gold diggings in Mysore.

(e) They had no requisite machinery and appliances, say, for drawing or dredging, for boring or driving levels, for lighting or winding. In the case of copper mines, for instance, the access of water proved fatal to extended working. Quartz-crushing was always very hard work on the gold fields.

(f) Their methods were primitive and involved waste. In Orissa, for instance, in many workings the slag often contained 30 to 40 per cent. of the metal. So, again, they used only charcoal. The needful supply of fuel, however, was not always available.

(g) These miners and metal workers had no aid whatever from the State. The rulers in those by-gone days had other ambitions and other ideals than to help their subjects in their industrial pursuits.

(h) On the contrary, the taxes and the royalties they levied were sometimes too heavy a burden on the industry. And even the conditions of the mining leases were hard. In the Bellary District, for instance, in regard to diamonds there were—(1) all diamonds weighing one pagoda and upwards to be the property of Government ; (2) on others a royalty of 2½ per cent. ; (3) a heavy

monthly nuzzur besides. At Sambhalpore, the miners had to surrender the diamonds they found to Government, contenting themselves with the gold they could wash out of the gravel.

On the whole, putting the strong and weak points together, it is clear that the position of the industry was radically one of weakness. It lacked organisation, rested on a shaky basis and without the necessary resources of capital and proper direction. There was no attempt at improvement ; and in the then state of things none was possible. Evidently an industry so circumstanced could only stand as long as, but no longer than, the general conditions of the world's competition permitted it to stand. And we held our own only so long as things were not much better elsewhere. The century (1756—1857), however, which witnessed the final passing of India under British rule, was in Europe and America a century of unparalleled growth and progress. The old order of things gave place to the new ; science advanced, commerce expanded, and the arts improved ; and economic developments followed in these countries of a character and a magnitude which had no precedent in the annals of the world. The mining and metal industry shared in this general movement of progress. Geology was extensively studied, particularly economic mineralogy ; and with the aid of applied science in other directions, the whole art of mining and metallurgy was revolutionized ; and vast improvements were effected in methods, processes and machinery ; and the industry was elevated to a plane of efficiency never reached before. In India, on the other hand, we stood where we were—moving and working in the old ruts.

But a change soon came. With the British occupation India's isolation came to an end ; and we were placed in close commercial intercourse with the nations of Europe and America. And with the policy of the open door, and with no protection whatever, we found ourselves to our utter consternation face to face with an industrial competition with which, even on our own ground, we were powerless to cope. It was, indeed, a heavy shock, a crushing impact to our old industries ; and now half a century and more of such violent collision, such unequal conflict, has had its natural effect. Our industries are all but extinct and our market is flooded with foreign imports. The indigenous worker is elbowed out of the field ; and the foreign trader enjoys the easy monopoly.

In no branch of national industry is the collapse of our native enterprise more complete than in

mining and metal work. It is an awful and total shipwreck. Only here and there a broken spar to be met with. Some iron smelting in the remote villages, some brass, copper and bell-metal work in the towns; the making of glass beads and bangles here and there, this is still ours. So, again, we mine some mica in Nellore and make and refine saltpetre in Behar. This is about all that is left to us of this old extensive industry. Most of the important branches are simply crushed out of existence. Diamond-digging is gone, iron-work and steel-making exist no more; copper mining has completely ceased; lead is little worked; and even gold washing which at one time was an important industry supporting thousands of poor people is dead. In Assam where there were 20,000 persons so engaged, there are now just 3 and in all India 1,300. A few figures from the Census and Trade Returns will make the situation clearer.

Number of persons employed in this industry, including workers and their dependants:—

(a) Gold-washers	1,901	
Jade and diamond miners	1,271	
		2,572
(b) Brass, copper, and bell-metal workers	261,622	
Tin, zinc and lead	60,742	
Workers in iron and hardware	13,35,256	
		16,57,620
(c) Knife and tool makers	7,183	
Agricultural implement makers	216,931	
Glass makers	78,152	
		366,266
(d) Workers in gold, silver and precious stones		15,72,249

(a), (b), (c), (d), 3,538,797, i.e., 12 per cent. of the whole population.

Thus, we have at present 3½ million persons still in this line of occupation. Leaving out the comparatively large class of goldsmiths whose work is rather more ornamental than useful, there are just 2 millions and no more in the field, i.e., 7 per cent. of the total population of the country and this in respect of an industry one of the most flourishing and extensive! Practically, the whole old mining population is forced out, compelled to quit the mines—it does not know how to work under modern conditions and seek a living elsewhere! What an industrial exodus before the resistless advance of the foreign exploiter who, with his superior organisation and resources, leaves the Indian worker but little hope or chance!

And while, thus, our mining and metal work has perished, our market has passed almost completely under the control of the foreign trader, and

the indigenous supply, except at the village fairs, is now almost at the vanishing point. The imports, inclusive of gold and silver, were in value last year nearly 55 crores. The principal figures are—(1904—05).

	Lakhs of Rs.	Crores of Rs.
Arms, ammunition, military stores	129.3	
Chemicals	69.9	
Coal, coke, fuel	49.3	
Hardware and cutlery	268.5	
Machinery and mill work	437.2	
Metals	393.2	
Railway plant and stock	569.7	
Salt	71.2	
Mineral oils	327.9	
Glass and glass-ware	112.5	
Jewellery	106.1	
Earthenware and porcelain	29.2	
Building and engineering materials	35.3	
Stone and marble	27	
		31.82
Total		23.68
Gold and silver (net imports)		54.90
		Grand Total

The figures speak for themselves. A yearly foreign import of about 55 crores of rupees, in respect of mining and metal work alone, while our plentiful mineral deposits lie unworked and unutilized. What a field of varied and fruitful industry is here voluntarily surrendered to the foreign worker instead of providing these things ourselves for our own use, not to mention exports to foreign countries; we are content to get them from others, leaving them the work, the profits of such work, and all its higher benefits and let our miners shift for themselves as best they can, starve and suffer for want of employment. An old and proud nation uncomplainingly resigning itself to such a condition of things—no severer penalty can be conceived of ignorance and the moral incapacity and helplessness it induces.

Thus, whether we take the census or trade figures and test the position from the point of view of population or foreign supply, we see only too clearly what a total and extensive collapse is here in regard to our mining and metal work. The field lies almost deserted and has the dismal look of an abandoned Australian digging. Our minerals are still there; our mines are there—of diamonds and gold, of copper and iron—the hidden wealth lies underground. Only we, the heirs to the treasure, are forced to quit the arena where we do not know how to hold our own, and our miners compelled to betake themselves to the plough—or worse—and earn a precarious living!

Such a collapse—and of an important and extensive industry—is a fact of our present position of serious import. To the nation it means the atrophy of a fine side of its economic life—a dismemberment of its co-ordered and balanced system of industrial work, a fruitful source of wealth abandoned and a splendid field of employment surrendered to the foreign worker; to the working population, it means the loss of an extensive industry which once afforded varied occupation to numerous classes; and to the miners the loss of their hereditary employment and a compulsory resort to an agricultural life and with the grim spectre of famine staring them in the face!

There is one more feature of the present position which deserves notice. We have in several parts of the country a number of mining and metal works started and run mainly under foreign auspices on modern lines. The aggregate work—though the outcome of a series of efforts extending over 80 years and upwards, is small,—limited in scope and range and meagre in its practical results. It is, moreover, a new form of industrial activity with which we, the people of the land, are but little associated and is of help to us only as indicating an important line of endeavour in the new direction. Taking the latest official report on Mineral Productions in India (1898–1903), we find the total value of minerals produced in 1903 was £ 4,988,527, or  $7\frac{1}{2}$  crores approximately.

The minerals are as follow:—(000s omitted).

	£
Gold .....	2,302
Coal .....	1,299
Salt .....	366
Saltpetre .....	288
Petroleum .....	354
Rubies .....	98
Mica .....	86
Manganese ore .....	132
Jade stone .....	47
Iron ore .....	14
Graphite .....	16
Tin, Amber, Magnesite .....	10
<b>Total value</b> .....	<b>4,988,527</b>
<b>Rupees</b> .....	<b><math>7\frac{1}{2}</math> crores</b>

Of these, salt is a Government monopoly. Saltpetre was once a Government monopoly under the East India Company's rule, then transferred to European firms, and now, when the trade has largely fallen off, is again in Indian hands. Mica is in the hands of the native workers who hold their leases at a fixed royalty of Rs. 50 per acre. Part of the coal production belongs to native mine

owners and associations. The rest of the mineral production of the year represents the results of European enterprise and capital. Leaving out of account salt and saltpetre, we have an annual output of, say,  $6\frac{1}{2}$  crore rupees—surely an insignificant item in the industrial balance-sheet of the nation. But they are all successful enterprises conducted on modern methods and in the case of gold and rubies yielding large dividends. They are useful to the nation as affording for its guidance a remarkable object-lesson in industrial exploitation on the new lines. They are, however, too small to affect or alter the general position. The average number of persons employed in these mines is about 102,000—and, work and wages for so many workers. This is all our direct material gain.

Such in brief outline is the present state of things. The picture is rather a shaded, cheerless picture—the picture of a *vanished industry* once so prosperous—of *numerous sections* of the population once living in such comfort by it forced to quit their ancestral calling, and *thrown on the land*, to shift as best they may, *of no beginnings* yet to be noticed, nor even a sign of any serious endeavour to rescue them from their fate! The few new enterprises in the country serving no such purpose, the nation looking on with apparent unconcern; no outlook could be less hopeful! Now, however, there is a turning of the tide. With the new national awakening as symbolised in the *Swadeshi* movement there comes a glorious opening, a new prospect bursting on the view, bright with hope and promise. Things which only a short while ago seemed all but impossible and chimerical, are now well within the range of possible attainment. And there is every reason to hope that we may not have any very long to wait before some vigorous action is taken to grapple with this branch of the general industrial problem.

Such an endeavour under the existing circumstances is a duty—a national duty—which we ought not to put aside. Every economic consideration emphasizes the necessity of such remedial and ameliorative action. There is first the economic evil of a general dependence on agriculture as the one sheet-anchor of industrial life; there is next the condition of the people question—the grinding poverty in which a vast mass of the population is under the existing conditions of economic life in the country, condemned to live, imperatively demanding the opening out of diverse lines of non-agricultural employment to relieve

the pressure: there is again the problem of a general re-construction of our national industrial system, of which this mining and metal industry forms such an important and integral part. There is also this further aspect of the matter. As things are, there are whole tracts in India where agriculture cannot well prosper—neither the soil and climate nor the water supply conditions being favourable for it—but which are highly mineralized tracts such as Kurnool and Cuddapah in the Madras Presidency; and it is simply distressing to find that no effort is made to work such tracts along the lines of development their varying resources suggest. Just as different classes of people require different lines of employment suited to their aptitudes, so, too, different tracts of country—industrially speaking—need different treatment according to their capabilities; and it is a grievous economic mistake to turn a whole country of varied physical features and diverse resources into a sheep-run or a cattle-farm as it is to turn a whole population of varied constituent elements on the land; the Procrustean process is as ruinous in the one case as in the other, and does incalculable harm to the general style and tone of economic life. Kurnool, for instance, in the Madras Presidency, is one of our richest zillas with its diamond deposits and copper ores, and was at one time one of the most flourishing centres of such mining industries in Southern India. There are a number of localities in the district where numerous traces are still to be seen of rock workings and alluvial washings for diamonds as well as of extensive copper-mining operations. Now, however, there is neither copper-mining nor diamond-digging here and the tillage of the land is the only occupation of the people. The consequence is—the district is a poor agricultural district—ever in the grip of famine and with a starving, struggling agricultural population. The same is the case with Cuddapah, another Madras District, which is even worse off, to be sure, under normal conditions of varied economic development. These zillas in Southern India ought to be among the foremost mining districts in the land. Similar remarks apply to various other parts of the country.

The need for a comprehensive endeavour to initiate such varied development of the country's resources is thus obvious, and will meet with general recognition; and the revival of our old mining and metal work is suggested as one important step in the new direction.

We will now proceed to submit a few observations indicating in a general way the lines on which such revival of this mining and metal industry may be initiated. And the first question in this connection for consideration is the question of agency. What is the best and fittest agency for purposes of such work? The State, foreign enterprise, or we the people of the land, or all these together?

In this matter, the Government of India does not follow the *doctrinaire* principle of *laissez faire*. It holds, and rightly, that as a policy, whatever its adaptability elsewhere, it is altogether unsuited to the circumstances of the country. A protective tariff is, of course, out of the question; and the State has not even any large works of its own—if we except the Watora Collieries—and carefully abstains from starting any—where, as for instance, in iron and steel, it might most appropriately do so. There is the sanction of precedent as well as of abstract theory for such direct intervention on the part of the State in matters industrial, and there is further ample warrant for such in the economic conditions that prevail in India. But Government does not think fit to go so far and embark upon such a course of direct action. And its consistent policy during the whole of the past century has been to look up to private enterprise to do the work and confine its own efforts to aiding, encouraging, and stimulating it in every legitimate way by the grant of liberal concessions, subsidies and advances, etc., etc. The principle of State help and State guidance in pioneer work in the line is fully recognised; and the general attitude of the State in India in respect of such undertakings leaves little to be desired.

As for ourselves, however, it is obvious we have hitherto done little to avail ourselves of our opportunities in the matter. We have our saltpetre refineries in Behar and mica mines in Nellore; and we have a considerable share in coal production in Bergal. But such straggling efforts apart, our association with the new enterprises is almost *nil*. Whatever the causes of such aloofness on our part, the fact is there as stated and has to be frankly admitted.

And thus, so far, English enterprise is there and holds the field. It has been doing its work in the line ever since 1820 when the first coal mine in Bengal was opened, and the first attempt made to work iron ores on the modern methods. And during the whole of the time it has had the most active support of the Government of India.

As far as this development of industry is concerned, the net result of its labours, extending over 80 years and more, is on the whole meagre and just touches the fringe and no more. Coal and gold, petroleum and manganese ore, gems and mica, jade stone and graphite are about all the minerals yet tapped. There are some 74 registered mining and quarrying British Companies including coal, gold, mica, etc., with a nominal capital of 3 to 6 crores of rupees. The total number of mines in 1903 was (including both European and Indian) 646, the average number of persons employed being 102,195, and the total value of minerals produced was, as already stated before, £4,998,527, or leaving out salt and saltpetre £4,367,893. This represents the total net outcome of 83 years' effort on the part of English enterprise, enjoying the cordial support of the State to develop our mineral resources. This cannot be regarded as satisfactory or in any way encouraging. But we have no right to complain. The work that has been done deserves acknowledgment; and it is only fair to recognise that there are obvious limitations to the extension and usefulness of such undertakings engineered by foreign enterprise. The field of effort is ours, and we have no right to expect the foreign exploiter—whatever the energy he may bring to his task—to do everything for us without our aid or co-operation in any form or degree. There are, further, certain considerations in regard to this point which we have to bear in mind.

1st.—English industrial enterprise is justly famed throughout the world for its unrivalled energy and its splendid achievements. It has claims coming upon it from all quarters of the globe, and its help is sought in developing so many virgin fields and pastures new. Australia and South Africa, Tasmania and New Zealand, Canada and the West Indies with their immense possibilities—these and others within the ring-fence of the Empire, and Egypt and China, and the rising countries of South America outside—with such and so many superior competing fields for exploitation, India evidently can expect to have but a limited chance. The activity of English enterprise will naturally follow the broader lines; and the chances of its taking up the work of industrial revival and development in an old country like India will be at the best remote, and this to our thinking accounts for the slow and meagre advance yet achieved in India. Take Tasmania—a poor Australian colony—with but little hope up till 1850 when coal was first

discovered; and gold two years later. The work of systematic geological exploration was commenced in 1860, and after an exhaustive survey of the mineral deposits of the island colony, English enterprise took up the work; and in 30 years' time Tasmania has become one of the foremost mining colonies in the Commonwealth taking the lead in copper production. The progress of Victoria, another Australian colony—since the discovery of gold in 1851,—has been under the auspices of the same agency simply magnificent; and the colony is now one of the richest in the Empire with a total gold production of 266 million pounds sterling. In India such work commenced in 1820; and after 85 years the mineral production is not yet over 5 millions in value. The contrast well illustrates the point.

2ndly.—It is worth noting that when even so we get our chance, and English enterprise comes to your help, it comes to our help only in respect of the most promising lines of development. It does not take up—and why should it?—any inferior or less attractive fields. Its operations as yet extend only to a limited range; but even within the limits of that range it is to be noticed that they are confined for the most part to some of our richest tracts. Whether we take coal or gold, petroleum or gems, we find that the work of the British Companies does not go much further. Coal, for instance, is a well paying mineral but coal mining is yet limited to the Gondwana fields, whereas at Raniganj and Jherria the richest seems to occur. These two coal fields produce between them over 70 per cent. of our total coal production of the year. So, again in the case of gold the mining is practically restricted to the Kolar mines in Mysore which are about the richest in India. Eight Companies are here working with a total capital of less than two millions sterling (1·8). The total value of the metal extracted from 1882 to 1903 being 18·6 millions sterling—ten times the original investment and over 8 millions sterling paid as dividends—more than four times the capital. Similarly, petroleum is worked in Burma under almost "ideal" conditions on the well-known Yenang-yaung oil-field in the Kodaung tract. As to rubies, the Ruby Mines Company is in a position to pay about 18 per cent. dividends. But we have not got such splendid tracts all over the country, and there are numerous areas where these and other minerals occur, but where the conditions of development are not so attractive; and they yet lie almost untouched. The gold deposits, for instance, of

the Wynaad, of Chota Nagpur and of Assam are unworked, and the Government specialist reporting on them only recommends further prospecting and trial borings. As to iron ores they still lie undeveloped, and with all the repeated attempts on the part of Government to get iron and steel works established, and an important industry developed ever since 1820, there is as yet only one British Company in the field—the Barrakur Iron and Steel Company.

3rdly.—Manifestly, such efforts on the part of English enterprise and such help rendered in respect of our industrial revival whatever their value *per se* can never suffice for our requirements. Ours is an old country where the lines of work and new developments lie on varied planes of prospective benefit and success, and where what is most needed is an even all-round advance. Here the work to be effected has to be steady, persistent, and all over the field. Foreign enterprise will be easily persuaded to take up the working of the Kolar mines or the Yenang-yaung oil-fields; but the development of tracts less favourably conditioned like Assam, or the Wynaad, must be our own work; and no foreign exploiter will assist us here.

4thly.—Further, under such a division of work as between indigenous and foreign enterprise; the inequality of the conditions, effort is only too apparent. Indigenous enterprise is placed at a serious disadvantage when the foreign exploiter is permitted to get hold of the richest tracts and it is only the less favoured that fall to the share of the native worker; the arrangement certainly involves a grave injustice, and is eventually likely to retard rather than promote the country's advance. The indigenous worker so handicapped may not be able to take up the less promising fields which, in such a case, must remain undeveloped. At all events such a state of things is a great discouragement to native industrial enterprise which is yet so feeble and just taking shape and which requires for its growth all the nursing and stimulus it could receive.

5thly.—There is, also, besides this consideration which applies with peculiar force to mining industry:—As in the case of pearl and other fisheries, so in this, the supply of the raw material is a natural supply existing independently of human intervention. Further, it is a supply incapable of augmentation or replenishment by human effort. It is a *limited* treasure, hidden underground, and is in the nature of God's gift to the country where it lies, and belongs of right

to the people of that country and to no one else. No doubt, in India, technically and in law the State owns the minerals as it owns the forests, except in permanently settled tracts; but such ownership can never be absolute. It is a trust held on behalf of the people and to be administered for their benefit. And in this view of the matter, it would appear that the mines should be in the hands of the people whose property they are, and to be worked by them and ought not on any account to be suffered to pass into the hands of outsiders. And when—and as long as—the people are not for any reason in a position to so take them over, they should be held by the Crown in trust and worked as Crown mines for them. In some of the Native States the most valuable of the mines were held as the Raja's property and managed as such.

Looking at the matter from this point of view, it would seem that the working of our mines as things are, is the weakest part of the existing system. Most of these mines are leased to foreign companies. They hold and work them; we the people of the country get only a small royalty for the State and wages at the rate of 4 annas a day for the labour employed. We have absolutely no further share in their working or management. The business experience and the invaluable training all go to the foreign Syndicates. Besides as the mines are worked, and to the extent they are worked, they are exhausted, and such exhaustion is a permanent loss to the country which can never be recouped. An exhausted coal-mine or a worked-out petroleum field is an irreparable loss. Take, again, the ruby mines in Burma. The supply of gems is not an inexhaustible supply, and when it comes to an end, part of the nation's hidden treasure is gone, and absolutely, never to be replenished, foreign enterprise is the only gainer. Nor, again, does the existing system bring us any moral advantage. The business is all administered by outsiders in all its main departments. We are not associated with any, and the exclusive arrangement which shuts us out from all participation in the higher advantages of business discipline fails naturally to promote amongst us a spirit of enterprise. 328 prospecting licenses were issued during the years 1888-1903,—129 in Burma, 82 in the Madras Presidency, 64 in the Central Provinces, and the rest elsewhere. Of these, 64 were for search for gold; 48 for petroleum, 36 for manganese ore, 26 for graphite and plumbago, &c. But excepting Mr. Tata's in the

Central Provinces, we doubt if half a dozen of these 328 prospecting licenses are held by Indians. They are for the most part in the hands of the foreign exploiters. Such is the cramping, paralyzing effect of the existing system of exclusive foreign exploitation on indigenous enterprise in this matter of mining.

Nothing, economically speaking, could be less satisfactory. In the case of this mining industry, the development of the country's resources has meaning and a reality, when the minerals mined out go to the people and are added to their standing working reserve of wealth, and when further, such development has the effect of encouraging and stimulating their enterprise in the process. But when neither is the case, it is no economic development proper, but one of the worst forms of exploitation conceivable. And under such circumstances, every ounce of gold, every ton of coal, every gallon of mineral oil, every gem mined out which leaves the country is a dead loss and without an equivalent. In commenting upon Lord Curzon's great speech at the Calcutta Chamber of Commerce Dinner (February, 18, 1903,) over two years ago, the *Statesman* puts this point with great clearness, thus :—

“In the case of the mining industry, for instance, it (i. e., the development of the country's resources by English capital) means not merely that the children of the soil must be content for the time being with the hired labourer's share of the wealth extracted, but that the exportation of the remainder involves a loss which can never be repaired. Though the blame largely rests with them, we can well understand the jealousy with which the people of the country regard the exhaustion, mainly for the benefit of the foreign capitalist, of wealth which can never, as in the case of agriculture, be reproduced. It is, in short, no mere foolish delusion, but an unquestionable economic truth, that every ounce of gold that leaves the country, so far as it is represented by no economic return, and a large percentage of the gold extracted by foreign capital is represented by no such return, implies permanent loss.”

So, again, recurring to the subject a few days later, it writes (March 5th, 1903):—

“As we said in a previous article, the exploitation of the mineral resources of the country by the foreign capitalist stands on a different footing; for in this case the wealth extracted is not reproduced, and, on the not unreasonable assumption that it would sooner or later have been exploited with Indian capitalist may unquestionably be said

to deprive the people of the country, for all time, of a corresponding opportunity of profit. Even in this case, however, it must not be supposed that the people of the country reap no benefit whatever from the exploitation. They lose a valuable asset, in the shape of the potential profit on capital, it is true; but they receive a greater or smaller quota of the value of the mineral wealth extracted, in other forms such as wages and royalties. In some cases, no doubt, wages and royalties combined are small compared with the profits of the capitalist; but these are the exception rather than the rule.”

In both Japan and China under the new awakening, this undesirable side of foreign industrial exploitation in this matter of mining industry is well borne in mind, and the laws provide statutory safeguards and limitations in favour of the national interest. In Japan “prior to 1900 Japanese subjects only were allowed to undertake mining industry or become the partners or shareholders of a Mining Company; but according to the amendment introduced in the same year, any Japanese subject or any Company organised in accordance with the Japanese Commercial Code may undertake mining industry in Japan, so that foreigners may now take part in the mining industry in Japan, as partners or shareholders of a Mining Company.” (Financial and Economical Annual of Japan No. III, issued by the Department of Finance, Tokio, 1903, p. 48). Similarly, in China “The control of mining operations is now in the hands of the Board of Commerce which has made new regulations respecting the Constitution of Mining and other Companies. Of the capital of any Chinese Company not more than 50 per cent. may be foreign and every foreign Company must reserve at least 30 per cent. of its share capital to be taken up by Chinese” (*Vide Statesman's Year Book*, 1905, p. 529).

The reasonableness of such statutory restrictions is beyond dispute, and we wish we had some such in India. But here, alike in the British Provinces and in the Native States this higher economic point of view is more or less put aside, and our mines are freely made over on lease to foreign Syndicates for exploitation. Our very rights of property in them are denied, and they are treated as though they were the mines in “No-man's-Land.” Viewing the matter from the standpoint of cosmopolitan progress, Lord Curzon in his Calcutta speech above referred to observed in this connection:—“The whole industrial and mercantile world is one great field for the tiller to till;



and if the man who lives on the spot will not cultivate it with his own spade, then he has no right to blame the outsider who enters it with his plough." All the same, however, it is permissible to hold the view that it would have been better for us and the country, if instead of calling in the aid of foreign Syndicates in the matter, the State in India had thought fit to own and work these mines itself as it owns and works the railways and the Warora Coal mines. Similarly referring to the agreement recently arrived at with the concurrence of the Government of India between the Mysore Durbar and the Kolar Gold Mining Companies for an extension of their existing leases when they severally terminate for 30 years on condition of the payment of royalty as at present, viz., 5 per cent. on the gross output and 2½ per cent. on dividends as and when declared, it would seem that the Durbar would have done better if it had decided to take over these mines itself on the determination of the existing concessions and made them over for working to some Mysorean Syndicate or failing such Syndicate, retained them under its own administration, and run them as State concerns. In this connection it is worth noting that while the Mysore Durbar takes only 2½ per cent. as its share of the dividends, the Government of India in their concession to the Ruby Mines Company in Burma claim 30 per cent. of the profits of the concern as the State share. So, again, it is not easy to understand the considerations which have led the Government of the Nizam to grant large mining concessions in the Hyderabad territories to a foreign Syndicate in preference to Messrs. Tata and Company.

Be that as it may, we recognise that it is chimerical to hope to have in India such restrictions relating to this industry as exist in Japan and China. But we trust and hope that in view of some of the considerations referred to in previous paragraphs, Government cordially desires and is fully prepared to do all that lies in its power to promote indigenous enterprise in this direction. English works started and run in India by English Syndicates on lines suggested by their experience of the freer conditions of industrial life in England do not naturally require any direct aid from the State. Indian indigenous enterprise, however, is just in its first stages of growth and is entitled to a larger measure of State support, and we have no doubt that when the Indians enter the field and ask for it, they will get it at the hands of the Government of India.

The main point of the argument is that this

mining industry pre-eminently represents a field of effort which belongs to us and to no one else, and that we ourselves should work and develop our mines as best we can with our own exertion, as far as possible, and with such aid from the State in case of need as we may legitimately claim. In this as in other branches of industrial work it is well to bear in mind that there is no instance in history of one nation undertaking and carrying out with success the development of the industrial resources of another by such methods of direct exploitation. In the case of the Colonies and Settlements, the work there has been in supersession and exclusion of the wild aboriginal populations. And, all things considered, it is clear that self-help is for us the only safe rule of action. The field is vast and varied—only touched on the fringe.

Surely it is unreasonable to expect the outsiders to work it for us: nor—judging from close on a century's experience—does it seem likely that English enterprise would render to us the measure of assistance we need for the purpose, and even supposing that it would, it is open to grave doubt whether we should avail ourselves of such assistance and entrust to other hands the work which it is our national duty as it is our national interest that we should do for ourselves. The hard economic situation in India imperatively demands of us such an effort, and requires that we should put our hands to the plough and till the field which is ours by right of birth. And it would be little short of a dereliction of duty on our part if we should blindly persist in our present strange unconcern and aloofness and passively look on while it was being exploited by foreign agencies.

And now the practical question for us to consider in this connection is, in what way and on what lines we may best be able to organise work of our own in this department of industry and take up our proper position in respect of its development.

First, then, as to the conditions of the effort required—

(1) At the outset it may be pointed out that with us such an effort is no new effort. Mining has been in the country an important industry for centuries, and the work before us is essentially a work of revival and restoration only on modern methods. Our old miners are still there, though not now actually engaged in the line. They have still their old traditions and, in parts of the country, their hereditary knowledge of their local mineral capabilities, e. g., the gold washers of

Chota Nagpore and the diamond diggers of Cuddapah, and their assistance will be of service to us in the new effort.

(2) Even so, we have to remember that this mining industry differs from other industries in certain important respects. The minerals are there as a natural product independently of our effort, but they lie underground and there is the element of chance which cannot be altogether dissociated from the effort as in the case of fisheries.

(a) Where these minerals occur, such as coal or argentiferous shale, in beds and seams which are constituent members of the enclosing series of rocks and of contemporaneous origin with them, the geologist is able to give us in the work of exploration all the aid we need. He can mark out for us the geological zones of their occurrence to which prospecting has to be limited. But in cases in which the minerals are to be found only in veins, lodes, or masses disseminated through various formations, *e. g.*, diamonds or rubies, gold or copper, there is an uncertainty about their occurrence and extent, which science even in its present advanced stage is not able completely to remove. The veins and lodes differ in thickness within very wide limits. Sometimes they may thin out and even disappear, or after a break reappear at lower depths, their lie, their strike, their size all present variations which cannot be calculated beforehand. No doubt in certain cases there are the well-known affinities of mineral vein and lodes for particular rocks and geological formations to guide us) *e. g.*, magnetic oxide or specular iron ore usually occurring in the granites or copper in slate formations. Still, chance cannot in all cases be altogether eliminated.

(b) There is further—in the case of both these classes of minerals—the uncertainty of the *find*. Geology and the observation of surface indications and associated minerals and peculiarities of fauna and flora are both of help in the matter. But all the same, prospecting is always more or less in the nature of a speculation.

(c) There is, again, the peculiar difficulty of work in the mines. The open shafts and pits are comparatively easy to conduct; and our miners are used to it; but labour is distasteful in underground works where mining is done under cover of rock or earth and excavations are carried out of solid minerals under water, *e. g.*, the dredging of gold-bearing gravel from river bottoms or of liquid minerals by wells. Here trained miners are required, and appropriate machinery.

Such are some of the inherent uncertainties of the industry. We have also to look to the nature of the field where our work must lie.

Our mineral resources are rich and varied—though not quite as magnificent as those of the United States or South America. There is not a district in the country excepting, perhaps, Sind and parts of the barren Deccan which is not found on exploration more or less well mineralised. Even Rajputana has its underground supply of beryl and garnet, lead and limestone, silver and slate, and Rewah has an inexhaustible supply of corundum. But ours is an old country where there has been mining from time out of mind. As a natural result, the tracts to which the old operations extended show more or less signs of exhaustion. But it is the surface diggings that are so exhausted. The mineral supply lying deeper is perfectly intact. And this applies to diamonds and gold as it does to copper and silver shale. It may be added in this connection that the Mysore Kolar mines are worked on the lines of the old operations—only the metal is sought at greater depths. The law of *diminishing returns* holds good in the case of mining as it does in that of agriculture, and re-working the old mineral tracts must mean a smaller return to capital than in the case of virgin fields. But this is a necessary condition of such industrial work in an old country like India and has to be accepted as such. Even in Australia, and in and around Ballarat itself gold is now sought under a regular system of mining at great depths below the surface and so too in the United States. This, however, apart, there are extensive deposits in many parts of India—and gold which will last us for years and years. In regard to diamonds, there are considerable tracts of the diamond-bearing conglomerate in the Cuddapah District which are intact, untouched and untried by the old miners. So too in the matter of gold, the metal exists in richly-paying quantities in many of the lodes running through the Dharwar schists, &c., &c.

We must remember that the work in the new line must be up to the level of the modern standards. Mining is now a scientific art and no longer an empirical industry, and unless the requisite standard of efficiency is reached, we can have no chance whatever under the hard modern conditions of the world's competition. Protection in India under the existing system of government is beyond the pale of practical politics, and we cannot and ought not to rely upon such shelter even in the first stages of the effort.

So, practically though the work is one of revival, we must begin at the beginning and start as with a complete *tabula rasa*. The old tools and appliances, the old methods of exploration and prospecting, the old empirical processes of mineral extraction and mineral dressing, &c.,—all these will have to be discarded. And as the Japanese have had to do under somewhat analogous circumstances we must employ the most effective modern machinery and mining methods whether for boring and blasting, for draining or dredging, for winding or haulage, &c., and, indeed, if we mean business, we must call in expert guidance and help in respect of all the different branches of the industry. Nor is this all. We must further have a fresh organisation of the whole working agency.

Thus, the inherent uncertainties of the industry which even advancing science cannot altogether eliminate the apparent surface exhaustion of the mineral tracts to which the old mining operations extended—pointing to the necessity for deeper and consequently more costly diggings—a high level of efficiency in the work under modern conditions as a *sine qua non*, and with it the employment of the newest and most effective machinery and methods for such work—these are among the conditions of the new effort to which we are called in this matter of mining and metal work. Agricultural revival cannot be half so difficult, nor even the starting of cotton mills: and it is evident that for an efficient organisation and prosecution of the work on the new lines we must have every aid that we can possibly obtain—State-aid, popular aid, the aid of the foreign capitalist, &c. Above all, we must have the fundamental resources of enterprise and capital commensurate with our requirements.

As regards *enterprise*, it may be individual or co-operative. And for our purposes we require it in both its forms. It is true, in the general scheme of modern industrialism, the individual has but a small share as an independent factor. But sometimes he brings to his work an impulse, an amount of moral force, a vigour of initiative and action, and a command of resources which guarantee success. A Junkichi Furakawa or a Tata would do for the country and its industries even more than a dozen joint-stock companies could do. But such men of commanding genius and business capacity are but few in any country, and fewer in a country like ourselves, where business is just beginning to be built up on a modern basis, and joint-stock co-operation is the one form of enterprise on which we must chiefly rely.

It would be worth while to try also village guilds, where as in several districts of the Madras Presidency (e.g., Cuddapah, North and South Arcot) the necessary constituent elements exist. The aid of village organisations, too would be of value in the various stages of the work. But these would be more or less accessory helps, and the main agency for the effort which could be depended on would be joint-stock companies. We have a number of such companies in various branches of industry—but few or none in this mining field—if we except the native coal mine associations in Bengal. No advance, however, would be possible in the new line except on the basis of organised co-operative effort.

Next comes the question of *capital*. This is one of our greatest wants for purposes of the new industrial start. In these days of vast extensions of industry and commerce, small works and limited investments could have but little chance. Foundries, factories, mining operations, refineries—all have to be on an extensive scale; and costly machinery, tools and plant have to be employed. Capital in large amounts is an indispensable aid even for a start and how and where it could be obtained from, is one of the hardest questions we have to consider. Lord Curzon's estimate of our hoarded wealth is 825 crores. It is not known on what bed-rock of facts it rests; but supposing it is fairly correct, it is evident that much of it is locked up in the State jewels in our Native States, a considerable part in the people's ornaments and only a small residue at the best is available for our purposes of industrial investment. And even this, in the absence of banking facilities and credit organisations, we have at present no means of drawing out in any tolerable amounts. Possibly, cautious people would advise us to wait till the country should come to possess the necessary capital; but, unfortunately, time and tide will not wait for us, and we shall be throwing away opportunities which may not return. Under such circumstances, we would suggest a resort to the aid of the foreign capitalist as the only alternative left. We are aware such a proposal would scarcely meet with general acceptance, and would be viewed with distrust and hostility. Men naturally do not desire to share with others the profits of their work, and view with jealousy foreign aid in such efforts. It has, however, to be remembered that such aid is to be sought only in the last resort and for the first stages of the new industrial endeavour. Interest would be all that we should have to pay on it; and there would be no

interference of the foreign capitalist whatever with our undertakings in their initiation or management. They would be ours entirely, and in proprietary right, and under our administration, only run with borrowed capital. Besides, as soon as the first trials are passed, and the concerns are well established, the loans would be repaid, and the aid of foreign capitals would cease. No sacrifice would be entailed and no harm caused, but such aid would enable us to do what must otherwise be left undone, and we are persuaded that a hundred million pounds sterling so borrowed from the foreign capitalists on easy terms and judiciously laid out would not only be the means of enabling us to start numerous industrial enterprises on the newer lines, but also of effecting a vast ameliorative change in the economic life of the people so as to send light and hope, comfort and joy into thousands of cheerless homes in the country in a way of which we could have at present but a dim idea. A similar question has been for some time past exercising the public mind in Japan. A large majority of the Japanese people are opposed to the introduction of foreign capital into the country; but according to Baron E. Shibu Sawa, President of the United Chamber of Commerce, the weight of authority and experience, as represented by Marquis Ito and others, is distinctly on the other side; and Baron Shibu Sawa himself holds the view that "as the capital we have in the country is not enough, foreign capital is needed to open up the resources of the country" (*vide Japan by the Japanese*).

In this matter, however, of foreign loans, it would in some cases be necessary for us to appeal to Government for special assistance. Foreign capital would not easily come in except under adequate securities; and it would scarcely be possible for us in all cases to offer such ourselves in our individual capacity and in the first tentative stages of industrial effort. And in such circumstances we should find it indispensable to invoke the aid of the State. The State represents the collective strength of the nation and where its support is necessary for purposes of national advancement, we may be justified in seeking it in matters industrial as in other branches of national life. And we would venture to suggest that we might in such cases of absolute need appeal to Government to allow us to raise the necessary capital in foreign markets under a *State guarantee* on conditions similar to those on which railway companies are permitted to borrow for their purposes. The State guarantee has effectually paved

the way for the growth of railway enterprise in the country, and so would it be of service in helping other enterprises too into healthy life. This no doubt marks a large departure from *laissez faire*: but the principle of State-aid and State-guidance in such matters is here with us fully recognised and we submit that railway enterprise in no way differs from other forms of industrial activity. And we have no doubt that Government would extend to native enterprise in respect of this mining and metal industry the kind and measure of help it allows to the railway companies. The aim in both cases is the same, namely, the industrial development of the country.

But this is not the only direction in which we should need the aid of the State in these efforts. We should further require such assistance in respect of the existing rules regarding prospecting and mining leases, mineral exploration, mining education, &c.

As regards prospecting and mining leases in view of the peculiar uncertainties and difficulties of this branch of industrial enterprise, short leases and limited areas would hardly suffice for the first stages of the effort, and we would earnestly solicit on behalf of Indian mining efforts more liberal rules extending both the terms of leases and the areas for prospecting and mining. So, again, as to royalties and rents, we would ask that they might not be levied until a certain minimum limit of profit on the investment is reached. Lastly, as to prospecting work, this work of trial search is always more or less speculative, and there is ever present the risk of failure. So it would be a valuable aid to private enterprise if Government would themselves carry it out at their own cost and by their own special staff of officers, at least in all important cases. Where, however, they should decide not to undertake any such operations themselves, they might help private efforts with grants of money in aid of such work.

Next as regards mineral exploration; a good deal of valuable work has already been done; and the labours of a long line of distinguished Geologists, including Drs. Oldham, Blanford, Medlicott, King, Foote, and Ball deserve our grateful acknowledgment. A vast deal more work, however, still remains to be accomplished. Mineral investigation seems to have been hitherto confined mainly to the eastern parts of the Peninsula, particularly the Gondwana area, and whole tracts outside the range lie practically unexplored. The

Bombay Presidency is left out in the cold, under the supposition that it has but few minerals of economic value. And yet we have our laterites in the Deccan in which magnésite occurs to the extent of 15 to 20 per cent. They are of the same geological formation as the Bundelkhand and Amarkantak laterites; and it has been recently ascertained that several of these laterite deposits contain large quantities of aluminium and are almost identical with bauxite. In the Dharwar schists we have gold-bearing bands of quartz reefs; in Godhra, in the Panch Mahals in Guzerat, we have plenty of iron-ore and some coal too. With all this, however, there has been no systematic mineral investigation of the Presidency. Similarly our Native States are for the most part, geologically speaking, a *terra incognita*. And yet many of them abound in useful minerals—such as the Nizam's Dominions, Mysore, Cutch, Kathiawar, &c.

This work of mineral investigation is at present carried out by the Geological Survey of India. The operations of the department embrace partly *economic inquiries* and partly *geological surveys*. And for the former purpose special officers have been of late years temporarily engaged from England for the purpose of reporting on the coal, gold and other mineral resources of the country. When things are so arranged, it is the scientific part of the work that receives the special attention of the department while investigation is relegated to temporarily engaged outsiders. The arrangement is altogether unsatisfactory: and we are strongly of opinion that the temporary employment of such men should cease, and that there should be a special staff of experts under the Director of the Survey, charged with the duty of economic inquiry and that this work of such special importance should be conducted in a more systematic, comprehensive and thorough manner. The temporary men have often too large areas given to them and their labours often yield no results of any permanent practical value. Major Maclaren, for instance, in his recent report on the auriferous occurrences of Chota Nagpur admits that his conclusions "are the results of a single season's work over a very wide area" and are therefore naturally "liable to modification on the production of fresh data derived from a closer investigation." There is evidently waste in such inquiries, and we would press for a better organisation of the work.

Further, we would suggest that the results of such economic inquiries should be rendered available to the people through vernacular transla-

tions of Survey reports. Such vernacular literature would be of great service in disseminating amongst the people a knowledge of these matters, awakening inquiry, and assisting in a material way the projection of mining undertakings.

Lastly, we come to *mining education*. Here it is satisfactory to find that the Government of India fully recognises, in view of the growing importance of the mining industry in the country, the necessity of providing adequate facilities for mining instruction. It has recently sanctioned the opening of a mining class at the Scelphoor Engineering College under a Professor of Mining Engineering and also a number of foreign technical scholarships to enable students to study the subject in England and elsewhere. Already there are four Bengalee students studying mining in Birmingham. This is on the whole a fair start.

We are not, however, we confess, in favour of such special classes for new and independent studies joined on to old educational institutions. They run the risk of being shadowed over and relegated to a subordinate position as was the case with the agricultural classes in the College of Science, Poona; and we should have wished for an independent, well-equipped, well-staffed college of mines located in some central position in the mining area. But this is for the future. We are just now only at the threshold, and we think it would be premature to make any large demand upon Government in the matter at this stage. Meanwhile, however, we would suggest that geology with special reference to economic mineralogy might be advantageously introduced into the curricula of the schools and colleges as part of general education, as is done in the countries of Europe and America.

Under some such scheme and with the aid of the State in some such forms, we think, the work of reviving our old mining and metal industry may be attempted with a fair prospect of success. And such revival of the industry would be a boon and a blessing to the country. It would resuscitate an ancient industry and restore to the old mining population of the land their fruitful, congenial hereditary calling which would lift them beyond the grasp of famine; open up a large field of varied employment for our working classes; would tap a new source of national wealth and create a new field of investment for our capitalists; prove an important step taken for a reconstruction of our national industrial system on modern lines and would furnish a means by

which it would be possible to restore to large tracts in the country (e. g., Kurnool and Cuddapah in the Madras Presidency) the prosperity which once was theirs.

And as a beginning of the new lines, we would venture to suggest the following, among other works, as affording fair chances of success:—

1. *Aluminium industry* in Madras—now an established industry, and several British Companies are already engaged in it.

2. *Manganese ores*.—The mining might be started in Dharwar or Belgaum where the deposits are rich and plentiful. The industry has a bright future before it.

3. *Copper-mining* at Jubbulpore in the Central Provinces where rich deposits of the metal occur.

4. *Iron and steel works* at Salem where the richest deposits exist. Absence of coal is a drawback. In France there is a similar difficulty, iron and coal not occurring together. The question, however, reduces itself to one of transport and can be easily settled.

5. *Granite works* in Madras where granite occurs capable of high polish.

6. *Glass works* at Aligarh, in the United Provinces of Agra and Oudh. There is in the Provinces already an extensive manufacture of glass by native methods; it might be reorganised on European lines. So, again, they may be started at Kapadvanj in Kaira Zilla in the Bombay Presidency.

7. *Gypsum*, a most valuable manure and otherwise a useful mineral, in Satara or Phalton where the supply is large.

8. *Lead-mining* in Kurnool, in the Madras Presidency, where the ores occur in considerable quantities.

9. *Gold-mining*, in Dharwar. The schists there are rich; and only recently 3 British Companies have been formed with a capital of £160,000. Here the industry is most promising and the field is large. In the opinion of experts, the operations at present going on tap, but to a small extent, the gold-bearing rocks, the extensive bands of schists.

10. *Diamond-mining*, at Panna, in Bundelkhand, and in Cuddapah, in the Madras Presidency, where we have long stretches of promising diamond conglomerate beds.

11. *Galvanised iron and tin plates* in Bombay. The import is a large import, nearly 160 lakhs in 1904-1905. The manufacture is a simple process; only a supply is needed of iron, zinc and tin.

12. *Gold-washing* in Assam. Government should be appealed to restore to the poorer classes in Assam this their ancestral craft which they have been for 35 years past prohibited from following, most unjustly, with a view to ensure gold concentration in the river-beds, and in the interest of foreign exploitation.

A few such works would suffice for a start; and it may be remarked in a general way that *diamonds and gold, copper and lead,* and *iron* are among the most promising of our minerals and that it is a duty we owe not only to ourselves, but also to our children and children's children that we should ourselves endeavour to work them and not suffer the foreign exploiters by our apathy and inaction to secure a monopoly of the working. We would go a step further and advise that the main effort may for the present be concentrated on these minerals as far as our means may permit.

The whole work is new; the subject is but little studied or understood in the country; and in view of the urgency of the circumstances and the practical importance of the endeavour, we would earnestly recommend the creation, as a necessary part of the practical scheme, of a strong organisation for the purpose—a central association with a net-work of branches all over the country, particularly in the mining tracts—to work out in a practical way this problem of the development of our mineral resources. The objects of such association to be, *inter alia*, these:—

(a) To collect information regarding the mineral capabilities of the different parts of the country.

(b) To investigate the past history of the mining industry in the country.

(c) To study the question of the development of such mineral resources with the advice of experts and in the light of experience in other countries.

(d) To send out Indian experts—as the Japanese did at the start—say men like Professor V. S. Sambasiva Aiyar, of Bangalore, to study in other countries the working of the mines and the systems prevailing there of mining legislation, mining labour and mining education.

(e) To arrange to disseminate amongst the people the information so collected and the results of such study and investigation in other countries by means of cheap vernacular literature, peripatetic lecturing, exhibitions, &c.

(f) To create a healthy, well-informed public opinion on the subject and with a view to the end

to start a mining paper, and to have mining institutes established at various places for discussions and study.

(g) To organise mining enterprises in promising tracts and otherwise assist in the organisation of such efforts.

(h) To render assistance in prospecting work in such cases.

(i) To undertake search work independently where there may be good prospects of success.

(j) And, above all, to watch and promote in all practicable ways the mining interests in the country, &c., &c. The associations will require funds of their own, museums, laboratories, &c.

No large practical effort in the desired direction would seem possible and no healthy start without the aid of some such organisation.

Lastly, we desire to point out that this question relating to the mining and metal industry does not affect the British Provinces alone. It concerns the Native States as well, where a similar situation exists. Many of these States possess considerable mineral resources, notably the Nizam's Dominions, Rajputana, Gwalior, Cutch, Rewah and Kolhapore. And we submit that it is a duty which the rulers and administrators of these States owe to the populations under their rule to do what in them lies to resuscitate this ancient industry. Every important State and group of States should have a mining expert to advise in the matter. The necessary surveys, the experimental trials, &c., should be carried out under his supervision, and no effort should be spared to call out and encourage indigenous enterprise in the field. It is further worth remarking that the Native States Governments can do even more in the matter than the Government of India, and accord to private efforts a larger measure of direct and indirect aid—in the shape of guarantees, subsidies, bounties, and special concessions regarding prospecting and mining leases.

These are some of our ideas on this important subject of the mining and metal industry in the country, and here we must bring our observations to a close, apologising for the length to which they have extended. In the preceding pages we have pointed out how great and varied are the mineral resources we possess; how mining and metal work was at one time one of our most prosperous industries in the land—supporting a numerous population—and how, in recent years,

under modern conditions and owing to the impact of unrestricted foreign competition, it has unfortunately suffered a most grievous collapse. We have dwelt at length on some of the calamitous results which has followed from such a failure of an ancient and extensive industry, not only to large sections of the population, but to the general industrial life of the country. And we have pleaded with all the earnestness we could command for some practical action with a view to its revival, and re-building on modern lines. In our opinion, the work of such revival and re-building should be entirely our work—and ours alone—with just the kind and measure of State-aid that may be absolutely necessary; and we have ventured to sketch out a rough plan on which such work might be arranged and carried out under the existing circumstances both in the British Provinces and in the Native States. We humbly trust the scheme of practical action so submitted—and submitted with diffidence—will meet with the approval of the Conference.

The movement here advocated is, as things are at present in India, rather one along a difficult line of advance in the industrial field; and the effort required is a large, vigorous, strenuous and sustained effort. And like every other effort of the kind, it must depend for its effective initiation and successful prosecution upon the popular and other support it may enlist. It is a self-reliant effort conceived in the best interests of the country, and under the new *Swadeshi* awakening; we have no doubt it will receive all the aid it needs. Further, we may also count upon the generous and cordial assistance of Government in such efforts, the one sole object of which is the development of the industrial resources of the country and with it the amelioration of the condition of the people. And with such help and support the new effort has every prospect of assured success—and when it succeeded as we hope and pray it may by the blessings of Providence—and the industry revives as part of a general re-building of our national industrial system, we trust India will be in a fair way to be once again what she was for centuries—one of the richest and most progressive mining countries of the world—the land *par excellence* of gold and plenty and bliss. And in the progress of the *Swadeshi* movement we have already the dawn on the hills—the dawn of a new era of hope and promise.

“And the light is Victor, and the darkness  
“Dawns into the Jubilee of the ages.”

# THE MINERAL DEVELOPMENT OF INDIA.

By Mr. T. H. HOLLAND, F.R.S., Director, Geological Survey of India.

OBVIOUSLY, before sketching out a line of advance, it would be wise to take stock of our present position, and to determine the trend of recent progress in mineral developments. Recognising this principle, much of my time has been devoted lately towards improving the system of collecting statistics of mineral production and of critically analysing the results. The first essay in this direction has been published by Government in the form of a review of progress made during the years 1898—1903.\* For the assistance of those who wish to follow the subject with closer detail than is possible in this paper, I propose to make that review the basis of the first part of my remarks, modifying the conclusions stated therein by the extension of data to the end of 1904.

## VALUE OF MINERALS FOR WHICH RETURNS WERE AVAILABLE IN 1898 AND 1904.

	1898. Rs.	1904. Rs.
Gold ..	2,41,27,560	3,54,91,185
Coal (a) ..	1,43,57,430	2,09,82,390
Petroleum (a) ..	10,18,461	71,09,565
Salt (a) ..	53,83,990	65,62,950
Saltpetre (b) ..	39,88,440	39,95,235
Manganese-ore (b) ..	4,11,389	19,44,480
Mica (b) ..	8,08,350	14,68,980
Rubia ..	8,69,250	13,59,180
Jadestone (b) ..	6,26,700	7,60,890
Graphite (a) ..	1,650	3,00,720
Iron-ore (a) ..	1,86,045	1,89,255
Tin-ore (a) ..	38,295	1,25,295
Chromite (a) ..	..	62,055
Diamonds ..	35,000	39,540
Magnesite (a) ..	..	13,140
Amber ..	15,915	12,570
<b>Total ..</b>	<b>5,18,68,475</b>	<b>8,04,17,430</b>

Those who have had occasion to consult the review of Mineral Production for 1898—1903

\* Records, Geol. Surv. Ind., Vol. XXXII, part I, January 1905.

(a) Spot prices. (b) Values on export.

will have noticed that the first table of figures professes to express the total value of minerals produced within the period under discussion. It is the first attempt we have made to express the value of our mineral produce in terms of a standard currency, and to the critical student of political economy, it is not necessary to do more than point out the shortcomings which are specially attached to this particular statement in addition to the imperfections common to, and confessedly inseparable from, all such methods of expressing the value of natural products.

The chief amongst its special shortcomings is one which we hope gradually to reduce, though we shall never wholly exterminate, being due to the omission of items for which even approximate returns are at present unobtainable. One of the largest of these, and one of the most important in determining the progress of a country, is that of common building materials. The extent to which structural materials are used in a country would form a better measure of its industrial progress than even a periodical census of its population if we could but express their quantity and nature in terms of any recognised standard. But it will be many years before we shall be able to assume with safety that the returns for building materials in India conform to the recognised test of all statistical expressions in covering all but an unimportant fraction of the total.

This claim can be made, however, for the sixteen minerals included in the table of total values now given, and it is hoped gradually to enlarge this list until the residue of those left unestimated is a fraction too small to disturb our percentages, or materially to affect the curve of progress. The table is obviously not intended to afford a means for comparing the mineral production of India with that of any other country; it merely gives us at a glance the rate of progress which is being made, the same system of expression being followed from year to year. Used in this way, it will be seen that the total production of minerals for which approximately accurate and trustworthy returns are available has risen



in value from about 5½ crores of rupees in 1898 to over 8 crores in 1904, that is, an increase of 55 per cent. in six years.

Considered as a mere rate of progress in value of output, this table is extremely satisfactory; but a critical review of the constituents of our yearly totals reveals a seriously weak feature in the present state of the industry. The most valuable amongst the minerals raised are either consumed by direct processes, without contributing to subsidiary, chemical and metallurgical industries, or are mined simply for export. The obvious cause of these weaknesses, and the probable cure for them will be discussed when we have briefly surveyed the chief items in mineral production.

The mineral of greatest value to the country is undoubtedly coal, for 94 per cent. of the mineral produced is consumed in various industries in the country. The actual money value returned for last year's output of coal amounted to more than 2 crores of rupees, but such an expression gives only an imperfect idea of its value; for whilst the value of Bengal coal is returned at the average rate of about Rs. 2-6 a ton, that of the inferior material raised in Burma is reported at about Rs. 7 a ton. The so-called values given in our general table are thus more accurately described as local prices, varying, naturally, according to the relation between the cost of production and the demand of the nearest market. The average pit-mouth price of Indian coal is less than half that of coal raised in the United Kingdom, Australia and Canada; and is about two-thirds of that raised in the United States. Even taking into account its slightly inferior calorific value, there is still a great saving in fuel charges for those who will undertake the enterprise of reviving the decayed metallurgical industries of India to compete with the foreign metals for which we have now to pay such enormous bills.

The coal-mining industry began in the Ranigunj area as long ago as 1777, but the industry was naturally restricted to local requirements until the East Indian Railway connected the field with Calcutta in 1854. Since then, the output has risen from about 300,000 tons in 1857 to 3,350,257 tons in 1904. Until 1870, the output for the Ranigunj field represented the total for India; but with the distribution of railways, other coal-fields in Bengal became opened up, and finally the deposits known in the Central Provinces, in Central India, the Nizam's

Dominions, in Rajaputana, Punjab, Baluchistan, Assam and Burma contributed to swell each year's total until 1904, when the coal production for India during the year reached the record of 8,216,706 tons.

Practically every feature of the coal industry can be regarded with satisfaction by those interested in the progress of the country. Imports of foreign coal have been gradually reduced to about 250,000 tons a year; the proportion of foreign coal consumed on our railways has been cut down during the past twenty years from over thirty to under one per cent. of the total; new markets have been found in the Indian Ocean ports, with the result that exports have exceeded the imports, and last year reached 602,810 tons; although the railways still take about 30 per cent. of the coal produced, there is a tendency for this proportion to diminish, showing that other industrial enterprises requiring fuel have developed faster even than the railways, and that the enormous rise in production is a true index to industrial progress. I can point to one regretful feature only in this trade, and that is the fact that in many mines the resources of the thick seams have not been fully turned to account. This loss, so far, is, however, an unimportant item compared to the enormous stores of coal that we know still lie untouched, and the systematic mining, now being enforced under Government regulations, framed from a purely humanitarian standpoint, has a secondary effect in producing increased efficiency and more complete utilization of the stocks of marketable coal.

From the worker's point of view the coal-mining industry is equally satisfactory. Over 100,000 workers are employed directly in connection with coal-mines in India, and the death-rate from accidents is lower here than in any coal-mining country in the world.

In this respect, coal-mining compares favourably with gold and mica-mining which maintain a much smaller number of workers, whilst in Bengal, where the natural conditions are so favourable to safe underground work, the average death-rate from coal-mining accidents is distinctly lower than in any other Province or State. If risks to life were estimated by coal-mining in India, the industry would not be classed amongst "dangerous" occupations: there is not only a low rate from isolated accidents, but a remarkable freedom from disasters, which, in European countries, have done more than accurate statistics to force special legislation for the protection of workers engaged in "dangerous" occupations.

When one sees in a coal-mining district the general happiness and well-to-do condition of the miner, one is inclined to regard the dangers incurred as fairly gauged by the proportion between the results of accidents and the numbers who find congenial and profitable employment. The Indian collier, in this respect, is far better off than any other in the world. He can earn higher wages than those engaged in simple agriculture; he is now being provided with suitable quarters under sanitary conditions, and is encouraged on the best-managed collieries to acquire fields for his own use. The general attractiveness of the industry is revealed by the great increases in the population shown by the last census for the civil sub-divisions in which mining has mainly developed. In the Giridih sub-division there was an increase of 4 per cent. between 1891 and 1901, whilst in the Gobindpur sub-division of Manbhum there was an increase in population during the same period of 25 per cent. One feature of the industry, which appears to be slowly diminishing, is the comparative inefficiency of the Indian miner: in this country we turn out about 80 to 90 tons of coal a year for each worker employed; for the rest of the British Empire the annual output per collier is about 285 tons.

Amongst the remaining minerals, the most conspicuous progress has been made in developing the petroleum resources of Burma. During the past ten years, the production has risen ten-fold, the output of crude oil last year amounting to 118½ million gallons. The imports of foreign oil have been largely displaced by the home production, which enjoys the slight protection of the difference between royalty and import duty. At the same time, there has been a valuable trade created in the export of Indian kerosene and of paraffin wax obtained from the crude oil, these exports in 1904 being worth 28 lakhs of rupees.

The old method of raising oil from narrow shafts 200—300 feet deep was the only system followed by the hereditary oil-diggers until Upper Burma came under the British Administration in 1886, when deep wells were drilled by the Burma Oil Company, and the lower sands, containing the largest supplies of oil, hitherto untouched, were exploited. Since then, the output has rapidly risen in the Yenangyaung field alone to the extraordinary figure of 73 million gallons in 1904.

The petroleum trade in Burma supports a large population of labourers on the field, in the refineries, and in the transport trade; the increased

output has been a source of profitable revenue to Government; the importer has been compelled to keep his prices down to face competition with the native product, and in every respect but on the whole industry has been a source of solid wealth to the country. The one regrettable feature is the fact that the capital required to drill the deep wells has been raised in Europe, and the profits consequently have left the country. In the petroleum industry, as in so many other enterprises of the kind, India will continue to pay such an unnecessary and undesirable tax as long as those in the country who possess money will not risk their reserve funds in industrial enterprises.

The other large mineral industries which produce a rosy picture by a yearly expanding table of values cannot be regarded with unalloyed satisfaction. Nearly 30,000 workers are maintained by gold-mining, a certain number of luxuries are obtainable in the two centres of production, and over a million sterling has been retained in the country in the form of royalty; but more than eight times the royalty has been paid in dividends.

Rubies, obtained on a much smaller scale in Burma, may be ranked with gold; both are limited in value to the royalty and the local support of labour. But our loss of metalliferous ores, of fertilizers and of minerals employed in the great web of industrial arts necessary for the maintenance of a civilized community is, in no sense, compensated by the individual profits obtained, by a few workers and traders.

It is in the belief that the dissemination of information about our imperfections, as well as our resources, will, in some small degree, assist in placing our mineral industry on a sounder economical basis, that I have, with the full sympathy of Government, accepted the invitation of your committee to address this Conference. It is with the assurance that we possess in the country the natural elements essential for the restoration of our decayed metallurgical and chemical industries that I have diverted the energies of my colleagues, and have commenced the expenditure of public money for the investigation of our resources in minerals which are essential to industries now maintained entirely by imports, for which we have not only to pay heavy bills to other countries but to exist always in a state of absolute dependence for articles that are no longer mere luxuries.

Thirteen years ago, India produced no manganese-ore at all. This year our output of the ore will not be exceeded by more than one or two of

the twenty countries that contribute to the World's total supply: Manganese-mining may thus be looked upon as a successful new industry, one that helps to swell the table of total values, and to give an impression of industrial expansion. It is better that manganese-ore should be raised for export than be allowed to lie idle in the ground; but this country receives no more than fifteen out of the thirty rupees that a ton of manganese-ore is worth at an American or European port. We thus not only lose half the value of the mineral, but have to pay again for the metal it contains in the large imports of steel, for which India is still practically dependent on Europe. The same thing has now commenced in connection with the chrome iron-ore. To the miner the chrome-ore is worth about 23 shillings a ton, whilst the European manufacturer pays 75 shillings for it. Until iron and steel are manufactured on a large scale in India, we have to submit, either to this imperfectly compensated drain of the mineral resources, or the still less profitable alternative of allowing the minerals to lie undeveloped.

I have seen it stated as a matter for regret that India has lost the place it once held as the World's supplier of saltpetre. There was a time when saltpetre, being an essential constituent of gunpowder, gave India a place of special political importance amongst the nations, when during rumours of war saltpetre became an object of speculation as dangerous as the consols of the countries involved in a possible war. Since then, the potassic nitrate of India has been largely displaced by the discovery of large quantities of sodic nitrate in Chili, and its use in the manufacture of gunpowder has been curtailed by the invention of other and more efficient explosive chemical compounds. Although we still export nearly 20,000 tons of saltpetre every year, the trade shows a tendency to diminish rather than expand, and as long as our agriculturists and planters remain in a state of ignorance as to its value, it is better to reap the profit obtained by export than to leave the substance lying idle in the soil. But it would be still more profitable if we could turn it to its natural use as a fertilizer, and with this end in view, the Agricultural Department has been experimenting; hoping to reduce its cost of manufacture, as well as, to discover to which of our crops it can be most profitably applied.

About 53 per cent. of the constituents of saltpetre are obtained indirectly from the air under

the peculiar meteorological conditions which exist ideally in Behar; the remaining constituent exists in unlimited quantities in our soil. We consequently possess the power of indefinite reproduction, and that which is exported thus leaves the country none the poorer. But the case is otherwise with our export of bones, of which we lose nearly 100,000 tons every year. Nine-tenths of the constituents of bones consist of phosphate of lime derived from the soil, and consequently what is exported in this form is so much lost in the way of material essential to the production of our grain crops. As India is poor in phosphatic deposits, the time will come, if this drain is not compensated, when the soil will begin to show its deficiency in phosphates. But there is a form of compensation within our reach, and I will deal with this point after reference to one or two other unfavourable features in our balance sheet of exports and imports.

In preparing the data for the review of our mineral production recently published by the Geological Survey, the two features that struck me most forcibly were, firstly, the remarkable development of minerals consumed by what conveniently might be called direct processes, such as coal, gold, petroleum, gem-stones and salt, or which are raised merely for export, such as manganese-ore, graphite, saltpetre, mica, tin and chrome iron-ore; and, secondly, the equally pronounced neglect of the metalliferous ores and the minerals essential to the more complicated chemical and metallurgical industries.

In these respects, India of to-day stands in contrast to the India of a century ago. The high quality of the native-made iron and steel, and the artistic products in copper and brass once gave the country a prominent position in the metallurgical world. To-day the manufacture of iron by the primitive *lahar* has been restricted to small local industries, limited to areas far removed from the railways and ports, which have permitted the importation of cheaper goods from Europe; copper and brass-ware are made entirely from imported metals; no lead-mining now exists in the country, while the once flourishing manufactures of alum, the various alkaline compounds, blue vitriol, and copper as are now all but exterminated. These facts are expressed in our returns for imports. Our imports of minerals, chemicals and metals amount to over 10 millions sterling (15 crores of rupees) a year, without counting articles manufactured from metals and minerals, such as glass-ware, earthenware, porcelain, hardware, cutlery,

machinery, millwork and railway plant, much of which would be obtained in any case from foreign countries whether we raised the necessary raw materials or not. But so far as I can find, with the exception of quicksilver, which is the smallest item in the bill, there is not one amongst the imported minerals and metals not known to exist in the country. I am not prepared at present to say that all of them exist in quantity sufficient and in a form suitable, to displace the foreign article in open competition; but the most valuable certainly do so exist, and it is towards the development of these that our energies should be directed.

It is, however, not sufficient merely to know that we have unlimited supplies of a mineral, to assert that we can face foreign competition. The case of copper will give a convincing illustration. In 1901 our imports of copper were valued at about one crore of rupees; in 1904, on account mainly of the extended use of electric power, these imports had risen to over  $2\frac{1}{2}$  crores of rupees. The increased demand for copper naturally directs our attention to the copper-ores which were once worked in India and known to occur in large quantities. But our ores, like those largely worked elsewhere, are copper sulphites, and we know that such ores are worked elsewhere with profit only because the sulphur as well as the copper is turned into marketable products. It is thus not enough to know that we have a demand for copper: we cannot work our copper-ores against foreign competition unless we have a market for the bye-product of sulphur. To make use of our sulphur, we must have a demand also for sulphuric acid sufficient to take all that will be produced in smelting the copper-ores. To find a local market for sulphuric acid, we must have other chemical industries, many of which cannot exist unless their bye-products are also marketable in the same area. To extract the metal, therefore, with profit, it is necessary to find an assemblage of smaller industries in order to utilize the bye-products economically. Consequently chemical and metallurgical industries do not exist singly, but in family groups.

In this case we have an illustration of the way in which the European manufacturer has killed the native Indian chemical industries. He has turned his bye-products to full account, and with the reduction in freights following improved forms of transport, he is able to compete at distant points with those who work minerals for one or only a few of their constituents. On account

almost entirely of the economic recovery of bye-products, the price of sulphuric acid in England has been reduced during the last seventy years from over £ 18 to under £ 3 a ton; at the same time, the dependent manufacturer of soda-ash has reduced his prices from over £ 16 to about £ 4, whilst bleaching powder has dropped from about £ 19 to £ 3-10s. Since the opening of the Suez canal, with the reduced cost of transport by improvements in marine engineering, eastern freights have dropped to about one-fifth of what they were before the canal was opened. In consequence, the European manufacturing chemist is able to place his bye-products at a profit in parts of India where the same compounds are formed by the natural processes of a tropical climate, and merely require extraction.

It looks at first sight as if we could never recover our lost metallurgical and chemical industries. But the rapid spread of railways in India, the gradually extending use of electricity, and development of manufactures connected with jute, cotton and paper have gradually increased the demand for chemicals and metals, until now we have probably reached the stage at which the quantity and variety of products required will be sufficient to form an outlet for the bye-products that are necessary in a well-defined family circle of chemical industries; and the protective effect of sea-freights will assist in the competition with the materials of European manufacture.

I have already cited the case of copper as an example of a metal for which there is a rapidly increasing, and so far as one can judge, of a permanently increased demand on a scale sufficient to produce large quantities of sulphuric acid. When I took up this question two years ago, the first doubt to settle was the extent of a market for the sulphuric acid, for at present the acid imported is a comparatively small quantity, limited by the enormous cost of its freight. A certain amount also is manufactured, but its price is also of necessity kept up by the cost of importing the required sulphur. Obviously, to judge the possible market by the present consumption of sulphuric acid in India, would give us little hope of developing our copper-sulphite ores. Knowing, however, that sulphuric acid, in the presence of a sufficient number of raw materials, and of certain industries would rapidly make its own market, we turned our attention to the possible outlets in India. The import returns reveal a small demand for certain inorganic chemicals which are made by the direct use of sulphuric acid, and

although we are safe in assuming that the demand for them would increase by a slight reduction in price, there is not enough in these imports to warrant the expectation of a local market large enough anywhere in India to absorb all the sulphur separated in the copper-smelting on a scale that would pay. We had thus to develop the conditions necessary to create a market. The Forest Department have consequently brought out an expert to test the suitability of our woods for the manufacture of paper pulp by the use of sulphurous acid, and the Agricultural Department are making experiments to test the fertilizing value of ammonium sulphate, in the hope of retaining our now wasted products in coke-making, and of superphosphates, in the hope of retaining our supplies of bones and of importing mineral phosphates from the large deposits in the Indian Ocean islands.

Of the subjects of these experiments, one of the most immediate importance is, perhaps, ammonium sulphate. About 300,000 tons of coal are converted every year into coke on the Bengal coal-fields by a process which loses nitrogen enough to make ammonium sulphate worth 20 lakhs of rupees in the open market. As soon as this fact was brought to the notice of the owners of our collieries, enquiries were made as to the economical results of erecting bye-product recovery plant instead of the cheap open kilns now in use, and the East Indian Railway Company, acting on the advice of Mr. T. H. Ward of Giridib, have already commenced the erection of the necessary plant, intending, in the first instance, to use sulphuric acid manufactured from imported sulphur until the supplies lying idle in this country can be turned to account.

Some idea of the value of ammonium sulphate can be obtained from the way in which it is being used in Java and Mauritius. Nearly 30,000 tons of this fertilizer are now consumed every year on the sugar plantations of these two islands, and as one consequence they made India pay last year something like 4 crores. of rupees for sugar which ought to have been grown in this country.

To show the value of recovering bye-products, one might quote instances by the hundred illustrating the way in which countries, relying solely on the reproductive value of a tropical climate, have had to give way gradually to the more cheaply made artificial products due to scientific developments in Europe. The case of sugar which I have already mentioned affords an illustration striking enough to us, as it affects a large industry in this country.

The beet-root sugar of France, Germany and Austria is sometimes referred to as an illustration of the value of a protective tariff and bounty in fostering an industry; but there is little doubt that these influences have been microscopic compared with what has been done by scientific work, first, in the agricultural treatment of the beet, and, second, in the processes of extracting the sugar. There was a time when the beet-root yielded less than 9 per cent. of sugar; roots now grown yield 16 to 18 per cent. These facts illustrate the first lesson to be learnt by us in India where our agricultural products are left to natural selection and chemical fertilizers are practically unknown. The second advantage obtained by the beet-sugar refiner has been through the adoption of the best machinery in the processes of extraction, of chemical processes to obtain the last traces of crystallizable sugar from the molasses, and finally of converting the residue of evil-smelling waste products, formerly a general nuisance to be got rid of at a high cost, into valuable chemical products like salts of potash, ammonia and the ferrocyanides, which now contribute to the profits of the industry instead of being a loss. As one result of the application of science to sugar manufacture in Europe, Austria alone last year sent sugar to India to the value of 138 lakhs of rupees. When a country, with a temperate climate, can beat the manufacturers of a natural tropical product in their own climate, and at a distance of 5,000 miles, it is time for us to review our methods of work with critical faculties well alert. How many other Indian industries, depending solely on the advantages of natural conditions, are in danger of extermination by applied science in Europe?

The trade of this country so far has been mainly a simple exchange of natural products peculiar to a tropical climate for artificial goods of European manufacture. Obviously, the outward half of this trade balance must suffer with the rapid development of science in Europe, enabling the manufacturer to turn out of his waste products the materials suitable to replace those growing luxuriously in India. To what extent the danger can be reduced in connection with vegetable products is beyond my province to judge: but in questions relating to minerals, I think the conditions are rapidly ripening for the successful development of numerous products now obtained from Europe. The rapidly growing imports of metals, chemical and mineral products are daily maturing the conditions necessary for us to open up our mineral deposits with new methods; the extension of railways and engineering works is

increasing our requirements in iron and steel; the utilization of electric power has created a demand for copper; the development of industries connected with paper, cotton, jute and agriculture is forming a market for chemical bye-products.

Metalliferous ores cannot generally be developed except on a scale sufficiently large to make the recovery of the smallest among these bye-products remunerative. When the European manufacturer, therefore, was once able to reach the Indian market by low freights, our native metallurgical and chemical industries naturally became exterminated, and must remain so without chance of revival until the variety and quantity of subsidiary products required in the country are sufficient to absorb the products of metallurgical works erected on a scale comparable to those now established in Europe. It is useless to start with methods and on a scale already superseded in the countries with whom we have trade conditions restricted only by existing freight rates. The individual worker in metallurgy or in most forms of mining must give way in the future to the company with limited individual risks. But we have the advantage of starting with the matured results of metallurgical evolution in Europe, and the conditions are now, or soon will be, ripe for the exploitations of some of the minerals hitherto left untouched.

To turn our opportunities to account, it is necessary, firstly, to disseminate the information we already possess, secondly, to obtain more precise information of local conditions by an increase in the number of those who possess the necessary technical and scientific knowledge, and, thirdly, to discover more enterprise on the part of those who can contribute to the necessary capital.

With regard to the first point, information is being distributed by publications issued by the Geological Survey Department as fast as suitable data are collected. Our *Records* are supplied to various libraries, societies, newspapers and individual subscribers; all known mineral occurrences of value are represented by collections of specimens available to the public in the Calcutta Museum, and we are now engaged in the preparation of a Manual which will give a summary of everything that has ever been written about Indian minerals; but we have still to look to Conferences of this kind to assist in the dissemination and thorough assimilation of the published reports.

The second condition must await the slow extension of secondary and technical education in India. It will be many years before there will be an effective proportion of the general popu-

lation able to detect local occurrences of valuable minerals; but the end in view may be somewhat hastened by a wider knowledge of the fact that the Geological Survey Department will willingly determine minerals free of charge for any amateur who is willing to give the precise locality from which each specimen is obtained, although we do not wish to assist those who, thinking they have discovered possible diamond mines and gold-fields, prefer to keep their information secret in hopes of way-laying some innocent speculator.

The third condition is, perhaps, the most serious difficulty of the lot. Nearly every valuable mineral development in this country has been due to the enterprise of a few Europeans, the preliminary work of exploration no less than the subsequent risks of prospecting and working. As one consequence I could name many Europeans who have dropped the money they have made in other ways; for few industrial enterprises involve more indeterminate risks than mining. As another consequence, where success has followed enterprise, the profits are leaving the country in the form of dividends instead of remaining here to contribute to the general wealth. A striking case is now developing in connection with the enterprises initiated by the late Mr. J. N. Tata, whose great name will be perpetuated by the Institute founded by his generosity to remove complaints like the second of the three that I have just named. As most people are aware, Mr. Tata for some years undertook the investigation of the many known iron-ore deposits in Central India with the hope of finding one under conditions suitable for the local manufacture of iron and steel. After his lamentable death, the work was taken up by his two sons, Messrs. D. J. and R. J. Tata, and after an expenditure of over three lakhs of rupees in the work of investigation, they have at last evolved a project which appears to contain the elements of a sound industrial venture. But Messrs. Tata and Sons have been compelled to go to England to raise the capital necessary to launch a project that ought to commend itself to every patriotic capitalist in this country. One would feel happier if there were more leaders of the kind of the Tata Brothers in India—men whose ventures, inspired by patriotic motives, are conducted with cautious regard to the business risks involved. I have been privileged to keep in touch with each stage of their most recent enterprise. Mr. J. N. Tata started with the idea that some amongst the many occurrences of iron-ore reported by the Geological Survey must surely be suitable for exploitation, and consequently ought to be developed

for the benefit of the country. The preliminary information with regard to actual occurrences seemed sufficient to warrant the expenditure necessary to test the most promising; and on these systematic prospecting operations were undertaken, no step in expenditure being ventured not warranted by the information derived from that already completed, until the investigations narrowed down to the thorough testing of the two ore-bodies determined to be the best by the more superficial preliminary tests. Being certain that ore of the right kind existed in sufficient quantity, they subjected the other raw materials necessary for flux and fuel to equally exhaustive tests, and finally selected as the centre of operations the point which gave the most favourable results in an equation involving (1) the cost of the three groups of raw materials of different quantities, (2) the market for iron, steel and bye-products accessible at various distances in counterbalancing the competition with imports and existing manufactures, and (3) the suitability of water supply and climate for the workers as well as the works. I have seen no mineral enterprise undertaken in this country in which the scientific method has been so completely adapted to business essentials, and Messrs. Tata and Sons deserve the gratitude of every one interested in the welfare of India.

The patriotic feelings of the late Mr. J. N. Tata formed merely the *inspiration* of the great project about to be launched; if, however, the subsequent steps had not been undertaken with regard to financial results, one would have been justified in doubting either the sanity or the honesty of the promoters. The desire to see the country economically independent will not be accomplished by merely patriotic demonstrations against foreign goods. Their importation can be prevented only by the manufacture in this country of the same quality at lower rates or of better materials at the same price. To do this, enterprise is wanted more than self-sacrifice—enterprise on the part of students willing to take up technical subjects instead of law, philosophy and literature; enterprise on the part of capitalists ready to invest intelligently in industries now taxed by borrowed capital.

It would be impossible in a short paper to indicate the many ways in which mineral developments are possible in India, and I doubt if any good would result in the publication of matured plans until there is a community sufficiently grounded in applied science, not only to turn the present opportunities to account, but to adapt

itself to the changing industrial equation as science progresses elsewhere.

The Geological Survey can do no more than accumulate and publish for general information the raw materials which form the basis for a more thorough investigation of local problems. We have, for instance, recently announced the existence in various parts of India of ore similar to that used in Europe and America for the manufacture of aluminium. Before that ore can be turned to account, we want a cheap supply of alkali for the extraction of the alumina; the manufacture of the alkali involves the simultaneous manufacture of bye-products for which a market must be found; to convert the alumina into aluminium, we want a cheap source of power; and finally a market for the metal turned out. To deal with this problem, we have thus to determine by systematic prospecting whether any one of the known occurrences of the ore contains the alumina in sufficient quantity to support works on a large scale, whether it is present in sufficient richness to permit of economical extraction, and whether the ore-body, when found to be suitable, is within range of the necessary power, the necessary materials required for its manufacture, and a market capable of absorbing the bye-products as well as the metal. The discovery of a valuable mineral is thus but the beginning of a long problem, necessitating the collaboration of a string of competent investigators. Our poverty is not in material, but in men capable of turning the natural material into the finished product. We want more than Government provision for technical scholarships: we want a reformation in the *tastes* of our students; we want them to learn that the man with technical dexterity is of more use to the country than the writer of editorials or the skilful cross-examiner: that applied science now belongs to the highest caste of learning, and is a worthy field for the best ability we can obtain.

As far as our mineral resources are concerned, there is unlimited room for profitable enterprise: the country is sufficiently endowed by Nature, not only to meet its own requirements, but to take advantage of its central position for competing with others in the Indian Ocean markets; but until we find the chemical, metallurgical and mechanical workshops as attractive to our high-caste students as the class-rooms for law and literature now are, the cry of *Swadeshi*, no matter how worthy the spirit it embodies, will remain but an empty word.

# COTTON CULTIVATION IN BENGAL.

By Rajah PEARY MOHAN MOOKERJEE.

THE backward state of cotton cultivation in India strikes one as an anomaly when one reflects that it is the chief article which clothes her millions, that India is the birth-place and nursing ground of cotton manufacture, that the arts of spinning and weaving cotton were known to the Hindus long before the Egyptians wove their clothing from the fibrous bark of their native flax, and that those arts flourished here even before the date of authentic history. It is from India that cotton manufacture spread to different countries, towards the East to China and Japan, towards the West and across the Continent, to Europe, and, perhaps, also to the farthest antipodes.

Wool and materials for linen were never wanting in India, but the people were not slow to perceive that cotton clothing was more agreeable to wear in temperate climates and in torrid zones, and that it was much better calculated to preserve the warmth of the body than linen. It is to the manufacture of cotton, therefore, that the ancient Hindus directed their attention, and they gradually acquired a flexibility of fingers and a dexterity of manipulation which adopted them in a remarkable degree to the finest and most artistic operations of the loom. They thus succeeded in attaining unapproached perfection in their fabrics of cotton, and have maintained their supremacy for ages, in spite of the marvelous appliances which science has placed in the hands of foreign manufacturers. The cotton piece-goods, calicoes and muslins which were manufactured in the country not only formed the staple clothing of the people of India, but were also sent out from remote times, in large quantities, to Arabia, Greece, Turkey and other countries. Towards the end of the seventeenth century the beauty and cheapness of Indian muslins, chintzes and calicoes attracted the attention of the English, and the quantities in which they were imported to England by the East India and Dutch Companies raised a loud out-cry against the admission of Indian goods to

the prejudice of English woollen and silk manufactures. The desired protection to English manufacture was given by Acts 11 and 12, William III Cap. 10. (1700), which forbade the importation and use of Indian silks and calicoes under a penalty of £200 alike on the wearer and the seller. The other Governments, too, of Europe found it necessary to prohibit them, or to load them with heavy duties in order to protect their own manufactures. The check thus imposed on the growth of Indian cotton manufactures was further aggravated by the introduction of the fabrics of Great Britain in Bengal to an extent which proved the ruin of the manufacture of cotton in India. Even so early as 1831 a large number of Indian manufacturers petitioned the Lords of His Majesty's Privy Council for Trade representing disastrous effects caused by English enactments and import duties, and praying their Lordships "to allow the cotton and silk fabrics of Bengal to be used in Great Britain free of duty or at the same rate which may be charged on British fabrics consumed in Bengal." But this reasonable prayer was not granted. The result was the surprising commercial revolution which was effected in the mutual relations of the two countries. India, so long superior to Europe, India, which inundated the West with the products of her looms and exhausted the riches of Europe, even India, so long a victor, now lay vanquished in her turn, a prey to foreign commercial aggression. The British merchant carried the raw material to his country, committed it to the operation of the machine, carried back the products to the East, and, in spite of the loss of time and the enormous expense incurred by the double transport, sold the cotton fabrics at a price less than the price of the cotton spun and woven by the hand near the field that produced it, and sold at the nearest market.

The loss to the country occasioned by the transfer of the manufacture of cotton piece-goods from India to England has been aggravated by the state of cotton cultivation in India. By far



the largest portion of cotton goods imported from England is spun from American cotton. It has driven Indian cotton out of the European markets; while even in our own country the raw material available for manufacture in the mills, is fit only for the manufacture of rough and coarse fabrics. Should the success of the *Swadeshi* movement lead to the establishment of a large number of cotton mills in India, we should have to face the difficulty of getting an adequate supply of good cotton for our mills. The area under cotton in India and Burma has varied from 9 to 11 millions of acres between 1890 and 1903; while in Bengal, the area under cotton, which has never been large, has shown a tendency to decline. In 1898-1899, the area under cotton in Bengal was 151,500 acres; but in 1902-3, it came down to 87,400 acres, and in 1904-5, it was, as the Hon'ble Mr. Carlyle declared, on the 2nd of December last, from his place in the Council Chamber, only 90,000 acres.

It is not, however, merely in quantity but in quality as well that cotton production is in a backward state in Bengal. Bengal cotton is much inferior to foreign cotton. Not only are the filaments wanting in proper length and strength, but dirt, seeds, leaves, the broken shells of pods, and the rubbish collected from the ground are permitted to be mixed up with the staple. It is further adulterated by middlemen by the admixture of old and inferior cotton. The inferiority of the staple and the admixture of impurities are due not so much to the neglect and ignorance of the cultivator as to his poverty. The ground is not well prepared, the soil is not thrown up into ridges, the seeds are not carefully selected and are sown broadcast, the fields are not carefully weeded, the soil is not treated with suitable manure, irrigation is neglected, and the ryot does not wait for reaping his crop as it ripens and the pods open, but is obliged to sell his crop very often before it is ripe in order to pay the land rent and the costs of cultivation. It is small wonder that in such circumstances the quality of the cotton is not what it should be, and that the yield is barely 20 lbs per bigha, while the average yield in America is more than 200 lbs. per acre. Long before America presented herself as a rival, the quality of Indian cotton had attracted the attention of the Court of Directors. In 1803, they complained that "dirt and leaves mixed with the wool had depreciated the value of the cotton sent them," and in 1810, they wrote to Bombay "that no excuse

will hereafter be admitted by us for the foulness, dirt and seeds which are permitted to remain mixed with the cotton; and it is our positive orders that the commission be not paid to any commercial resident whose provision of cotton shall be faulty in this particular."

In their laudable endeavours to develop the material resources of the country the Government of India have made for no one object such earnest and persistent efforts or undergone such heavy expenditure of money as for the extension and improvement of cotton cultivation in India. The experimental cultivation with American seed was made so early as 1828, model farms were established in a number of places, every attention was paid to the improvement of indigenous varieties, cultivators were encouraged to adopt foreign crops, prizes were given for fine specimens of produce, and long leases on easy terms were granted to properly qualified Europeans on their engaging to grow approved kinds of cotton. I would refer those who wish to read the history of those experiments to Dr. Royle's "Culture and commerce of cotton". These experiments have been attended with a certain amount of success both in the Bombay and Madras Presidencies as well as in Central India. It is a recognised fact that the Bombay Presidency in spite of its area is the largest cotton growing Presidency in India.

There is no future for cotton cultivation in Bengal so long as it depends solely on the resources of the cultivators. Ignorant of the rules and methods of growing a crop with which they are not familiar and which requires careful cultivation, wanting in enterprise enough to undertake it with the risk of failure and an uncertain prospect of profit, the Bengal ryot, unaided, would be wholly unable to produce cotton of a certain quality and send it to the market in a condition capable of challenging competition. The superiority of Bombay cotton is due to merchants and mill-owners having come into closer connection with cultivators in the matter of the cultivation of the staple and the harvesting of the produce, after they had despaired, from long experience, of leaving the processes to the ryots themselves. It behoves the landholders of Bengal, Behar and Orissa to take an earnest interest in the cultivation of cotton in their estates and to direct to it their most unwearied exertions. Cotton is at this moment one of the most paying crops in India, and fortune is within easy reach of those who may invest their money and devote their

energies to its cultivation. By the last official returns there are more than 13 millions of acres of cultivable waste in the Provinces of Bengal. The soil and climate are favourable to the cultivation of cotton. Experience has shown that it grows equally in the sea-board, in alluvial flats and in the uplands, and we may hopefully rely upon the advantages of a soil recovered fresh from Nature's hands. All loamy, calcareous and even kunkur and sandy soils are suitable for the cultivation of cotton. It is only stiff, clayey and damp soils, and too rich soils that make crops run into stalks and leaves, which should be avoided. The seasons for sowing cotton are at the end of the monsoon after the heavy rains are over, and, in some places, at the beginning of winter. Deep ploughing is essential for the cultivation of cotton. It enables the plant to get an extra amount of nourishment, and as observed by the late Mr. Rivett Carnac, it makes "the plants much stronger and healthier than their neighbours." The clods should be broken and the soil well pulverised and thrown up into ridges. Too much care cannot be taken in a judicious selection of the seed. Men of ability, distinguished for their practical knowledge and scientific acumen, have devoted their attention to the question of selection of cotton seed for India. A number of gentlemen recommended the introduction of American or Egyptian seed and their acclimatisation in India; while the result of the experience of other persons is that although the best crops are obtained from freshly imported seed, the foreign variety grown from acclimatised seed rapidly degenerates. Men are, however, not wanting who would have nothing to do with foreign seed, and would rely on the gradual improvement of the indigenous seed by careful cultivation of the crop and selection of the seed. Mr. Carlyle observed truly at the meeting referred to above that the question is still at the experimental stage. The seed having been selected, it should be soaked in cow-dung and water or in a solution of saltpetre for 12 hours and then allowed to dry in the sun for an hour. The seeds should be drill-sown, two or three seeds being dropped into each hole about three feet apart and covered with a little earth. The cost of the ridge system exceeds but a little the cost of the broad-cast system, but its evident advantages in respect of weeding irrigation and reaping are great. When the plants are five or six inches high, and, if necessary, once or twice afterwards, the grasses and weeds should be thoroughly

eradicated. It is necessary also to thin the crop, the strongest plant only of each cluster being left, and, if the plants grow too luxuriantly, the tops should be nipped off and the growth of lateral branches encouraged. Mr. Chapman truly says in his valuable work published only a few months ago that the agricultural chemistry of cotton is still in its infancy. But there can be no question that substances containing phosphates of lime, such as cotton seed cakes, ashes of cotton plants and bone dust could be profitably used as manures for cotton crops, while all nitrogenous manures should be avoided. The doubt once entertained as to the efficacy of irrigation in cotton cultivation no longer exists. It is now allowed on all hands that cotton of fine quality cannot be grown without the aid of irrigation. The rapid development of Egyptian cotton is due to the cotton fields being periodically flooded by the water of the Nile. Nothing could be more emphatic on the point than the statement made before the Colonization Committee in 1858 by Mr. Dalston: "The effect," he said, "of irrigation on the cotton plant of India is to raise it from a small stunted annual, producing 50 or 60 lbs. of clean cotton per acre, to a large perennial plant, producing 400 to 500 lbs. equal in quality to anything grown. \* \* It improves the quality of the cotton, and brings it up to the standard of the American crop. \* \* \* Water never fails to lengthen the staple of Indian cotton."

The harvesting of cotton is an important process. The pickings should be begun as soon as the capsules opened, and they should not be allowed to fall to the ground. Three pickings should suffice to secure the whole crop. The first and best pickings should be kept separate from the inferior cotton picked afterwards, and the seeds should be taken from the largest and the best developed of the pods picked from the plants. Selection of seeds thus made would improve their quality at each successive cultivation, and it is not too much to hope that Indian cotton would gradually hold its own against the best New-Orleans and Georgia.

About three quarters of the raw cotton of the world is raised in the United States, and about four-fifths of the cotton manufactured in Manchester comes from America. But as the American cotton crop has not kept pace with the increase of manufacture of cotton, England has naturally become anxious to increase the supply of raw cotton from the countries which constitute her

vast Empire, and to gradually lessen her dependence on America. This anxiety found expression in the speech His Majesty the King-Emperor made in Parliament in February, 1904. "The insufficiency," he said, "of the supply of the raw material upon which the great cotton industry of this country depends has inspired me with deep concern. I trust that the efforts which are being made in various parts of my empire to increase the area under cultivation may be attended with a large measure of success." It is the interest both of England and of India to make all possible exertion to supply American cotton in the English market. The Government of India has been alive to the importance of the subject from a very long time. 1788 the Court of Directors called attention to the cultivation of cotton in India "with a view to affording every encouragement to its growth and improvement." The Government of India has spared themselves neither time nor money to improve and extend the cultivation of cotton in this country, but,

although they have met with partial success in some places, it cannot be acknowledged that they have succeeded in the task they have set themselves. In Bengal, at least, it is the landholders who are responsible for this failure. They have been wholly apathetic as regards the cultivation of this important crop. Possessing the advantages of a suitable soil and favourable climatic conditions, they have hitherto neglected an industry which, whether they be moved by self-interest or actuated by feelings of patriotism, more than demands their strongest support. By undertaking the cultivation of cotton in our estates and devoting our best energies to the enterprise we shall render the supply of cotton elastic in the English market which provides our clothing, we shall make the success of the *Swadeshi* movement in the matter of clothing India's millions with home-made fabrics possible, and shall open a new sphere of activities which would lead to the prosperity both of the landholders and of their ryots.

## SOME FACTORS IN THE INDUSTRIAL AND COMMERCIAL DEVELOPMENT OF INDIA.

By RAI BAHADUR LALA BAIJ NATH.

THE last few months have witnessed an unusual development of activity in the promotion of the indigenous arts and manufactures of India and brains once busy in solving political or legal questions, are now busying themselves in discussing economic questions. Capital once so slow in flowing in this direction is beginning to do so and merchants and traders who used to deal in foreign goods so largely, have refused to give fresh orders. The movement is gradually finding its way amongst the masses and even Indian women are beginning to show a preference for Indian over foreign goods. Men of light and leading who were hitherto such great patrons of imported articles are now showing, with patriotic pride Indian clothes upon their persons and Indian things in their houses. Shops for the sale of Indian goods are fast springing up everywhere and factories, large and small, are being started for manufacture of articles for which India had to depend upon foreign countries. That this is a matter for satisfaction to every well-wisher of the

country is certain. But there are several factors in the development of the movement which cannot be too prominently kept in sight and upon which the economic progress of the country so largely depends. They are (1) the sympathy and co-operation of the Government along with a much greater progress of technical and artistic education and development of a spirit of self-help among the people, (2) improvement of the quality and quantity of raw material upon which the excellence of all manufactures largely depends, (3) the conditions under which the artisan class of the country has to work, its social environments and organizations and (4) the principles which govern Indian trade at present. All these greatly contribute to the economic progress of a country and in India all these, as they exist at present, shall have largely to be strengthened or modified before we could hope to rival the countries of the west with their capital, co-operation and enterprise, in producing articles of necessity and luxury, in quantities as large and at rates as cheap as they. We in India have not only to labour under the disadvan-

tages of poverty, want of organization and technical skill, but also under social conditions from which other nations with whom we wish to compete are free, and greater, therefore, is the necessity of persistent effort in removing all that stands in the way of our progress.

I shall in this paper briefly discuss each of these factors and try to point out how they can subserve to the interests of the country as a whole. My remarks will be more with reference to the upper provinces which I know, but I believe the conditions in other parts of the country will also be found to be similar.

(1) *Government co-operation.*—The first essential of success in any undertaking, industrial or commercial in India, is the co-operation of the Government with the people. One cannot do without the other. In former regimes it was the Government and not the people which patronized the arts and industries of the country. In fact, the latter owed their existence largely to Government patronage. The people were not of much account and whatever of art there was, was because of the patronage accorded to it at the local court of the day. Now-a-days this has greatly changed and the people are also coming to be a great factor in their commercial and industrial development. But the Government has still a very great share in shaping the future of all Indian trade and industry and shall have it so for some time to come. Unlike other foreign Governments, which own no industrial or commercial concerns, and which only regulate the trade and commerce of their country, by proper legislation, the Government of India is the owner of enormous systems of railways, telegraphs, canals and opium factories and has always taken the initiative in fostering new industries or reviving decaying ones. It now possesses some 28,000 miles of railways costing some 240 millions sterling and a system of canals which irrigate 11 million acres of land. In 1823 the East India Company which then ruled the country, granted special concessions to coffee planters to stimulate the production of that article. In 1819 it did the same with indigo. Large sums of money were invested by it in the silk trade and it introduced into the country the Italian method of winding silk. Its opium monopoly yields a very large revenue which cannot be got otherwise. Its model farms, agricultural schools, bureaus for the investigation of the methods of production of raw material and devising means for promotion of scientific and agricultural education amongst the masses, all

show that it has long abandoned the doctrine of non-intervention with trade in its dealing with India. It has lately established a number of scholarships for natives of India who go to foreign countries to learn mining and such other industries as are of special importance to this country and has now a member for commerce in its highest council. Its Commercial Intelligence Department publishes from time to time correct information as to the various branches of commerce now flourishing in India and its monographs on indigenous arts and industries not only furnish useful material to work upon, but also show the resources at command. It has now in contemplation the establishment of a large Agricultural College at Pusa and is actively devoting itself towards improving the quality of Indian cotton on the initiative of the British Cotton Growers' Association. Its imports of stores annually amount to more than a million sterling and any concern or industry which it patronizes is at once assured of success. It is, therefore, of the utmost importance that it and the people should move together in the matter of the economic progress of India. Without the help the task will be almost impossible of accomplishment.

The first thing in which the Government can help the people is protection of Indian trade and industry. Opinions differ as to whether free trade or protection is good for a country and the advocates of both will be found everywhere amongst thinkers and political economists. So far, however, as India is concerned, there never was any free trade before the advent of the British rule, nor is it suited to the circumstances of the country. If India could at once start new industries in place of those which have disappeared under foreign competition, or if it could manufacture its raw produce into articles for home consumption and only export its surplus, free trade would have, perhaps, been good for it. But, unfortunately, it has now almost nothing but its raw produce to give to the world in exchange for the latter's manufactured goods and often receives its own products with enormous profits to foreign manufacturers. The loss of its hand industries has driven and is constantly driving a large population to agriculture and one famine means the increase in the number of those dependent upon an already exhausted and overburdened soil. Therefore while it may be of great importance to Europe to have free trade, especially in raw produce exported from other parts of the world, to India free trade whether

in the matter of exports of raw produce or imports of manufactured articles from other countries, means so much more drain upon her already diminishing resources. The evil becomes greatly intensified in times of scarcity when grain stocks become exhausted in particular areas and enough is not left for home consumption. In such times free export trade means greater misery to the Indian masses, and the question of regulation of export trade of grain often engages public attention. It is true that there has been a rise of some 25 per cent. in the wages all round in India, but along with it, there has been more than a fifty per cent. rise in prices of all food stuffs during the last 25 years, so that the ordinary agriculturist or artisan is not much better off. On the contrary, he is much worse off than before. There is no free trade in America or Germany, two of the greatest manufacturing and trading countries of the world, after England. There is also no free trade in most British colonies in spite of the protests of English statesmen. The Government of India does not, moreover, leave the Indian agriculturist or landholder freedom of contract and by legislation reduces the interest upon the loans of the one and regulates the sale of the lands of the other. Sometimes ago it levied countervailing duties to prevent the indiscriminate export of bounty fed sugar into the country from foreign markets. It is, therefore, of the utmost importance that in the interests of the Indian agriculturist who forms about 66 per cent. of the population, export of grain be regulated by proper export duties, and, in the interests of the Indian artisan, whose trade is fast declining, imports of manufactured articles from foreign countries, by proper import duties. In the one case it means less taxation, and in the other greater incentive to home manufacture of articles for which India has to depend upon foreign markets. The direct action of Government in the development of Indian manufactures is seen in its factory laws and regulation of hours of labour. But I need not say much upon this question, because by far the largest portion of our industrial population still lives upon hand industries and is not much affected by such laws.

The question of excise duty upon cotton manufactures is also another instance and it is said that the imposition of such a duty seriously hampers Indian manufactures. But as the hand industry is free from any such duty, it need not be discussed here. The Tariff should be capable

of automatic adjustment as in France, so that in times of emergency, it may be reduced or increased. All that need be emphasized here is that the Government having repeatedly declared itself to be in favour of the progress of Indian arts and manufactures and having of late patronized several Indian firms by purchasing their goods for the public service, as well as by devoting greater attention to the matter everywhere. The resources at its disposal will, it is hoped, be even more largely applied in order to assist the people towards fostering the commercial and industrial progress of the country.

II. *Improvement of the quality and quantity of raw produce.*—This ought to be the first to engage the attention of the Government and the people alike. The pressure upon the soil is constantly on the increase on account of increase of population, and lands which 25 years ago yielded a mound of grain, do not now yield half that quantity. All the available lands of a village are taken up for the cultivation of either food grains or stuffs which find a ready market and little is left for pasturage of cattle. The rainfall of the country is getting very precarious every year and men and cattle are always on the verge of famine in some parts of India or the other. The condition of the great mass of our peasantry is a subject of anxious consideration to both the Government and the people, and measures are constantly taken to assist the former but not with success. Says Mr. Crooke: "There is, perhaps, no more pathetic spectacle in the whole range of human history than to watch these patient masses tumbling in their traditional way along a path which can only lead to suffering, most of them careless of the future, marrying and giving in marriage, fresh generations ever encroaching on the narrow verge which separates them from destitution. Anxious statesmen peer into the mists which shroud the future and wonder what the end of all this will be. "North West Provinces" pp. 173-174). Those who think that the hardship and suffering experienced by the poor of other countries are unknown in India except in periods of famine, forget that it is not in the nature of our people to complain or make themselves troublesome to their neighbours or the authorities as do the unemployed of other countries and their sufferings are, therefore, not so publicly known as of the latter. But that the country is getting poorer every year and the pressure on the soil is increasing are facts which can scarcely be

denied. There is here no diversity of occupation worth the name. Agriculture is the only means of subsistence not only to the many who have always lived upon it from time immemorial, but also to the many whom ruin of hereditary industries have left no other occupation but agriculture to follow. Lands which ought to lie fallow are thus tilled for what they can yield. Cattle fodder is getting so scarce that in the Batesar fair in the Agra district grass was sold 16 seers per rupee, the price charged for grain, and many a trader in horses had to return with an empty pocket even though he sold one or two of his best breed. In the Agra district cultivators are now feeding their bullocks not only upon leaves of trees, but also upon choppings of Babul thorns as I was told by the people of my own village there the other day. Every new legislation devised with the best intentions whether in the interests of the landlord or the tenant is increasing litigation and what with an increasing population, an impoverished soil having to support an ever-increasing mass of people, increase of wants due to advent of cheap articles of luxury, increasing expenses of marriages, and other ceremonies, increase of drunkenness in several parts of the country, the prospect is not at all good to contemplate. With the exception of a few large towns like Bombay, Calcutta, Delhi, Cawnpore the majority of our towns are so many collections of hamlets with more an agricultural than an industrial population and even in large towns which are considered to be large industrial centres, the agricultural element largely preponderates in villages. On the other hand, all hand industries are in their primitive condition as they were a hundred years ago. Each village has its own weaver, carpenter, potter, barber, blacksmith supplying its little needs and receiving his customary allowance of grain at each harvest as he did in times past. But the cultivator has not only to meet the demands of these, but also of his Banya who has him in his clutches from generation to generation. He is thus left without anything to fall back upon in times of scarcity and I have seen in several villages of these parts in the coldest weather of the year he has to go without a rag upon his person. In some of the permanently settled districts, he is comparatively better off. But there he ruins himself by indulgence in shows and litigation. In my own experience in the Ballia district of these provinces, agriculturists who own lands yielding as much as 60 mds. of grain and worth as much 600 or

700 rupees per bigha living upon two pice worth of *sattu* (parched rice or barley and yet emptying their purses before legal practitioners and fighting for years up to the High Court for every *dhur* (240th part of a bigha of land). All this requires the most careful attention of the Government and the public alike. We do not require to increase at one stroke the productive power of the land by ten or hundred or 200 per cent. as in Europe or America. Foreign methods of cultivation have been found to be entirely unsuited to India. All that we can do in the face of the present condition of our people, their poverty, and want of education, is to give them such methods of agriculture as they can assimilate. These are elementary education in village and District Board Schools and better training in provincial Agricultural Schools working in harmony and with knowledge of the agriculture of the province, better and more plentiful supply of water through canals, wells and tanks erected in each village or for each group, of villages, better cattle and more manure. Too great attention cannot be directed to the question of well and tank irrigation, and where the Government does not undertake such works, landlords and cultivators ought to be encouraged to undertake them by being assured in practice as they are in theory against enhancements due to such improvements. I have specially noticed this in the permanently settled districts where *pucca* wells and tanks are more common than in temporarily settled ones.

The Government has an Agricultural Department in each province for agricultural research as well as for showing to the people improved methods of cultivation. But its methods are too expensive as well as generally inaccessible to the majority of our people. The department shows improved implements of husbandry, water lifts, sugar mills, at district shows, distributes acclimatized seeds and trains zamindars students as licentiates in agriculture. But its efforts scarcely touch the great mass of the people, because of its being located in one central place as well as of the expense involved. If it had more farms and operations in the districts as in the Central Provinces, it might do better. Even as they are, its schools have done some good. Those of the students who have been trained in its school in Cawnpore are doing good work as practical agriculturists. One of these is now having a farm for improved cultivation of wheat in Gaziabad; another is raising better qualities of Indian corn, barley, potatoes and other stuffs by ordinary me-

thods better supervised in Meerut. A third is having a good business as a seedsman in Sisoli. If, therefore, more zemindars were induced to send their sons to be trained in this way, they will vastly add to the value of their estates as well as make themselves independent of Government employment which they so much hanker after.

The great drawback in all technical education in India in the paucity of the field of employment for those who receive it and it is worth consideration whether special inducements should not be held out to graduates and undergraduates of our Universities to qualify themselves as agricultural experts, by allotting to them a number of Tahsildarships and other posts in Government service where they could come in direct contact with the agricultural population as well as employing them more largely than heretofore in the management of estates under the Court of Wards or large zemindaris controlled directly or indirectly by Government.

The improvement of the breed of cattle employed in agriculture ought also to engage the attention of all who wish to improve the productive power of the soil. Every famine or season of scarcity reduces the number of such cattle or leaves them impoverished and almost unfit for work. As cultivation advances, the area of fodder crops becomes less. Therefore, even in good years there is not much for cattle to spare. In bad years terrible is their fate. In this way their number is now not even  $\frac{1}{2}$  of what it was twenty years ago. With the decreasing number of cows and buffaloes, the supply of ghee and milk both in towns and villages is decreasing every year and no manure is left for fields in the village. The Government keeps stallions in parts of these provinces for improving the breed of horses. I should think bull stallions are more necessary for improving the breed of cows and bullocks and the matter deserves serious consideration on the part of all who are interested in agriculture.

In former times when Brahmini bulls used to be let off, the supply was better. Now-a-days it is difficult to find good bulls in many a village. At most district shows in these provinces while the number of horses and mares shown as well as their breed is very decent, the number and breed of bullocks is very poor. The ordinary cultivator or zemindar has no inducement to improve the breed because he knows that he will scarcely be able to secure a good price for his bullocks as he would for his horses. If, at each show, it were made a point to award as many prizes

for good bullocks as for good horses, some improvement would at once result.

Fodder crops should, moreover, be encouraged in all cultivated areas by remissions of rent or revenue and, in times of famine also not only men but, cattle should be relieved from starvation.

The next great drawback in the improvement of agriculture is the want of manure. The ordinary agriculturist cannot get any manure except what he collects in his own house. In the vicinity of towns night soil manure is always available and is highly prized. Not so in villages where the quantity of refuse collected in houses is very small and each has to use his own.

Leaves of trees or oil-seed cakes which are also good for the purpose are used for cattle to eat and thus the majority of the fields have to go without any manure at all from year to year. The increase of cattle employed in agriculture as well as planting of such trees whose leaves supply such manure is, therefore, of great importance and all owners of landed property cannot too carefully attend to them.

The fact is that without improvement of agricultural produce, no improvement in arts and industries is possible in a country like India. What with ever-changing assessments of rent and revenue, and an overburdened soil supporting an ever-increasing population, the outlook is not very promising. The last Census shows the great inequality in the distribution of the Indian population, for while, two-thirds of the latter live in a fourth of the whole area, only one-third live in the remaining three-fourths, and that while in parts of the United Provinces and Bengal we have 600 persons to the square mile, in other parts like those of Rajputana, we have only five. In the former unless the productive power of the soil is soon increased by better farming or people migrate to less populated tracts, their misery will always be great. "That agriculture is the foundation upon which rests the whole economic structure of India is nowhere so plainly revealed as in the export trade and its remarkable expansion during the last four years, for putting aside gold and other minerals of which a few like coal, salt, saltpetre petroleum, mica and manganese have been developed beyond a rudimentary stage, and none of which figure prominently in the export trade, all, save an almost negligible fraction of the raw produce and articles mainly unmanufactured which form the great bulk of exports of India and of the material for the comparatively small export of manufactured articles, are provid-

ed by its own husbandry, pasturage or forests." (Review of Trade of India for 1904-05 page 2). Our concern is, however, not so much with exports as with home consumption and home industries and for them improved agriculture is of even more vital importance than exports. So greatly attached to the soil are the people of this country that they would not migrate to less populated parts of their own province, much less to colonies outside India, if they could help it, even though they see those of their fellows who had had the courage to do so, coming laden with wealth in a few years. I have specially noticed this to be the case in the most thickly populated parts of these provinces, where I have found people ruining themselves by years of litigation for every inch of land and though left penniless seldom leaving their ancestral village. In this way only ten per cent. of our people are found outside the land of their birth and the necessity of agricultural improvement becomes, therefore, all the more apparent. I need not specify the kinds of produce which require to be produced in larger quantities than heretofore; rice, wheat, gram, pulses, fodder, grains, maize, sugar-cane are all as necessary as cotton or jute, and the attention of the patriot or the lover of progress in India should be steadily directed towards improving the quality and quantity of each of these products.

III. *Improvement of the training of the Indian artisan* is also as necessary a factor in our economic progress as the improvement of the status of the Indian agriculturist. The figures of the last Census show that out of every 10,000 persons in a village while more than 7,000 are landlords, tenants and agricultural labourers, the remaining 3,000 live by simple hand industries of which those employing more than 100 persons are owning cattle and selling milk, fishing and plying boats for hire, oil pressing, basket making, and cotton spinning and weaving. Carpenters and blacksmiths also form a fair number. In towns the number of persons dependent upon agriculture is much less. There we find about 4,000 out of 10,000 living by preparation of articles of food and drink and supply of material substances and about 1,200 by commerce. In large cities like Delhi, Ahmedabad, Amritsar, half the population lives by the supply and preparation of such substances because of the growing mill and other industries there. In Bombay one-seventh of the population lives by working in mills while the jute mills of Howrah, support one-eleventh of its total population. This shows how important it is

to improve the status of the artisan for the purpose of our economic development. The ordinary artisan be he a smith, a weaver, a carpenter, a mason, a painter, or of any other trade, though not without skill and always possessed of much patience, is generally without any education or organization worth the name. Working with tools which are often worn out or are out of order, and wedded to methods of work at once crude and primitive, it is a wonder he turns out the work he does. His habits are simple and contented and he goes without showing any inquisitive turn of mind. His work, unless carefully supervised, is, however, generally unmethodical and unpunctual, and he has, therefore, to be content with far less wages than his English or even his Chinese compeer. In his anxiety to produce cheap articles now required by the trade or pander to the taste of his foreign customers, he is fast losing his old artistic designs and adopting artificial ones to the ruin of his trade. His secrets of trade are never published to the world but descend from father to son or master to apprentice and his trade even in his own specialities is declining both on account of not keeping pace with the progress of scientific education amongst the artisans of other countries and its application to arts of life. Clever in the rule of thumb, he requires his eyes and hands to be largely trained before he can dispense with his rule and compass. Wages are rising everywhere and the demand for, not only skilled but also for ordinary, labour in each profession is greater than the supply. A good carpenter or blacksmith can get from Rs. 25 to 30; an ordinary one from 15 to 20 a month. But while thousands of young men with Matriculation certificates will be available for even 10 or Rs. 15 and many a graduate for Rs. 30, it will be difficult to get a good carpenter or blacksmith for that sum. The reason is that hand labour does not possess the same dignity in India as it does elsewhere. Here a clerk or accountant or one who follows a gentle profession and slaves at it all his life in an office, is looked upon with greater respect by his countrymen, than a carpenter or blacksmith or mason unless he happens to be very rich. A Deputy Collector who does not rise to Rs. 800 even after 25 or 30 years of service and who has to be at his desk all day long, is much more honored than a merchant whose income is five times that sum. Government service in India has a charm which it has nowhere. This accounts for the inattention of our people to artistic professions. The times are, how-



ver changing. In Bombay the Parsees are fast qualifying themselves as engineers, mill managers and superior artisans. In the Punjab the Tarkhans (carpenters) are also coming out as engineers, and it appears that the dignity of labour will soon be recognized in the country. This low estimation in which the artisan class is held is partly due to the place assigned to it by Hindu and Mahomedan religious traditions and partly to the want of education and the absence of regular scientific training possessed by the majority of our artisans from time immemorial. Caste prejudices are also great factors in this respect, and in communities and institutions where they are not recognized, the inmates soon prove better artisans than those of the bazaar.

The first thing, therefore, necessary is to improve the theoretical education of the Indian artisan. There are, at present, several technical and art schools in India. But they do not attract students from the artisan class, because the system of instruction is not in touch with the habits of the people. Amongst them the old system finds more favour both on account of comparative inexpensiveness as well as of its not involving separation from family at an early age. Under this system a boy is apprenticed at his father's or at a relation or friend's shop at the age of eight or ten. He is given the rougher and the more elementary portions of the trade to begin with and acts as a menial servant. As he advances in knowledge of work, he is given the finer and more complicated portions, till he takes his proper place in the firm. In this way hundreds of our lads are trained in shops and factories without any cost to their parents and with no indentures and prove useful before they are out of their teens. The system has, however, this disadvantage that the pupil cannot become a greater and more skilled workman than his master and the trade thus remains where it was. What is required is to adapt this system of apprenticeship to modern scientific education in technical schools and institutions. We have the Victoria Jubilee Technical Institute, the J. J. Art School of Bombay for higher technical and artistic training. They are doing much good work and similar institutions are required to be established in all the chief trade centres of India. We also require technical and industrial schools in each district managed by its local and District Boards with workshops attached and working in harmony with the artisans of the place, recognizing and patronizing those who come to them for such recognition. In this way the technical

and industrial education will soon gain in popularity and the very fact of recognition by a local or Municipal Board or the Government will make the scheme a success. In Bengal they have about 28 industrial schools of which only 6 are maintained by District Boards and one by the Government. The average attendance is about 105 and the cost to Government about 4,500 and to Local Boards about Rs. 18,000 or 19,000. In the United Provinces there is no school under any local or District Board and only one industrial school at Lucknow with only 98 students of which two are sons of artisans. The total cost to Government here is about Rs. 19,000. In Madras they have a school of arts as well as a number of District and Local Board Schools with a cost of some Rs. 75,000 to the Government. In Bombay there are about a hundred of such schools with several institutes possessing a large number of pupils. These institutions are, however, not so managed as to be in touch with the habits and traditions of those for whom they are intended.

The fact did not escape the notice of the Committee appointed by the Government for the promotion of industrial education, who, in para 57 of their report, said: "The prospects of industrial progress in India must, for many years, largely depend upon the attitude adopted by the hand-workers of the country. For these instruction and improvement can only be satisfactorily secured by enlisting the sympathy and co-operation of their leaders, without any attempt to break suddenly with the methods and organizations that have, for centuries, controlled the progress and destinies of the craftsmen." As matters stand, each trade in India now forms a distinct caste or class and distinctions which to a foreigner seem unmeaning or absurd are here observed with a rigidity unknown in other countries, preventing the member of one trade from taking up the occupation of another. Without going into the question of the functional origin of caste, it may broadly be stated that while cultivation of the soil and field labour are open to all and can be followed without restriction by the highest as well as the lowest, the same is not the case with handicrafts. There only one can take up a craft which is not prohibited by his caste rules. A Brahmin can, for instance, act as a priest, a water bearer, a cook, a watchman, a peon in an office, or as a labourer breaking ballast on the road, or carrying loads, but never as a smith, a carpenter, a cobbler or a fisher-

man, and when some time ago two Kashmiri Brahmin brothers of Agra broke through tramels of caste and apprenticed themselves to a leather factory in Cawnpore, great was the howl raised by their people. They, however, withstood it manfully and came out as experts in leather and the opposition, be it said to the credit of the good sense of their community, died out. In other communities, more unreasonable, they would have been outcasted for ever. The same applies to Kshatriyas, Vaisyas, Kayasthas and other superior castes. None of them except inmates of institutions where these restrictions have been relaxed, can take up any occupation not followed by his community. Amongst the lower classes the number of professional castes is quite bewildering and each branch of a trade has come to constitute a caste with strict rules as to intermarriage and interdining which no one is at liberty to break. For instance, amongst workers in metals, the goldsmiths are a distinct caste from the blacksmiths, the braziers from the *thateras* who repair old vessels, the *mochis* who prepare harness, from the *chamars* who skin cattle or tan leather the *kewats* (boat men), from the *dhivears* who are fishermen. Thus an oilman can only have the option of taking up field labour in addition to his own trade, so also can a washerman, a weaver, a dyer, a *chamar*. He cannot take up the work of any other trade without incurring social disability. In some parts of the provinces, for instance, in the eastern districts, trades which are followed in the western districts by three higher castes, can only be followed by special castes. The confectioners in the western districts may be *Dravmins*, Kshatriyas, or Vaishyas, in the eastern they form a separate caste. On the other hand, some of the professional castes who claim to belong to one of the higher castes, and even observe their rules, are not allowed to mix with the latter, nor is a member of any of the higher castes who takes to their business, allowed to mix with them. Thus a carpenter who calls himself an Ojha Brahmin, a grain parcher or tailor who calls himself a Kayastha, a toddy drawer who calls himself a Vaishya, is not allowed to mix with the members of these castes proper, nor is a member of these castes who takes to the profession of a carpenter, a tailor or toddy-drawer, admitted into the fraternity of the latter. Amongst Mahomedans also, there are occupation castes like those of tailors, dyers, water carriers, musicians, drummers, wire-drawers, engravers,

but they are not so rigid as amongst the Hindus. On the contrary, a couplet is often cited to show how with the increase of his prospects in life one can rise from class to class and be ultimately recognized as belonging to the highest. "I was formerly a weaver, then I became a Shiekh, as grain becomes cheaper I shall become a Sayad." Instances of this are within every one's recollection in these provinces, and I know of a most charitable gentleman who was a butcher in Meerut, coming to be recognised as a leader of the Mahomedan community of the place on account of his wealth and public spirit. His parties were attended with pleasure by the highest and the best amongst both his own people as well as amongst Europeans. His habits were simple and his charities very large. His brother who is just dead, was, after his brother's death, made a Companion of the Indian Empire and his successors are now the foremost people amongst the Mahomedan society of Meerut. In other parts of the country, for instance, in the eastern districts, with the weavers of Mau and Mubarkpur and parts of Azamgarh, this is also the case. Amongst Hindus, it must be confessed with regret, there is no such liberty and a Chamar of Agra who had amassed wealth in trade, although he became a good manufacturer and employer of labour from castes superior to his own, was not recognised other than as a Chamar. The Mahomedan has also the advantage of a better physique due to his not marrying so early as the Hindu, and but for his spendthrift habits, he would be a much happier man than now. In Delhi, Agra, Benares, Azamgarh, the best weavers, painters, enamellers, engravers, carpet-makers, embroiderers, book-binders, pyrotechnists, will be found amongst the Mahomedans. Some of them have earned rewards and medals in exhibitions held outside India. The Hindus also excel in some trades such as goldsmiths, setters of stones, potters, etc., but, generally speaking, there is more artistic skill amongst the Mahomedans, than amongst the Hindus. In clay modelling the Hindus of Delhi have shown special aptitude and a potter ghazi there, got so famous for his models that he could make a life size figure true to nature of any object animate or inanimate, by merely seeing its reflection in water. In wood carving also the Hindus still hold their own against others. In commerce they are better off and the Marwaris, the Vaisyas, the Khatrias, the Bhatias lead the market every-

where, and only those branches of commerce which they cannot take up, for instance, dealing in hides or bones or leather, are left solely to the Mahomedans. In Upper India with the exception of the Punjabi Mahomedans and in Bombay with that of the Memons, Bohras and Khojas who are Hindu converts, the trade is all in the hands of the Hindus because in commerce caste restrictions are not so rigid as in industry. There the follower of one branch is allowed to mix with the follower of another, provided he is of the same caste. All these trades and professions as well as branches of commerce have their punchayats and unions, some strong enough to regulate the course of trade in their community, others merely concerning themselves with caste matters. Some of these institutions are very powerful. The Marwari Chamber of Commerce or punchayats everywhere leads the local market. In Delhi the cloth merchants' punchayat prevent every one of their members who is about to fail and who places his assets at its disposal, from being ruined by litigation. In Ahmedabad a section of the Vaishya community who are large mill owners on my initiative, at once started a powerful association for helping the people of the caste. In Amritsar the Nuriagot Vaishyas regulate the piece-goods trade of the place. In Cawnpore the brokers and the commission agents would not accept the terms of the Marwaris, and have lately formed themselves into a large joint stock company and have brought the Marwaris down. In Agra the cloth merchants have an organized system of charity. In Meerut the grain dealers levy a certain percentage for the relief of the inmates of our orphanage. Amongst the lower classes punchayats are even more powerful institutions, but only in caste matters, except it be in places like Lahore or Ahmedabad where some of them flourish in the shape of trade guilds and regulate the course of trade. All this has its good as well as its bad side. It secures specialization in trade and preserves trade secrets. But it also encourages narrow-mindedness and caste prejudice and seriously hampers progress. In some cases where the spirit of exclusiveness is very strong, it threatens destruction to the trade and instances of a once flourishing profession being now found amongst a few decaying families are everywhere common. This institution of divisions which now constitute so many castes, is now too deeply engrained in our social polity, to go for many years to come. If it can only be

relaxed by making at least those of a trade who follow its separate branches mix and work together and freely exchange professions, as in commerce, a great step shall have been gained. More than this it would be premature to hope for. The matter was carefully discussed by the Industrial Education Committee and they were also of opinion that in order to make the system of supervision of hand industries through a staff of experts entertained in each province successful, we must work in co-operation with the punchayats of each trade and that measures taken in co-operation with such punchayats, would be far more popular and be received with far less suspicion than those taken independently. Those who know the feelings and habits of our people can testify to the truth of this and it has been found in practice, as in our own Vaishya Mahasabha, that any scheme of co-operative trade or banking undertaken with the help of our own members is more successful and dispenses with the necessity of appealing for outside help, than any which seeks to bring all the castes together. The same is the experience of many European thinkers also, and, according to them, caste shall always have to do largely in every system of co-operative trade or manufacture. Much as we regret this exclusiveness, we have to take these forces into account and work with and not against them.

*IV. What is next required is a complete industrial survey and a complete system of technical and commercial education.* The lines suggested by the industrial education Committee in respect of the latter are (1) the appointment of a Director of Industries and industrial instruction, (2) research, experiment and instruction under his guidance in textiles and silk in Bombay, metal work in Madras, pottery and China ware in the Punjab, glass making in the United Provinces, sericulture in Burma and the Central Provinces, and lacs, tans and dyes in the Indian Institute of Science, (3) advances to artisans who are willing to train apprentices, (4) revision of the law regarding indentures of apprentices, (5) training of artisans in Railway workshops, gun carriage factories, duck-yards, harness factories and presses belonging to the Government, (6) recognition of private firms and giving them Government orders on condition of their training apprentices, (7) prescribing tests for industrial skill in consultation with committees of heads of trades and, (8) guarantee of interest to private individuals who start new industries on the capital employed. For each province they recommended the appointment of a chief

Inspector of Industries and under him of persons skilled in each of the principal industries of the province, the training of such inspectors, in the institutes, of industrial experiment as well as in Engineering Colleges, the recognition of firms willing to train apprentices under a system recognized by Government, the encouragement of trade guilds and carrying out of the work of technical instruction in workshops through them as well as through the punchayats of each trade, and the establishment of night schools for the instruction of the artisans engaged in work during day time. This scheme has not yet been carried into effect. I should think that even if the portion regarding the recognition of certain workshops in each town for training apprentices, by giving them Government Municipal and Local Board orders, be sanctioned, much good will at once result. Speaking of the United Provinces, there are large tracts of the country in the Etah and Bijnor districts where material for glass making can be had in unlimited quantities and where any experiment in this branch of industry will at once show how we could save a large portion of the money that now goes out in purchase of glass-ware from other countries. India imported in 1904-05 glass-ware worth more than a crore of rupees and it is a matter for serious consideration, how, at least, a portion of this money would be saved by making, if not the finer at least, the rougher kinds of ware by utilising the services of men already trained in that work locally. The same applies to many other industries especially cotton, sugar, lacs, tans and dyes. Here also we have abundant raw material in the country and all that is necessary is improvement of quality in such manner as to compete with foreign manufactures, if not in all, at least, in the rougher kinds. But even more important than the establishment of a research institute is an industrial survey for the whole of India. The matter was urged upon the attention of Government by Dr. Forbes Watson as far back as 1872. He was of opinion that each kind of produce must be accurately described, the different varieties distinguished, the places and methods of production ascertained, the industrial and commercial value investigated and the question of supply and utilization discussed, and when all this has been done, provision must be made for rendering such knowledge easily accessible and available for immediate reference not only by Government authorities, but by agriculturists, manufacturers and men of business generally." The work could not, according to him, be under-

taken by any private body but by the Government. "Such a knowledge of the country, as is here demanded for India, is in Europe the accumulated result of the efforts of many successive generations, the work of legions of pioneers of enterprise who, pushing on from experiment to experiment and from failure, to failure have revealed to the country by their final success the secret of its resources. The whole of the advanced portion of Europe is, in consequence of the development of commerce, covered by a net work of private agency, the express purpose of which is to indicate to the consumer the best sources of supply and to offer to the producer the means of realizing his products. A similar organization exists, of course, in India also, but only in a rudimentary state and restricted to a few principal towns and to a few of the principal staples although, no doubt, it would grow in time by its own efforts. To shorten, however, in India the period of preliminary trials and unavoidable failures, and to hasten the advancement of the country appears to be in the power of the Government which, although unable to take the place of private enterprise, may promote enquiries which will facilitate the task. Public as distinguished from private action, assumes, therefore, in India much larger proportions than it does here and this has always been admitted to be the policy of the Government of India. Much has already been accomplished with respect to opening the country by means of information. The trigonometrical, topographical, revenue and geological surveys, have been undertaken on a scale of, perhaps, unprecedented magnitude. It remains to complete the industrial survey which shall take stock of all the various productions of the country agricultural, forestal, pastoral and mineral, of manufacture of the localities, of production of the varieties, qualities and values of the produce, its supply, mode of distribution and consumption. Much good and useful information on these points has since been made available by the Dictionary of the economic products of India as well as by the various Gazetteers, Imperial and Provincial and special monographs published from time to time by the Government. But there has been no complete industrial survey of the country yet. The work is one of great magnitude and every patriot should do his best, at least, for the sixteen industries of cotton, vegetable oils, leather, iron, fish, wood, fibre, pottery, sugar-cane, dress, tea and coffee, milk, minerals, masonry and silk, and that amongst those who claimed immediate attention were the oilman

the potter, the leather worker and the fisherman, and last, but not the least, the weaver. Such a survey cannot be undertaken too soon and should be undertaken by the Association for industrial advancement. It would, perhaps, facilitate work were committees organized in each province with District Committees working under them and even though the information collected be not so complete as that collected by Government, yet it will encourage a spirit of self-help and research and at once give some impetus to both local and provincial enterprise amongst the people in directions most needed. The information will, perhaps, be more popular than any published by the Government, and should be collected as soon as possible. Directories of not only mill and factory industries, but also of the principal hand industries of each place should be prepared on the lines indicated in Dr. Forbes Watson's paper and the names of the chief manufacturers noted and their prices given. Such Directories will be of great use to those who do not now know where a thing required can be had, of what quality and at what price. If the Indian Industrial Conference publishes such a Directory even for each province every year or two years it shall have amply justified its existence. India which has hitherto had hand labour guided by custom, is now face to face with steam and electricity guided by experts. Ignorance and idleness are now pitched against organized skill and science and it will tax her resources to the utmost before she could hope to come out well of the struggle. We cannot and ought not to do away with our hand industries, our artistic designs and exquisite patterns which have always challenged the admiration of the world. But we shall have to adapt our hand industries to the time and so mould our manufactures and commerce as to save them from further destruction under foreign competition. In Europe trade is now conducted under keen and fierce international competition and each nation has to be as business-like, as thorough in trade and manufacture as in war, before it can hope to hold its own against its neighbours. India shall also have to realize the fact sooner or later. One great complaint against the Indian method of doing business is that it is very unbusiness-like; unpunctuality, want of uniformity of quality, short lengths, short weights, absence of fixed charges are some of the complaints made, to the great detriment of native trade. All this shall have to be largely modified before our traders can command the same confidence in the trade market as other people more

punctual, more business-like than they do. Experience shows that unless carefully supervised, the work of an Indian workman is unmethodical and indifferent in quality and constantly diminished in quantity. Many an Indian or European who would gladly patronise an Indian firm, is forced to go to a European because although the prices charged are higher, there is more punctuality and honesty in dealing. Amongst the higher ranks of the trade there is as much honesty amongst the Indians as amongst other people, but it is not yet a general characteristic of our business people. In all wholesale centres for sale of piece-goods, a broker goes to the wholesale dealer, shows a sample of cloth and offers to purchase a certain quantity. A regular higgling follows and unless the purchaser is cautious, a slight alteration in the quality of goods delivered is not impossible. An artisan acquires some reputation for his wares. As orders begin to come in, he does not scruple to substitute inferior goods for those he generally makes. To ask for one price and take for another is common in all ranks of trade, while to change artistic indigenuous design, for hybrid foreign ones under pressure is not rare. All this will have to undergo a radical alteration before it ceases to be an obstacle in the way of our economic progress.

The last great feature in our industrial and economic progress are local and provincial exhibitions. In Europe they have always been reckoned as great stimulants of trade and industry. In India they are also becoming the same. In European exhibitions there is, however, a little too much of artificiality which ought to be avoided in India. Our exhibitions to be useful should not aim too high. For instance, if they are to be local exhibitions for a district or province, they should aim at showing the things made in that district or province more than those made throughout the whole of India as well as encourage and improve more the local or the provincial than the Indian trade or industry. In this way the accumulated result of many local and provincial exhibitions will be a great gain to the whole of the country. All-India Exhibition like the one now held with the Congress is also necessary, and I would encourage to it as well as to all local and provincial exhibitions, visits of artisans and traders free as well as show them better methods of work. In the United Provinces the Nauchandi Exhibition at Meerut and the local shows at Aligarh, Bulandshahar, Muzaffernagar and other places have proved useful in reviving many a useful local industry and I would have such a show in each dis-

strict every year under the management of its local and Municipal Board.

These are some of the chief factors in our industrial and economic development, and each of them requires to be carefully strengthened before we can hope to secure it to the desired extent. As the world is now constituted, no country on earth can afford to be independent of every other country as in times past, when facilities of communication were fewer. But no country in the world is so dependent upon every other country in the world as is India of to-day for every little need in the shape of manufactured articles. Such a prospect is not a hopeful one to contemplate and it ought to be the care of every Indian patriot to see that much of this dependence is removed. We have now to face two problems, the first how to make ourselves as little dependent for articles of neces-

sity upon imports from foreign countries as possible, and, second, how to find food for the forty and odd millions now going through life upon insufficient food, upon the many more who are every year crowding upon an already impoverished soil and to secure useful and honorable employment for the yearly increasing number of young and intelligent men of education who, having nothing better to do, have to swell either the ranks of an already overcrowded Government service with little prospects of promotion till the best years of life are over or of the bar or medicine where the prizes are few and blanks many. The only solution of the difficulty lies in making the country better, more industrially and agriculturally like Germany or America and towards this the efforts of every one cannot be directed too soon.

## THE INDUSTRIAL DEVELOPMENT OF INDIA.

By SIR GUILFORD MOLESWORTH, K. C. I. E.

INDIA presents the strange spectacle of a country, formerly rich, prosperous, and in a manner highly civilized, of which the native industries are now decadent, being crushed out under the stress of modern civilization, and progress.

Of India's vast population of 300,000,000 souls, about 60 per cent. are supported by agriculture. This leaves a large residuum available for other industrial purposes, but the arts and crafts for which India has been so justly celebrated,—whether metallurgical or textile,—whether of cutlery, glass, pottery, silks, carpets, or other industries, are dead or dying.

Throughout the country may be found old slag-heaps, testifying to the former prosperity of native iron industries,—the splendid native iron being now superseded by cheap worthless metal of foreign manufacture. Everywhere may be seen evidence of flourishing industries of the past, whether in the huge forty-ton brass gun of Bijapur; in the great iron column of the Kutub,—in the magnificent inlaid marble, the fretwork and the carving of the tombs, palaces and mosques. It may also be seen in the glass, pottery, shawls, carpets and silks in the toshikas of many of the Rajahs, and also in the ruins of indigo factories. "Why keep India?" write-

a shallow thinker in the *Contemporary Review*. "India is of no use at all to us. We should be richer, stronger, better and happier without it. We are cramped, distracted, and impoverished by it."

Lord Lawrence, wrote in 1864:—

"India is, on the whole, a very poor country. The mass of the population enjoy a scanty subsistence."

Lord Mayo, wrote in 1871:—

"I admit the comparative poverty of this country, and am convinced of the impolicy and injustice of imposing burdens on the people which may be called either crushing or oppressive."

Instances might be multiplied without number to prove the poverty of India.

In connection with this subject, I may quote the following from an article which I contributed to the *Calcutta Review* more than twenty years ago:—"India, the land of the pagoda tree! India, the mine of wealth!! India, the wonder and admiration of Marco Polo, and of travellers of former times!! India in poverty!! Midas starving amid heaps of gold does not afford a greater paradox: yet here we have India, Midas-like, starving in the midst of untold wealth.

For India has untold wealth: wonderful natural resources, whether agricultural, mineral, or industrial, but they are, to a great extent dormant.

It has coal of an excellent quality, it has fine petroleum, large quantities of timber and charcoal: it has iron, of a purity that would make an English iron-master's mouth water, spread wholesale over the country in most places to be had by light quarrying over the surface: it has chrome-iron capable of making the finest Damascus blades, manganiferous ore, splendid hematites in profusion. It has gold, silver, antimony tin, copper, plumbago, lime, kaolin, gypsum, precious stones, asbestos: soft wheat, equal to the finest Australian, hard wheat, equal to the finest Kabanka. It has food-grains of every description: oil-seeds, tobacco, tea, coffee, cocoa, sugar, spices, lac, dyes, cotton, jute, hemp, flax, coir, fibres of every description: in fact, products too numerous to mention. Its inhabitants are frugal, thrifty, industrious, capable of great physical exertion, docile, easily taught, skilful in any work requiring delicate manipulation. Labour is absurdly cheap, and the soil for the most part wonderfully productive."

Ball, in his "Economic Geology of India," says:—

"Were India wholly isolated from the rest of the world, or its mineral productions protected from competition, there cannot be the least doubt that she would be able, from within her own boundaries, to supply nearly all the requirements, in so far as the mineral world is concerned, of a highly civilized community." I may add that this remark is applicable not only to mineral products, but also to almost every other article of produce. The coal-fields, as far as they have been explored, cover an area of 35,000 square miles, and are estimated to contain 20,000,000,000 tons of coal. In Bengal and Assam there is coal nearly equal in evaporative power to medium Welsh steam coal, though inferior to Aberdare. In some parts of India the supply of iron ore is on a scale of unparalleled magnitude, whole hills and ranges of it being of the purest varieties. There are also available in India millions of potential horse power, in the form of water flowing from the mountain ranges, capable of being converted into electrical energy at generating stations near the hills, and conveyed with slight loss to centres even at very great distances, where it can be utilized for industrial purposes.

There is plenty of capital in India. The amount of wealth now hoarded in the country has been estimated at about £ 550,000,000: but neither this, nor British capital, will flow to a market in which its operations are checked, and its struggling

industries swamped by unlimited foreign competition.

British capital, for the most part, has been attracted only by heavy guarantees from Government. For many years the Government had to struggle against the adverse pressure of those shortsighted critics who have denounced it as "plunging the country into debt and inevitable ruin. There can be no doubt that at the outset the interest required for the construction of large irrigation works and railways put a heavy strain on the revenues of India, and it is only in recent years that it has emerged successfully from the ordeal. These works are now yielding a large and increasing revenue to the State, a revenue which, to quote the words of Lord Curzon, has left India "better equipped to face the many problems which confront her:—stronger and better guarded on her frontiers, with her agriculture, her industries, her commerce, her education, her irrigation, her railways, her army and her police brought up to a higher state of efficiency, with every section of her administrative machinery in better repair;—with her credit re-established, her currency restored, the material prosperity of her people enhanced, and their loyalty strengthened."

Some of the manufactures of India under British capital, and especially that of cotton and jute, have increased, but it has been uphill work, and the development of these industries falls very far short of the magnificent potentialities of the Empire, and is not commensurate with the advantages which have been gained by the Public-Works policy of Railway extension and irrigation works. These have enabled the State to relieve some of that dead weight of taxation which burdens the agriculturists,—by remission of land revenue, by advances to cultivators for seed, and by reduction of salt-tax and income-tax.

About three years ago, Mr. Nilkanth Wagle, B. A. read a very careful and able paper at the Society of Arts on the industrial development of India, in which he pointed out that, some forty or fifty years ago, Japan was as backward as any Eastern nation, but that she had developed her resources "from within," or, in other words, by the people in conjunction with the Government: and he has quoted the advice given by Principal Dyer to the Government of Japan in 1877, shewing that the want of faith which the people then displayed in industrial enterprise, prevented what money there was in the country being usefully employed, and that, until confidence had been established in the practicability of such works, it

was necessary for the Government to take the lead, and give such assistance as might be necessary; taking care, however, to give it in such a manner as really to encourage private enterprise.

The success of this policy has been apparent in the wonderful development of Japanese industries. The Government of Japan brought out a very able staff of specialists and drew out a scheme of technical education which included everything required to enable her to occupy her proper place among the manufacturing nations of the world; and native talent was not only educated, but employed in the different manufacturing departments which were the property of Government.

It is now the accepted policy of the Government of India to render India practically independent of external supplies as regards her army, by establishing Government factories in various parts of the country for the manufacture of arms, ammunition, clothing, saddlery, equipment and munitions of war. There is no reason why this policy should not be extended to her State Railways and other Public Works, and to the needs of the country in general. There is no reason why she should not establish technical guilds, like that of South Kensington, in which the natives might first receive technical education, and be afterwards apprenticed, and obtain workshop training and subsequent employment in the different State departments or factories.

There is no reason why the Government should not develop agricultural industry in the same way that it has embarked in forestry, using the lands reclaimed by irrigation. This might serve as a school of agriculture generally, and especially for the improvement of the staple of cotton. India formerly produced excellent cotton, but it has degenerated, and is now short in staple. The Inspector-General of Agriculture has declared that our knowledge of indigenous cotton is incomplete, and that its degeneration is not due to inferior cultivation or exhausted soil; that the black cotton soil is very fertile, and he has attributed the deterioration in staple to the continuous use of unselected seed. Others say that the short staple is due in a great measure to careless and improper cropping. Be this as it may, there can be little doubt that if cotton-growing had been fostered the quality could have been improved, and the quantity increased, so that England would not now have been dependent on the speculations of American cotton rings for her supply. It is difficult to overrate the importance of agriculture in any country. Adam Smith has said:—"No

equal capital puts into motion a greater quantity of productive labour than that of the farmer. Not only his labouring servants, but his labouring cattle, are productive labourers. In agriculture, too, nature labours along with man; and though her labour costs no expense, its produce has its value, as well as that of the most expensive workmen. . . . No equal quantity of productive labour employed in manufactures can ever occasion so great a reproduction. . . . The capital employed in agriculture not only puts into motion a greater quantity of productive labour than any equal capital employed in manufactures, but in proportion to the quantity of productive labour which it employs, it adds a much greater value to the annual produce of the land and labour of the country, to the real wealth and revenue of its inhabitants. Of all the ways in which a capital can be employed, it is, by far, the most advantageous to the society." (Wealth of Nations, Bk. II. Chp. V.) Adam Smith has rightly insisted on the great value of "internal" (or as he terms it "home") as compared with "external" trade. He says: "The capital employed in the home trade of any country will generally give encouragement and support to a greater quantity of productive labour in that country, and increase the value of its annual produce more than an equal capital employed in the foreign trade of consumption; and the capital employed in this latter trade has, in both these respects, a still greater advantage over an equal capital engaged in the carrying trade." (Wealth of Nations, Bk. II, Cap. V). I cannot agree with those who argue that there is no market for the produce of Indian industry. As regards internal consumption, statistics of our imports show that there is a large and increasing demand; and the very development of industries would increase that demand. Sugar, for instance, is one article which India is in a position to supply as cheaply as any country in the world; yet in 1903 sugar, probably bounty-fed, to the value of nearly £4,000,000 sterling has been imported into India. Twenty years ago the wheat crop of India was nearly 36,000,000 quarters or about 14,000,000 quarters in excess of the total imports of wheat into Great Britain for the year 1902: and in the Punjab alone there is cultivable waste-land sufficient to produce 12,000,000 quarters, besides large tracts in Burma and other parts of India, only requiring irrigation or population to bring them under the plough. If India, had, by preferential treatment with regard to foreign wheat,



the inducement of a steady and certain market to grow wheat, there can be no doubt that her cheap labour and low railway rates could enable her to supply England with all the wheat she requires at rates as low as, if not lower than, those at which the United States now supply it.

The most important question at present is how to relieve, as far as practicable, the burdens on agriculture.

Capital is necessary for all industries, but, as I have already observed, it will not flow to those markets in which its operations are checked, and its struggling industries are swamped, by unlimited foreign competition. More than thirty years ago, Sir Lepel Griffin wrote an article in the *Fortnightly Review*, urging the great desirability of imposing duties in India to encourage Indian arts and manufactures, and for revenue purposes, and to raise the dead weight of taxation from the land.

For this purpose he thought protective duties might very justly and beneficially be imposed on India. But the question should be decided, not on English grounds, or by English people, in England, but by the Indian Government in the interests of India alone.

It has been pointed out by a very high authority that, "whatever may be the merits of free trade, as a system suited to these or those national circumstances, it probably carries with it a defect of its qualities in inducing too great apathy towards the exertion of Governmental action in trade matters. Non-intervention and *laissez faire* may easily degenerate from a conservative principle into an indolent attitude of mind, and then it is politically vicious."

The imports of India are large, and a moderate duty on them, which would not be felt by the masses, would not only materially aid the development of India's industries, but would raise a revenue that would afford a much needed-relief from the dead weight of taxation on the land. Such a policy, at the outset and during the stage of development, might involve slightly increased cost: but there can be little doubt that eventually it would be productive of considerable economy and general prosperity, nor would it increase the price of food, for India, in addition to the food consumed in the country, now exports to other countries more than 78,000,000 cwt. of food grains, neither could it affect the small articles of general use for the native agricultural labourer.

Moreover, experience has proved beyond all

doubt that protective duties, if moderate, do not increase the cost of articles taxed.

It may be taken as an axiom of political economy that, as a general rule, when an article is of home production (or, in other words, when it can be produced in the country), the tariff, if it be moderate and not prohibitive, stimulates production, promotes general competition, kills foreign monopolies, and, in some cases, actually reduces the cost of the taxed article.

But if the article be not one of home production, and cannot be produced in the country, or if the tariff be so high as to be prohibitive in times of scarcity, the duty will increase the cost of the article.

Innumerable instances have occurred, both in the United States and also on the Continent of Europe, in which the imposition of a tariff has been followed by a fall in the price of the article taxed.

The "American Economist" of Oct. 2nd, 1891 published a list of 55 articles in common use, all of which had been reduced in price after the imposition of the McKinley tariff.

Unfortunately, India's interests have been subordinated to English policy and to the extraordinary belief in the virtues of free-trade, which has been generally held by the British public, until it was awakened from its delusion by the startling speech of Mr. Joseph Chamberlain at Birmingham, in May, 1903; and England began to discover that, under the policy of free-trade, Britain's commercial and industrial supremacy was waning, her agriculture ruined, her industries struggling hard for existence, and many of them, like those of India, crushed out.

The origin of England's belief in free-trade is not difficult of comprehension. Great Britain had acquired her commercial and industrial supremacy,—as well as her position as the great capitalist nation of the world under a policy of strict protection; and before the introduction of free-trade in 1846 she commanded all the markets of the world; she had developed her coal, iron and textile industries and had a complete monopoly of them. Almost coincident with, but a few years before the adoption of free-trade, an extraordinary era of prosperity sprang up throughout the whole civilized world. This was due to numerous improvements in arts, science, and inventions as well as to improved communication by railways, steam navigation, and telegraphs, which made such rapid strides during the second quarter of the nineteenth

century. All other civilized nations shared this prosperity, but England from her position as capitalist, being first in the field, and having the command of all the markets in the world, was in a better position than any other nation to the advantage of this altered condition of affairs. She not only supplied manufacturing machinery and railway materials for the whole world, but, as capitalist, furnished the funds for every public work abroad, with the understanding that plant and materials of every description should be supplied from England. The value of her investments increased enormously with the rapid development of the countries in which they had been invested; and she has been enabled to re-invest the interest on these investments, so that her wealth as a capitalist has become enormous and must now amount to many thousand millions sterling. Then came the great rush of gold from the Australian and Californian discoveries, causing an expansion in the currency of the world, which is always accompanied by increased activity of trade.

The English people, generally satisfied with this rush of prosperity and wealth, accepted, without enquiry, the persistent claims of the advocates of free-trade for this result, and this idea has been so thoroughly ingrained into the British mind that it has required no small moral courage to question it.

For a considerable time England with her great advantages, having been first in the field, was able to hold her own, but, as soon as foreign Protectionist nations were able to avail themselves of these industrial conditions, they successfully competed with Great Britain, even in her own markets, and now England is flooded with productions of the very nations which she formerly supplied, crushing out her industries, in the way that India's industries have been wrecked.

England now stands alone (excepting Denmark), as a free-trading nation, but the commercial and industrial supremacy which she once enjoyed is rapidly waning, and although she still remains a rich capitalist country, her wealth is almost entirely due to the enormous interest on the investments she has made in those countries which have since developed with the general advance of the world.

British colonies are becoming more and more Protectionist, and are flourishing under that policy.

In the United States the periods of protective tariffs have been uniformly marked by prosperity, and the periods following their several repeals have been marked by depression of trade and distress.

Direct taxation in England has more than doubled during the last thirty years, and is increasing with alarming rapidity. Mr. McKinley pointed out that "Free-trade" in England had increased the rate of taxation by over 24 per cent. between 1870 and 1880, whilst in the United States the rate had, during the same decade, diminished by nearly 10 per cent.

From the evils of Free-trade Germany has been rescued by the sound judgment of Bismarck, who said:—"We refuse to remain the sole dupes of an honourable conviction. Through the widely-opened door of our imports we have become the dumping place of foreign surplus production, and it is this, in my opinion, that has prevented the continued development of our industry, and the strengthening of our economical conditions. Let us close our doors awhile, and secure for German workers the German market which hitherto the foreigner has exploited with our connivance. The abstract doctrines of science influence me not at all; I form my verdict on the teachings of experience. I see that the Protectionist countries are prospering, and that the countries which practise Free-trade are decaying. Even mighty England is gradually returning to protection, and will, in a few years time, revert to it altogether, in order to save for herself at least the English market. Since we lowered our tariffs, we have, in my opinion, been a prey to consumption. We have been bleeding to death."

Bismarck gained his point; Germany reverted to protection; and the policy has proved to have been eminently successful.

The term "Free-trade" (Libre Exchange) as explained by economists, means free exchange of commodities between nations, which England never has had, nor is there the slightest probability that she will ever have it. England has no free import of her productions into any country, not even into her self-governing colonies. She has thrown away her bargaining power with foreign countries, by abolishing tariffs on competing products, and has handicapped her trading relations with her colonies and dependencies.

The fiscal policy of England, though claimed by Free-traders to be based on the political economy of Adam Smith, is absolutely opposed to

it. Adam Smith rightly devoted much argument against "monopolies", "absolute prohibitions", and "high duties" which amounted to a prohibition", and he only advocated free import of corn on the assumption that the import of foreign corn would be so small that it could affect very little the interests of the farmers of Great Britain." Of course, he could not have foreseen that steam navigation and railways, which did not exist in his days, would enable the actual import of foreign corn to be 1,800 times as much as that on which he based his conclusions.

He predicted the ruin which has actually fallen many of the British manufactures in the following terms:—"If the importation of foreign manufactures were permitted, several of the home manufactures would probably suffer, and some of them, perhaps, go to ruin altogether." (Wealth of Nations, Bk. IV. Chap. II).

Both Adam Smith and Mill advocate the imposition of countervailing duties on those foreign nations which restrict by high duties or prohibitions the importation of produce into their countries—

In conclusion, I may add that in order to develop the industries and vast potential wealth of India, it is necessary

(1) To develop India's resources from within, pursuing that policy which has been initiated by Lord Curzon:—in the creation of a Board of Agriculture, a Board of Scientific Advice, a Commercial Bureau:—and by the institution of Industrial Schools, Technical Scholarships and apprenticeships for workshop training.

(2) To improve the agricultural status, by the regulation of land revenues, by relieving the indebtedness of the agricultural classes, by advances to cultivators to enable them to purchase seed, by the establishment of experimental State farms which may form nuclei for the purchase or distribution of improved means and methods of agriculture.

(3) To relieve the dead weight of taxation from the land, and, at the same time, to attract capital, both native and English, by protecting industries from being swamped by unfair and unlimited foreign competition. For this purpose to adopt a policy of moderate and carefully considered import duties, which should not be prohibitive, but (as in the case of the sugar duties), place Indian industries in a position to hold their own.

(4) To open external markets for produce with countries bordering India and to foster international and intercolonial trade by the exchange of mutual concessions and preferential treatment, which would be mutually advantageous.

(5) To improve the internal market either by the establishment of State industries, which will supply the requirements of the Indian Government, or by the purchase of Indian produce as far as possible.

(6) To give facilities to capitalists who may desire to start industries, for obtaining concessions, and for the acquirement of mining and other industrial rights, and to put a stop to the interminable delays to which the acquirement of such concessions is often subjected.

(7) To pursue that policy of railway extension and irrigation works which has been eminently successful in contributing greatly to State revenues, and consequently to the reduction of taxation.

(8) To promote trade, as far as practicable, by the adoption of the lowest possible rates for transport.

(9) To govern India, *not* on English grounds, by English people in England, but by the Government of India *in the interests of India alone*; and to resist the interference of the Home Government in any attempt to sacrifice Indian interests to the exigencies of English party politics.

India requires protection from England as well from foreign countries.

# A PLEA FOR A CHEMICAL LABORATORY.

By Mr. PURAN CHAND, Analytical Chemist (Tokio), Member of the Chemical and the Pharmaceutical Societies of Japan.

MR PRESIDENT, FELLOW-DELEGATES AND GENTLEMEN:—

HAVE been in close touch with the wonderful system of education in Japan, for a little more than three years. I consider myself fortunate in having had the famous Professor Dr. Wilhelm Nag-Nagai one of the foremost disciples of Dr. Hoffman of Germany, as my beloved teacher in the Science of Chemistry. He gave me a thorough insight into the subject and moulded out of me a new man, from whom he said that he expected a good deal in the field of original research in chemistry. He sent me out here in India to work for the spreading of this science in this country. I am really proud that Dr. Nagai owns me and I am very well fathered as a chemist to appear in any assembly, whether of chemists or of those who take interest in the subject.

## WHAT JAPAN HAS DONE.

Gentlemen, Science occupies the most prominent place in the curriculum of Japanese education and the aim is, to produce first class Botanists, Geologists, Chemists, Metallurgists, Bacteriologists, Agricultural Scientists and Engineers. The system of education is so wisely organised that at the bottom, it spreads the knowledge of letters to the masses broadcast, so that 94.0 per cent. (both men and women)—of the total population are literate, and at the top, it merges into the sublime heights of the spirituality of science, so that, Japan, to-day, is not behind any country in the field of original research in any science. But the whole strength of the system lies in the production of the Captains of Industry. The Universities organise the raw Japanese intellect into a tremendous force, with which the resources of the country, both of land and sea, are governed, investigated, developed and made into the national treasures. Every nook and corner of Japan has been and is being searched by them and the day is not far, when every little particle of sand, will be literally made to contribute to the national wealth.

## THE GEOLOGICAL SURVEY OF INDIA.

Sir, the land resources of every country are more or less enormous, but nowhere, there is such

a great variety and abundance, as in our land. The science that will lead us to take the first step in the organisation and development of our industrial resources, is geology. By making a fundamental and thorough geological survey, it will find out for us and locate our mineral resources. The best surface materials for glass, cement, pottery, etc., will be made known. For example, samples of the best kind of quartz were sent to me from Kangra District and the rates given were incredibly low, because of its abundance.

The hills of quartz—the best material for high class optical glass are to be found somewhere near Gwalior State. All these surface raw materials with their definite localities should come within the knowledge of every intelligent Indian.

Geology will do more. It will dive deeper and reveal to you the rich, hidden, contents of the underlayers of earth and will open mines of information on the mining industry including metallurgy. America, England, Germany and Japan draw a great part of their income from the mines. The Boers only had a few. Thus, it is that the Science of Geology that would solve many of our preliminary problems. Some geological surveys have been made here by the Government officials, but they are quite inadequate to our needs and do not aim to be exhaustive. We will have to make ourselves an exhaustive geological survey, as a right beginning to our material advancement.

## BOTANY.

The Science of Botany, too, does the work of surveying the vegetable and herbal treasures, locating them and showing the possibilities of their growth. Till some more time to come, I mean the point of greater development of Synthetical Chemistry, the world will be, in need of its raw materials, mainly from the vegetable kingdom. For quinine, cinchona and for India-rubber, the ficus tree and for camphor and other perfumes, the various aromatic trees and herbs, and for alkaloids belladonna, poppy, oconitum, ipecacuanha, etc., will be always sought. The Synthetical Chemistry has done wonders. It has synthesised indigo camphor, otto-de-rose, etc. But still, it is regarded

to be yet in its infancy and if proper researches are made and continued, there is a possibility of competing in indigo and camphor also from natural sources. Dr. Nagai invented a method of extracting indigo from indigo-fera polygouus which is the indigo yielding plant in Japan and his indigo got the gold medal from the Paris Exhibition and is much better as a dye than the artificial indigo. This was frankly admitted by the German merchants. The indigo industry in India, is in the hands of unscientific Anglo-Indians and no researches have been made to improve the quality of the dye. Thus, Botany not merely as a pure science, but such as applied to medicine and agriculture will have to be taken up in all earnestness.

#### CHEMISTRY.

Though the ancient alchemists did not leave to us the mysterious philosopher's stone reputed to turn iron into gold, yet they have certainly bequeathed to us, in that riddle germs of a profound Science of Chemistry, touched with which, a poor nation grows rich and rich nation grows richer. In converting the raw materials of little or no value, into valuable commodities of daily human consumption, chemistry exercises a vital influence on human life and is a great factor in national advancement. Germany has stolen marches over England on account of the development of the chemical sciences, for the real study of which, men like Dr. Perkins are, perhaps, crying in wilderness in England.

There is no manufacturing industry that does not require the aid of chemistry. The science of Engineering apart from its application in navigation and road-metalling and bridge-making, is solely for a secondary service to the manufacturing chemist, viz.,—to supply mechanics and look after its working, while the privilege of the chemist is to create things. Technical education or industrial education that does not include a thorough and masterly study of science in general and chemistry in particular is futile and does not fulfil its purpose.

The very first thing that they in Japan did to organise their educational system was to send some brilliant youths to foreign countries, who, in some cases, stayed for more than sixteen years abroad to thoroughly master their respective subjects and when they returned home, they were recognised professors and experienced experts of industries. This step is fortunately followed by our people, too, but I have to point out that the

wise mode of sending students to foreign countries is only the second step taken first. Such was the case in Japan, because they brought our professors and experts from the foreign countries and started that work in anticipation of whose demands, they had sent their young men abroad. They began the industrial work also similarly without their own men.

I have personally met old Japanese engaged in industries, to know something of the history of the introduction of foreign industries in Japan. It has been the history of losses, disasters, and bankruptcies. But you know, how the Japanese fight and they fought in this field, as bravely, as they did on the battle-fields in Manchuria and though many fell and many fainted, they control these foreign industries as they do their own indigenous beautiful arts.

In short, a thorough, scientific educational system supplemented by industrial organisations started at any cost under our own experts or foreign experts, will produce those very fruits here which Japan is enjoying in these days. In order to properly respond to the great cry of industrial regeneration of India that is being raised in the country from end to end, you will have to successfully build up a grand temple of scientific knowledge in India which would aim to produce real hand-working Edisons and Hoffmans. The happy thoughts of a moment of scientists may open a century of industry. One chemical reaction can set up into being a whole factory handling millions of rupees. Like the perennial snowy summits of the Himalayas our towering and science-absorbed savants will certainly feed the running rivers of our national industries, which cannot possibly prosper without their kind and royal side-glances.

After my return home, I have been just finding a place to stand upon and the V. D. H. J. Technical Institute, Lahore which I have the honor to represent in this assembly, opened the Applied Chemistry Department. We had two students who, after one year, had to give up their studies abruptly and we had to cancel a large order sent to Germany for apparatus to equip our laboratory more extensively. In fact, we had made a fair progress, when for want of students, the whole thing came to a standstill.

In this laboratory, I have been experimenting for the last two years on the possibility of various chemical industries that it would be profitable to start in this country. I give here below a report of my experiments.

## REPORT OF MY EXPERIMENTS.

Each and every one of the following industries can be started at once and the chemical as well as the commercial purity of the articles thus manufactured guaranteed.

## TURPENTINE.

Official reports show that vast quantities of turpentine oil are imported every year. We also import Rosin and bye-products of turpentine factories. In India, there is a vast field for this industry. Nepal has forests of pine trees. Kangra, Chamba, Jammu, Hazara and Dehra Dun, Tehri and other forests can, in my opinion, afford sufficient materials for at least ten turpentine factories, each handling 1 ton of raw material every day. Raw turpentine is obtained from the following species, by making seasonal incisions, which do no injury to the growth or the timber of the trees. *Pinus Pinaster S. Maritima*, *Pinus Silvestris*, *Pinus Palustris*, *Pinus Australis*, *Pinus Tarda*, and *Pinus Stroleus*. From middle of February to the beginning of November incisions can be made.

The yield of turpentine oil ranges between 20 to 25 per cent. and that of rosin 60 to 70 per cent. Both these articles are of extensive application in every country.

The following is an almost exact estimate of a Turpentine factory that may work 1 ton of raw material every day.

CAPITAL NEEDED Rs. 50,000.		
Machinery and Building (Machinery includes Boiler, Engine, Stills, Sundry appliances &c.)	Rs.	
Running Capital	10,000	
Reserve Fund	35,000	
	5,000	
Total	50,000	

## MONTHLY BALANCE-SHEET.

Expenditure.	Quantity in Maunds.	Price Rs.
Raw material required per month (Rs. 5 per maund including the State or Government Royalty amounting to 0-8-0 per maund and other gathering expenses)	840	4,200
Establishment expenses		200
Manager's pay		500
Fuel and other expenses		200
Wear and tear of machinery taking its life to be ten years		84
Total expenses		5,184
<b>Income.</b>		
Oil at 20 per cent. (Selling at Rs. 25 a maund wholesale, deducting all commissions, etc.)	168	4,200
Rosin at 65 per cent. (Selling at Rs. 4 per maund deducting all commissions, etc.)	546	2,184
Total		6,384

Interest of 5,184 at the rate of 5 per cent. per annum	about	260
Interest per month		22
Net profit therefore per month		6,384
Deduct (5184+22)		5,206
		1,178

This factory can be started even on a smaller scale. The raw material—the *Ganda Biroja* can be had in sufficient quantity for such a factory from Amritsar, Jammu and other places, which is selling at equal rates with rosin, the bye-product of the turpentine factory. Though individual efforts may succeed in reaping enough profits for its own labour, but, in consideration of great, open competition with foreign countries, we have to organise on a large scale.

The Punjab Government has been trying the experiment for turpentine manufacture for some time and the reports of the Forest Department show, that they were very profitable concerns, but from last year the Nagpur Turpentine Factory is closed with the remark that it was more paying to sell the raw material than the finished articles. I find that the Nagpur factory was worked with crude methods. Steam distillation has not yet been tried by the Government. The old kettle process is in favour. The Government reports betray some misgiving as to the life of the pine trees from which it is extracted, but this is a wrong notion, if the tapping process is carried on judiciously. The other factory of the Government is attached to the Dehra Dun Forest School and it is working well. The pine forests of Native States like Jammu, Patiala and other hill forests, if taken lease of, can supply the raw material for more than two factories. I strongly urge the importance of this industry on my countrymen.

## SHELLAC.

This is the second industry that has come under our notice which can be a better source of income than now. India is one of the shellac-supplying countries. Shellac is sold in great quantities in England and Germany. We have visited various shellac works in India and have seen that they are working in very crude ways. There is a large factory at Amritsar, but its methods are also very crude. Mirzapore has some European factories which use machinery and have a fame in foreign markets for the purity of their article. The writer has discovered a method, by which we can refine and manufacture shellac in a very economical way and can turn all sorts of inferior shellacs into the pure superior shellac of golden lustre. Shellac can be had in plenty from Assam and can be gathered in thousands of maunds from the Hoshiarpore sites in the Punjab, and also from the jungles of the Central Provinces. Perhaps, Khandesh also is a market for raw lac.

Here is an estimate for a shellac factory:—

Capital required	...	50,000
Machinery, &c.	...	5,000
Reserve fund	...	5,000
Running capital	...	40,000

The profits of this factory will depend upon the large quantities purchased at the proper seasons. So a good deal of money is to be invested in the purchase of the materials.

The figures are for maunds 500 per month:—

The price of the raw material ranges from Rs. 25 to 30 per maund. The yield of seedlac is from Rs. 70 to 80 per cent.

	Maunds.	Rs.
Raw material per month	500	15,000
Expenses on fuel, &c.	...	200
Establishment expenses	...	200
Wear and tear of machinery taking its life to be 5 years	...	84
Interest per month at 5 per cent. per annum for about Rs. 16,000	...	70
	<b>Total</b>	<b>15,564</b>

The yield counting at the minimum average of 70 per cent. } Maund. 350 ... 21,000  
 The cheapest rate when the market is very low } is Rs. 60 per maund.

By our special process, the chemically pure shellac can be made and the yield is almost the same as that of seedlac, say, 60 to 65 per cent.

This shellac, of course, sells higher than the seedlac, which contains rubbish also. The cheapest rate for pure shellac is Rs. 80 per maund. Counting at this rate, the sale-price of 300 maunds of pure shellac is Rs. 24,000. Gross profits including the shipping charges to England or Germany as well as commission is in round numbers 5,400 for seedlac, and 8,400 for shellac. This industry, too, can be made paying in the local market by investing a small capital. The special method aforesaid will highly advance the value of shellac in foreign markets. Raw lac being very different in its composition, the Amritsar people can get 20 to 25 seers per maund. The above estimates are for the best of raw materials.

I have examined the Hoshiarpore raw lac of the Punjab and find that it is not so good. Communications from Burma have come to me, that in Burma, it is available at 3 to 5 seers per rupee. I think, if a joint-stock company is organised to look up this raw material in Burma, good profits will ensue.

ESSENTIAL OILS.

Grass Oils.

Rhusa, Khus, Khavi, Nimbughas and various other species of fragrant grass grow wild in the Punjab, showing the possibility of their cultivation. In many tracts, the farmers are uprooting these valuable materials of great economic value. Here I may point out that in Singapore there are some hundreds of acres grown with citronella and lemon grass by the famous Fisher Co. In the Punjab these grasses should be cultivated anew, and the supply that is available now we should commence to utilise.

We find that patchouly can also be cultivated in the Punjab. Its seeds or plants are available at Singapore. The following is a general estimate for a factory,

	Rs.
Plant costing	10,000
Buildings	5,000
Appliances	2,000
Running Capital	33,000

Total Capital 50,000

Citronella.

Raw materials for one month=840 mds.

Costs at 12 annas per md. on the still	630
Fuel and other expenses	150
Establishment	500
Interest	210
Wear and tear	80

Permanent expenses 940

One still with citronella gives out 1,260 lbs. of citronella oil.

The other still with lemon grass gives out 1,260 lbs. of lemon grass oil.

Citronella costs	630
Lemon grass 840 mds. at Re. 1 per md.	840
Common expenses	940
<b>Total cost</b>	<b>2,410</b>

Income.

Citronella at Re. 1-0-0 a lb.	1,260
Lemon grass at Rs. 2 a lb.	2,520

Total sale 3,780

Deduct expenses 2,410

Net profit per month 1,370

Anise Oil and Thymol.

These are others that I have experimented upon the following are the figures.

Anise for one still per month	840 Mds.
	Rs. 4,200
Costs at Rs. 5 a maund on the still	4,200
Ajowayan for the other still 840 mds. costing Rs. 4 per maund	3,360
Common expenses	940

Total costs 8,500

Yield of oils  
 1260 lbs. Anise  
 300 lbs. Thymol Crystal  
 1700 lbs. Ajowayan oil.

Total	3,260 lbs.	Rs.
Anise at Rs. 5 a lb.	6,300	
Thymol at Rs. 8 a lb.	2,400	
Ajowayan oil at Rs. 2 a lb.	3,400	
<b>Total sales</b>	<b>12,100</b>	
Deduct expenses	8,500	
<b>Net profit per month</b>	<b>3,600</b>	

As for the consumption, an organisation is needed to distribute the products in India. Some of the oils can be exported.

#### *Lemon Oil.*

This oil is usually and commercially extracted from the rind of the citrus species and not particularly the lemon peel. One from the lemon peel is very dear. For this oil, there are plantations of lemon in Italy. There is a great field for such a plantation in India.

Lemon juice serving as a raw material for citric acid and the lemon peel for oil, the plantation of lemon peel for oil, the plantation of lemon would be a great industry in itself. Our people should stir themselves and see if there are tracts of land available for such an experiment.

No definite estimate can be given for evident reasons. But, considering the consumption of this oil and its general demand in all countries, the industry promises to be paying like all other essential oils.

#### *Camphor.*

India is a camphor-buying country. It is obtained from camphor trees. It grows abundantly in Formosa, China, and Japan. There are some suitable climatic conditions for the plantation of camphor trees in India. But the competition which Japan is opening with the whole world in this industry, renders the chances of this industry being profitable in India very rare.

Carraway and Eucalyptus bid fair. A large limited Company with an exploiting capital, will open quite a future for India in essential oils. While prospecting this Company can use its capital in producing the best of Indian perfumes on a large scale and by Western scientific methods—meeting all tastes. There is a great margin of profit in Attars of Rose, Bedmushk, Kewra, etc. The different seasons would keep the factory engaged with different materials in rotation.

#### CHEMICALS.

Recently, I received chrome stones from Quetta and cobalt ore from the Upper India Glass Works and the manganese ore from the Central Provinces. I successfully made cobalt oxide and chrome oxide which are the most important pigments for glue and green glass and supplied of the latter to the Upper India Glass Works, Amballa. By coming to terms with the glass factories, I hope a very successful business can be done in these oxides. My students prepared the iron oxide from ferrous sulphate, which can be easily prepared from the iron pyrites. I have just received a letter from Marwara, from the manager of the New Mining Association that they have discovered a large deposit of iron pyrites. There is a great possibility of manufacturing sulphuric acid from these pyrites, but the Lahore laboratory having been temporarily closed, I cannot proceed with my experiment. I was engaged at preparing potassium bichromate from the chrome stone of Quetta but could not finish it to put its assay before you.

As for the manganese ore we prepared potassium permanganate which is largely used as a chemical under the name of Condy's fluid.

Zinc oxide and the red lead and other pigments of which an enormous quantity is imported from foreign countries can be turned out here and a few samples of them are sent by the Lahore Institute to the Benares Industrial Exhibition.

Gentlemen, thus I have been engaged in experiments and those of them that promised some commercial profit, I have put down in the above report. I have been trying many other experiments which I cannot give here while experimenting on chrome tanning, I found out a treatment for curing those skins which get stained or spoiled by bad fat-ligouring. In one experiment, I got the fibrous mineral variety of calcium sulphate which is very interesting.

#### A PLEA FOR A CHEMICAL LABORATORY.

In conclusion, I beg to propose to this assembly, as I have done in the Punjab almost in vain, to start at once a chemical laboratory costing not more than 10,000 rupees to start with, with the express purpose and direct aim of investigating in analysing and definitely determining the economic value of various raw materials of India that are available under the present circumstances, described in Watt's Dictionary of economic products of India and the Economic Geology of India. This laboratory can be worked on commercial lines. One of the chemical industries that I have reviewed above may be taken up and a model chemical factory started in connection with the laboratory. When one such model factory has run for a sufficient period, it may be sold to a public company and another chemical industry taken up. Thus, this laboratory can be made the centre of information and a medium of establishing various chemical factories in the country and shall contribute to the success of the *Svadeshi* movement and the solution of the industrial problem in India.

#### INDUSTRIAL CHEMISTRY CLASS.

Mention was made in the last year's report of advantage having been taken of Mr. Puran Singh (who had returned from Japan after completing a three years' course of study in Pharmacy there) by holding classes commencing from 1st April 1904 for instruction in industrial chemistry. Up to October 1904 only one lecture a week was given, and during this period on an average seven young men attended the lecture days. This



was, however, considered an unsatisfactory arrangement, and in order that the work in this direction should result in practical good, regular daily classes were introduced from November 1904, in which two students joined in that month and two in March 1905. The syllabus (Appendix A) suggested for this class is rather a comprehensive one, but it is not proposed to fully work up to it until more experience is gained. The Rev. D. J. Fleming, Professor of Science, Foreman Christian College, Lahore, was kind enough to inspect our work, and he has remarked as follows:

"On the 14th of April, I had the pleasure of inspecting the work in the Chemistry Laboratory of the Technical Institute.

The three years' course, as outlined, ought to well prepare a student to engage in the manufacture of those chemicals, which can be made commercially profitable in India, and to undertake the posts of Chemical Assistants in connection with various manufactories throughout India.

One year, of the three year's course, has been taught, so far. On examining the student who has taken the work thus far, he appeared to have a ready, accurate, and practical knowledge of the work. It was plain that his interest was practical and not simply theoretical, thus fulfilling the end of the institute.

Mr. Puran Singh, the well-qualified instructor in this department, is making good use of the limited laboratory facilities, and considering this inadequate equipment, the results are to be commended.

### APPENDIX.

#### SYLLABUS OF THE INDUSTRIAL CHEMISTRY CLASS.\*

I. The course of the Industrial Chemistry class will extend to three years with a supplementary period of six months.

II. Every year is divided into three terms:

1st term 1st April to 31st August.  
2nd " 1st October to 25th December.  
3rd " 1st January to 31st March.

1st year.	1st term.	2nd term.	3rd term.
Analytical Chemistry ...	28 hours	30	30
Inorganic Chemistry (lectures) ...	10	10	15
Steam Engine (lectures) ...	4	4	...
Mechanics ...	2	2	...
Drawing ...	4	2	3

2nd year.	1st term.	2nd term.	3rd term.
Analytical Chemistry ...	20 hours	24	30
Inorganic Chemistry ...	6	4	...
Indian Economic Geology ...	3	1	...
Mechanics ...	2	2	...
Organic Chemistry ...	10	10	12
Drawing ...	3	3	...
General Botany ...	4	4	6

3rd year.	1st term.	2nd term.	3rd term.
The special subject practical Lectures on Mechanical Engineering ...	30	30	30
Inorganic Chemistry ...	4	4	4
Organic Chemistry ...	2	2	2
Factory Design ...	6	6	6
General Botany ...	3	3	3
Final Examination	12 hours.		

\* Cuttings from the Report of the Victoria Diamond Jubilee Hindu Technical Institute, Lahore for the year 1904-05.

## SOME LEADING INDUSTRIES OF UPPER INDIA.

By Rai Bahadur LALA BAIJ NATH.

THE chief industries of Upper India and those most in need of development at present are cotton, silk, wool, sugar, leather and vegetable oils and I shall, in this paper, briefly discuss the present condition of some of them and show how they can best be improved so as to conduce to the prosperity of our people.

Cotton has been a staple product of these parts from time immemorial and in 1904, 14 million acres of land were under cotton cultivation, giving an outturn of 15,200 million pounds. In spite of the fact that cotton ginning, spinning and weaving mills are fast multiplying, all these occupa-

tions are largely pursued after the old methods all over these parts and the demand for hand-made country cloth is not at all less than that for the machine-made article. The reason is that the old method is very cheap, affords employment to the women and the poor amongst the agricultural and labouring classes, and the yarn and cloth made by it are more durable even though they may be sometimes more costly than the machine-made article. The variety of cotton generally grown in these parts is the short staple known as the Bengals. Exotic varieties have been tried but without success. As I have already said in

another place, I tried the American variety in my own village, in the Agra district, and took care to follow the directions both in sowing the seed and preparing the ground as well as in rearing the plants. But the outturn was not equal to the indigenous variety and the experiment had to be given up. Under better conditions, if much larger quantities were raised, it may be more successful both in these and other provinces. The great recommendation of the Indian method is its cheapness all round. The cotton pod called *kapas* is picked early in the morning, when it is still damp from dew by the women of the agriculturists family. After a sufficient quantity has been collected, it is sold to a local trader at so much per maund. This year it is Rs. 7. The bania, has the raw cotton ginned at his shop by a gin made of two rollers, one of iron and the other of wood, set up on a frame geared together by an endless screw costing the modest sum of one rupee and capable of ginning about 8 seers of cotton per day. He either employs a labourer or sets to work himself and pays the farmer from two or three annas a day. These labourers are generally village women. Ginning factories worked by steam power are also becoming common in almost all cotton producing centres like Agra, Delhi, Hathras, Mathura, Etawap, Kosi, Hapur, and have all proved paying concerns. They gin a maund of cotton for about half the price charged for hand labour and yet make 50 per cent. profit. The country gin has, however, not yet been driven out of the market, nor will it be so for many years to come. After being ginned, the cotton finds its way into the nearest market town or is re-sold in the village itself for being spun into yarn. The quantity disposed off in the latter is, however, very small and by far the largest portion comes to the nearest town. Hathras, Agra, Etah, Cawnpore, Delhi, Meerut, Aligarh, are all large centres for the sale of cotton. Confining, ourselves, however, for the present to the indigenous hand industry, we find that the ginned cotton is first roughly picked by the hand in order to remove the grosser impurities, then carded by a bow with a catgut string and afterwards made into sliver called *poons*, and finally spun upon the spinning wheel. All this is done by the women of the family. If the latter do not card it, a professional carder does it for about an anna a seer. Spinning was once a very fashionable pastime for women even of the middle and the higher classes 25 or 30 years ago, parties of whose ladies used to sit up spinning whole nights, each vying with the other

in the fineness of her yarn and the quantity spun and one who wore clothes purchased from the bazaar, was looked down upon by her companions. Now-a-days the operation is confined to the women of the poorer classes. The quantity spun is about one-fourth of a seer in the day and the price paid is about two or three annas a seer of yarn. Large quantities of homespun yarn are still used in country handlooms, because of the thread being stronger and tougher than machine-made thread. Ordinary qualities sell for about annas 12 or a rupee and finer ones for about  $\frac{1}{2}$  per seer. Formerly when cotton was cheaper, it was three-fourths of these rates. The yarn is now made into skeins by an instrument made of three pieces of wood in the shape of an H or on a reel. It is then made into hanks and given to a weaver to weave. Numbers of these weavers, both male and female even though their trade does not bring them more than a mere pittance are still found in every village. Some work at their looms the whole day long, others only when they can spare time from their fields. From a seer of yarn they turn out about 18 yards of cloth and charge from 3 to 6 pice per yard according to its fineness. A family consisting of a man, his wife and two girls earns about 4 annas per day. The cloth made is coarse, but as it is more durable than machine-made cloth, it is greatly prized by the poor in all cases and by the higher classes where fineness of appearance is no consideration. If larger quantities of gazi and garha were available, they would be used everywhere in preference to the grey shirting of the mills whether of India or elsewhere. Finer kinds are also woven by country weavers from machine-made yarn, which is generally imported. Formerly when the spinning industry was more flourishing, fine yarn for hand-weaving was all spun in the country. Some places are still famous for their hand-made cloth. The checks of Ludhiana, Gujerat and Moradabad are largely prized by all classes of people. Women are still very fond of using stripes and checks made in these and other places, because they wash better and are more durable than any machine-made article. A coarse kind of check called Dobhra, white and blue, used for flour cloths is largely made in and exported from Aligarh. The chautais of Deoband and Sikandara Rao in the Aligarh District are also very popular. Etah, Saharanpur, Muzaffarnagar and Meerut also manufacture enormous quantities of coarse cloth of all descriptions. In the Azamgarh district Mau and Mubarakpur are famous for their

fine cotton and silk cloths. There are more than 12,000 looms in that district and of these 1,200 are in Mau and more than 1,500 in Mubarakpur. The weavers of these places are comparatively well-to-do people and export their wares largely to all parts of the country. The *gubdams* of Azamgarh made from colored silk are still very largely found in distant markets like those of Delhi. In times gone by they were in great demand in the richer classes, both male and female. Now only women use them. The muslins woven in Jais in the Rai Bareilly district were so fine that they were sold for their weight in silver, at Rs. 5 per yard. The place has now greatly declined and out of 600 weaver families only 200 are left in the place. The *chikans*, the *jamdani* and the *kamdani* work of Judh (all fine muslins woven or worked with silk or gold and silver thread) have earned a world-wide reputation. A piece of *chikan* of 10 yards sells from Rs. 10 and a piece of *jamdani* from Rs. 6. In the Punjab Sialkot exports large quantities of hand-made cloth to not only the frontier districts, but to the United Provinces and Bengal also and only 5 per cent. of the people there are said to use imported cloth. No figures of the quantity of cloth made in these indigenous handlooms, whether from handspun or machine made yarn, are available, but that the industry after agriculture supports a very large number of persons is undoubted. In the United Provinces out of 12 lacs supported by the cotton industry, only 20,000 are employed in mills and factories and the rest live by hand industries. In the Punjab it is even less and out of a total of more than 4½ lacs of people, only 58 per cent are employed in factories. There is therefore a great future for the cotton hand industry and if properly managed and the requisite funds are forthcoming, it promises to hold its own for many years to come against machine competition. The out-turn may not be cheaper than that of a power loom, but it is stronger and tougher, and shall always, therefore, be preferred, to the latter, by the poorer classes of people. The experiment of employing handlooms of various patterns is also being tried in many parts of the country, but cannot yet be said to be a success. Two of these handlooms that have lately been set up in our Orphanage at Meerut, have not worked well and the workers complain of the loss of material and the breaking of thread in working them. We have indented for others and hope still to be successful in this branch of hand-weaving. The reason why all these looms have failed, is that they are not made

with special reference to the Indian climate. In the mean-time if companies of small capitalists were organised in each town for having cloth woven by ordinary weavers after old methods, but under better supervisions, it will find a good market and with the increase of demand the supply will also increase. If such an industry is supervised by men who have received some technical training in an institute like the Victoria Jubilee Technical Institute of Bombay, it will be more successful than the work of many a handloom now in course of trial. In several orphanages the boys make better durries, dhoties and country cloth than ordinary weavers because of better supervision. Coming now to imported yarn and cloth we find that in 1904-05 India imported about 27 millions of pounds of yarn worth about 24 millions of rupees against 578 millions pounds made by Indian mills. The imported yarn is almost all in the finer counts 26 to 40 and upwards.

We have now many spinning mills not only in Bombay, Ahmedabad and Nagpur, but also several places in Upper India, Agra, Cawnpore, Delhi and other places are now becoming large cotton centres, manufacturing cloth and yarn for not only the provincial but other markets also. From enquiries made from the managers of some of these concerns, I give below a rough idea of the extent of their operations, the markets they command, and the number of hands employed.

*The Elgin Mills, Cawnpore.*—"Speaking generally I may say that the Elgin mills were the first cotton mills established in these Provinces and that they were commenced in 1864 and that they make all sorts of cotton yarn for hand and powerloom weaving, also weave all cotton goods such as dhoties, doosooties, and drill themselves. We are situated on the banks of the Ganges and turn out about from 20,000 to 25,000 lbs. weight of yarn and cloth per day and employ about 1,500 hands."

*The Muir Mills, Cawnpore.*—"The goods manufactured by us can be divided into four classes: (1) spinning yarn; (2) manufacture of bazaar cloth such as dhoties, latthas, etc., (3) manufacture of goods for European consumption such as towels, drills, twills, counterpanes and household and table linens, (4) manufacture of tents and durries and dyeing of piece-goods and yarn. Our markets for these manufactures are as follows: (1) Yarns we sell in practically all the large towns and villages of the United Provinces and as far east as Gaya and Giridih in Bengal and Nepal in the north (2) bazaar cloth is for the most part sold

in Cawnpore bazaar but is also sold at our branches in the bazaar of Jhansi, Delhi, Amritsar, (3) cloth for European consumption is sold from our head office in Cawnpore and also at our branches in Calcutta and Lahore, (4) durries, tents, and dyed goods are sold all over India and we also ship them to Egypt, Africa, the Straits Settlements and the Far East."

The Delhi cloth and General Mills Company is not so large a concern and its manager tells me that they make now only 500 lbs. a day and 1,400 when they are in full working order. Their cloth finds a ready market in Delhi, even though they are short of weavers. There are also other mills in Delhi, Beawar (Rajputana) and in the Punjab all turning out the coarser kinds of cloth for sale in the country. The figures of the last trade return from India, however, show that in spite of the large extension of spinning and weaving mill-factories, the quantity of unbleached cloth imported was 1,210 millions, white bleached 584 millions and colored 493 million, pounds and that its total value was 3,559 millions of rupees. This shows that even for the kinds of cloth which can be manufactured in the country, *viz.*, the unbleached grey of the coarser qualities, we have still to depend largely upon foreign imports and that there is a great room for expansion in mill as well as in the hand industry in this direction. No cotton mill under intelligent management European or Indian, has ever failed. The Central India Spinning Weaving and Cotton Manufacturing Company managed by the late Mr. Tata, is a typical example of what one man can do. Starting with a capital of 15 lakhs of rupees in 1874, the Company has in a period of 30 years, made a profit of about one crore 98 lacs, employs 4,300 people, has 6 agencies for the purchase of cotton and 28 for the sale of cotton and yarn in different parts of India, makes about 1 crore and 60 lakhs of lbs. of cloth and yarn during the year, works with the latest machinery and has a provident fund for its employees.

But it was all through the self-sacrifice of one man, who, as its report tells us, on the expiration of the term of his first agreement, finding his own allowance of Rs. 6,000 per annum to be too high reduced it to Rs. 2,000. There is no lack of managing capacity amongst the natives of India. Only in order to make such large concerns a success there must be a spirit of self-sacrifice. In 1904-05 as the Review of the Trade of India shows, the production of Indian Mills which consists chiefly of unbleached shirting, dhoties, table

cloths, domestics and chadars increased by 20.7 million pounds or 15 per cent. The yardage which is stated for plain goods that is bleached or unbleached, but not colored or figured, increased by 87.2 million yards, the total of this class being 547.7 million yards and the weight thereof 130 million pounds. In the five months of this year from April to August the quantity of yarn spun was 28 crores 16 lakhs of pounds against 22 crores 50 lakhs of the corresponding period last year, each province showing an increase and Bombay heading the list. In the mills in the Native States it is also the same and they show 7 lakhs of pounds more of yarn spun. In woven goods also instead of 5 crores 95 lakhs of pounds, we have 6 crores and 84 lakhs. In Upper India with which we are more immediately concerned, the quantity of yarn increased from 1 crore 15 lakhs of pounds to 1 crore 43 lakhs and woven goods from about 28 lakhs pounds to about 30 lakhs. In the manufacture of grey goods like chadars, dhoties, drills, jeans Bombay shows a good increase. In Bombay town it was from 4 crores 10 lakhs to 4 crores 62 lacs, and in the Bombay island from 2 crores 70 lakhs to 3 crores 24 lakhs. In Ahmedabad the increase was from 1 crore 5 lakhs to 1 crore 6 lakhs. In our own provinces it is from 24 lakhs to 29 lakhs, and in the Punjab from 42,000 to 1 lakh lbs. The case with hosiery, figured and colored, miscellaneous goods was also the same, and the increase of production in hosiery is most noticeable, for against only 6,000 dozens of last year, Bombay made 87 lacs of dozens of pairs this year. The Swadeshi movement has thus given a great impetus to the production of Indian Mills, and though India cannot yet clothe herself in her own dhoties and chadars and other grey cloth, and for many years to come will have to import these from other countries, the outlook for its mills in spite of the excise duty and the hours of labour and factory laws is far from being hopeless or discouraging. On the contrary, judging from the history of the spinning and weaving mills started in Delhi and elsewhere, with modest capital and making only the very commonest kind of coarse cloth for the local market, it is very hopeful. There is now a growing disinclination to use finer kinds of cloth whether Indian or foreign, and coarse dhoties and chaddars are coming to be largely patronized especially in Bengal where fine clothes used to be the order of the day. Therefore not only power mills to produce such cloth ought to be multiplied in all parts of the country, but a revival of the handloom industry

both through improved looms as well as through better supervision of the work of ordinary weavers is necessary. Says the late Director General of Statistics in his Review of Trade for 1904-05. "The decreasing importance of grey goods both relatively and absolutely is manifest from this statement (figures already given above) a fact which is explained by the great preponderance of these goods in the rapidly increasing production of the Indian mills. It is also noticeable that while Bombay takes an equal or as last year a greater share of white and coloured goods, as compared with Bengal, it takes a comparatively small and diminishing share of grey goods of which Bengal, where there are no cotton mills, absorbs a very large share, 904,7778,615 yards in 1904-05.

The hand weaving industry is also by no means a negligible quantity, for its production in cloth is double that of the Indian mills and it is still the largest industry next to agriculture, as the Census of 1901 showed 22-23 million handloom-weavers besides dependants numbering 24-25 millions. This ancient industry has suffered greatly from the production of machine-made goods and, though still possessed of considerable vitality, seems to be steadily decaying" (p. 15). Therefore, the sooner every rupee which the country sends out is applied towards the revival of its own handloom and the improvement of its own weaving industry, will be a rupee gained and will save its weavers, from having to fall back upon agriculture, from destruction of trade, and the nation upon imported goods when the indigenous supply falls short. The Manchester merchants whose business has been largely affected by the present revival of industrial activity in India, will not be slow to do all they can to restore it and they are already thinking of doing away with middlemen and deal with the local trader direct. Unless, therefore, the Indians wish to be left behind in the race, they should set to work and produce goods in quantity and qualities like those imported and sell them as cheap as they. For years to come the business may not yield large profits. But they must take the example of the British manufacturer who has more concern with the sale of his manufactures, than the profits he makes to heart.

To sum up, unless the owner and the cultivator of the soil produce better cotton through improved methods of cultivation, the ordinary town or village weaver is utilized and employed by companies of educated Indians started in each town for the production of hand-made cloth in larger

quantities and weaving and spinning factories working both by power and handlooms largely multiplied in each province, the great need of India to clothe herself with her own cloth will not be supplied in any distant future. Between imported and hand-made goods, the competition will never be on sentimental or caste grounds but on that of price and accessibility. These will always be the two chief elements in regulating the market. We in India cannot too vividly realize the fact. Handspinning and weaving are carried on in large portions of the country even for the pittance it affords to the spinner and the weaver. But each rise in the price of cotton and yarn drives a larger number of these workmen to agriculture and other trades, making us more dependent upon imported goods. But if the demand for the indigenous article rises steadily, they will have less inducement to leave their trades and be less miserable than at present. In this connection, the question of dyed goods must also be considered. The figures quoted above show how enormous is the quantity of colored cloths of all kinds that comes to India. Most of the dyes are of our own production. But the native dyer cannot dye cloth in such fast colors as the foreign dyer. The large quantities of foreign Turkey red (kund) and other colored clothes seen in every town and village market, are a proof of the profit made by the foreign manufacturer and on festivals every village damsel throws away her sari or chaddar of Indian gazi or garha, for one of foreign Turkey red. If, therefore, dyeing of fabrics were scientifically studied by educated Indians, both in as well as out of India, the profit will be great. The way in which silks are dyed in the Sassoon Mills of Bombay shows what great development of the dyeing industry is possible. The materials generally employed are cheap indigo, turmeric, safflower, pomegranate, rind and others that can be had everywhere and half the cloth produced is dyed from them. Only the colors produced in the country ought to be as bright and neat as those of imported cloth and they will at once attract customers. Those who go to Europe, America or Japan cannot do better than take up this branch of the subject. All the yarn that is now dyed in the country for fast and bright colours is imported yarn. What is required is such a scientific development of the art of dyeing, as would make the cloth and yarn dyed here compete with the imported article.

The Indian indigenous hand method as well as the machine method are not each without their

weak points. For instance, the power gin entangles the cotton fabric, makes it short and deprives it of its natural strength, which the hand gin does not. But the hand gin makes the cotton dirty and leaves the grosser impurities. In power machines between ginning and spinning, there are many processes which except carding are not necessary in the hand method. In spinning mills the waste of material and the loss of strength of the cotton is much greater than in the hand method, being about 70 per cent. This is the reason why hand-made goods are stronger than machine-made. Again with all the improvement in spinning the outturn of a mule is not more than 7 oz. per day which an ordinary spinning wheel can also yield, but while the former can work 700 spindles, the latter can only work one. The Indian spinning wheel can yet compete with the latest and the finest spinning machine in the fineness of its yarn, but it cannot compete in the quantity produced. In weaving the Indian weaver who has to work with the worst yarn, still holds his own against the weaving machine. All spinning and weaving mills only sell their weaker yarn and use the stronger and the better qualities for their own cloth and yet with the yarn he gets, the Indian weaver produces cloth stronger than machine-made cloth. In hand-looms with the exception of the Cannanore Weaving Factory, no concern has yet flourished, and the Cannanore factory flourishes because it employs the best imported yarn. If a hand-loom were made, which took into account the climate, the quality of yarn, the strength and the surroundings under which the Indian labourer has to work, it would be more successful than any yet employed. In dyeing the reason why India cannot produce fast colors like those of Europe, is that trade secrets which used to descend from father to son and master to apprentice, are disappearing with the decline of the trade. If chemical research were brought to bear upon the Indian method, the art will soon be revived.

The future of the cotton industry, which is the greatest industry of India, therefore, depends upon what knowledge, enterprise and capital Indians are able to bring to bear upon it and unless they are prepared to employ all these to the same extent as other countries do, they can never hope to be independent of them.

Next to cotton is sugar. The average area under sugar-cane cultivation in these provinces is about 12 lakhs of acres, and the average yield of

*gur* (unrefined sugar) is 47 crores of maunds per annum. The chief sugar producing districts are Meerut, Muzaffarnagar, Shahjahanpur, Bareilly, Pilibhit, Moradabad, Ghazipur, Ballia, Azamgarh and Jaunpur. The largest quantity of sugar is produced in Meerut which has always been famous for its *gur*. But the highest outturn is in the Gorakhpur Division, where the natural moisture of the soil favours the luxuriant growth of the sugar-cane. In Meerut the system of cultivation is somewhat more improved than in the eastern districts and though the outturn per acre there are about 39 maunds, against 38 of Gorakhpur, the quality is better. The quantity of unrefined sugar consumed in the country in very large and only half of what is produced is refined. The consumption of the unrefined article is chiefly amongst the poorer classes and comes to about 20 seers per head of population. Refined sugar is used by the better classes and averages 3 seers per annum. The processes of pressing the juice and refining sugar are mostly those that have come down from time immemorial. The time-honoured *Kolhoo* (sugar-cane-crushing-mill) whether of wood or stone is still common and may be seen at work in nearly every village. In most parts of the western districts the two roller iron mill or the three-roller *Nahan* mill is now becoming common. These mills are set up in houses where a number of cultivators crush their sugar-cane by turns on the co-operative principle. The cane for the *Kolhoo* is chopped into small bits for being dropped into the mill which is worked by a pair of bullocks moving round and round. The *Kolhoo* is a very, comparatively, inexpensive article, and can be set up for a few rupees. It does not require much repairs. The iron roller mills are very popular and produce a large quantity of juice but their expense stands in the way of their being largely utilized. The juice pressed out is collected into large iron-troughs sunk under ground below the mill. Thence it is removed to the boiling house where it is boiled and purified by Sajji (Soda) and other ingredients. It now thickens into a brown yellow mass and when sufficiently thick is transferred into an earthen receptacle, where after constant stirring it is made into *gur* and shaped into balls of different weights which are dried before being taken to the market to sell. The ordinary weight of a ball is from 2½ to 5 seers. In the Meerut District the *gur* of a place called *Lavadi* is highly prized and is not inferior to refined sugar in taste. Large quantities of sugar-

cane juice are also made into *rab* for the manufacture of refined sugar. The process of boiling is the same but the juice is not allowed to thicken like *gur*. This *rab* is manufactured under a peculiar system called *Bel* in the Rohilkh and the *Bel* consists of five pans and the juice is transferred from pan to pan in the process of boiling. In the last pan it is ready for the manufacture of refined sugar, and its colour is now changed from the natural to a golden yellow. The proprietors of these *Bels* are known as *Khandsaris* and some of them specially in Bareilly, Shahjahanpur and Pilibhit are very rich. A concern like this can be started with the small capital of some Rs. 2,000 yielding a profit of 10 per cent. to the manufacturer. Money is advanced to cultivators on bonds to grow sugar-cane and the boiled juice is brought to him for being made into sugar. If the manufacturer takes say 1000 maunds of juice in the season it costs him Rs. 450. His staff of workers costs him about Rs. 75 and he earns about Rs. 50. Each 100 maunds *rab* yield 60 maunds of sugar and his ordinary profits are Rs. 60 after two years, on a capital of Rs. 500. But he is content with these small profits as they do not involve much risk. The trade was once a very flourishing one. Now it is declining under foreign competition and I was told in Ballia that several refineries had to be closed on account of the enormous imports of bounty-fed sugar. This is proved from the fact that in 1902-03 about 5 crores, in 1903-04 about 6 crores and in 1904-05 about 7 crores worth of sugar has been imported into the country. The highest imports of beet sugar were from Austria Hungary and Germany, and cane-sugar from the Mauritius; so that one and three-fourth million cwts. of beet sugar and four and three-fourth million cwts. of cane-sugar were imported in India from foreign countries last year. During the quarter ending June 1905 the United Provinces alone imported 1,57,753 maunds of both refined and unrefined sugar. Java, Mauritius Austria Hungary are now deriving enormous profits from India because of the removal of countervailing duties lately imposed. India is said to be the largest sugar producing country in the world and produces annually about 3 millions tons and yet it imported the enormous quantity of about 6 million cwts. Some of the leading manufacturers to whom I wrote to make enquiries as to the present condition of the sugar trade write as follows:—

*Messrs. Carew & Co., Ltd. Rosa*:—The value of the sugar and spirits sold by us for the year ending June 1905, was 20 lacs. Markets for our goods are solely those in British India. As sugar makers and refiners we have suffered from the unrestricted import of beet sugars into this country, the result of which importation has been that not only have we suffered but also have the ryots who produce the raw sugar found the result of this large influx of sugar as they have been unable to obtain the higher prices which hitherto obtained, and in some parts a marked decrease has, we believe, arisen in the area of cane sown.

Suhu Brij Ratan Ratan, Moradabad. The importation of foreign sugar has lowered the high prices of the native sugar, and about one-thirds of *khandsars* only are now worked. In the Moradabad district about one lakh of maunds of sugar are produced. A *khandasar* costs about Rs. 3000—and, if it is properly worked and the outturn is good, it gives a profit of about 100. There are about 27 *khandsars* in Moradabad and their approximate production is about 11,000 maunds.

R. B. Lalta Prasad, Pilibhit: There is a now a great decrease in the number of sugar refineries in Pilibhit on account of the loss suffered by the manufacturer. Formerly there were 150 *khandsars* in Pilibhit; now there are only 92. The reason is (1) on account of the importation of foreign sugar which comes in large quantities and sells at cheaper rates; the rate of country sugar has also fallen and confectioners cheat the public by mixing *gur* with imported sugar in order to make it look less white. On account of this mixture of *gur* which sells in Pilibhit at 10 *seers* a rupee, the price of imported sugar has fallen even lower. (2) On account of a rise in the rates of sugar juice supplied by cultivators, there is much loss in the trade. There is no limit to the quantity of sugar produced in a *khandasar*. That depends upon the outturn of sugarcane in a village. Money is advanced to cultivators without interest between April and November of each year and varies with the quantity of the sugarcane grown. The sugar refining is commenced from March and lasts till July, so that the capital of the refiner remains without interest for 8 months. At the end of the year large balances are left due from cultivators and, if they are not cleared off in three years, the money is lost. The expense of manufacturing is about Rs. 3 per maund, and the profits and losses of one year are

ascertained in the next. The average rate of juice is 34 to 35 rupees per 100 maunds, which yields about  $3\frac{1}{2}$  maunds of sugar. The average price of the latter is Rs. 12 per maund. If the treacle left is sold at a good rate, there is no loss to the refiner. In this year on account of the high rates of imported sugar the khandaris earn some profit and in Pilibhit alone in the 92 khandarsars 30,000 maunds of sugar was produced.

The industry has still a great future before it, and, if a number of native capitalists engaged in the trade were to combine and work it under improved methods, they might, by producing an article as cheap and as refined as the imported one, yet drive the latter out of the market. Already there is a strong current of feeling in native society against the use of imported sugar and dealers and confectioners have resolved to discard it altogether. But, unless the indigenous article is not made equal to the imported one both in appearance as well as in quantity, such a resolution is not likely to have any permanent effect. The Government should also so regulate their tariff as to prevent the indigenous industry from suffering under foreign competition. Free trade here has been a source of great loss to India, especially in this respect.

The next important industry of these parts is leather. India exported in 1904-05 more than 8 millions of hides and 22 millions of raw skins worth more than 7 crores of rupees. Her greatest customers are Germany, Italy, Hungary, Spain, France, the United Kingdom and America. On the other hand, she imported leather manufactures of the value of more than one-fourth crore of rupees, often her own leather in the shape of enormous profits to her customers. In the three months of this year between April and June alone Calcutta and Bombay imported from the United Provinces  $3\frac{1}{2}$  lakhs of maunds of skins and hides which are sent out abroad. This shows that if she could tan and manufacture her own leather into goods imported from foreign countries, there will be an enormous saving of money besides profitable employment to a large number of her people. Shops for the manufacture of leather goods are found on a small scale in most towns of these parts and Cawnpore, Delhi, Kurnool, Ludhiana and Agra are all great places for the leather trade, both manufactured and unmanufactured. But here there are no large concerns except those owned or managed by Europeans. In Cawnpore two of the most flourishing concerns are Cooper Allens and the

N. W. Tannery, Limited. The latter was started some 18 years ago with a capital of 10 lakhs of rupees. It now employs between 1,000 and 1,500 men, tans, curries leather, makes boots, shoes, harness, belts and other leather goods after the latest and most approved methods. Its goods are largely patronized by the public and it turns out about 2,000 pairs of boots and shoes per day, with both steam and hand labour. Among native factories may be mentioned the Shahganj boot and shoe factory owned by Sayad Muzi Itaza of Agra who, starting with the modest sum of Rs. 80 in 1882, is now worth more than  $1\frac{1}{2}$  lakhs. He turns out about 6,000 pairs of boots and shoes in the month. The average price of his wares is about Rs. 2 and yet he makes a profit of about 15 per cent. He tells me he has now imported the latest machinery for the manufacture of boots and shoes and is soon going to work with steam power to meet his growing business, tan his own leather as well as make other goods generally sold by the trade. His wares are now finding favour with the best and highest Europeans and he furnishes the example of what energy and pluck can do in a short time. The Hindus have generally a prejudice against engaging in the leather trade though as I have already said in another place two Kashmiri Brahmins, men of education, overrode all caste prejudices and qualified themselves as experts in Cooper Allens' factory in Cawnpore. Their first venture did not, however, prove a success. But they have not lost heart and are going to revive it. There is a great field in this direction also, and if Hindus do not undertake it, there is no reason why others who have no such prejudices should not do so.

The last great industry which, though not quite indigenous to these provinces, has yet a great future before it, is wool. In the Punjab it has been a great industry from time immemorial and Kashmir, Lahore, Amritsar and Ludhiana have always been great places for the manufacture of shawls and other woollen goods. But the industry is suffering under foreign competition and Amritsar shawls which once sold for £ 50 each are now not in such great demand as formerly and yet an Amritsar and Kashmir shawl is in article of great value lasting better and retaining its fineness of appearance much longer than any imported one. Large quantities of these shawls are still sold in Delhi and other places and though much dearer in price than imported shawls are popular with the Indian community. There are still thousands of Kashmir weavers in



Amritsar whose business though not so paying as before gives employment to them even for the pittance it affords. In 1904-05 India imported the enormous quantity of 3,066 lakhs rupees worth of woollen goods of which one-fifth were shawls. The number was about 25 lakhs of which Germany supplied 18 lakhs. This shows how the trade has declined and what a great field it still has with better methods of work and more capital. The value of imported piece-goods was 194½ lakhs and the quantity 23½ million yards. In the United Provinces there are no large concerns except the Woollen Mills Company of Cawnpore and in the Punjab the Egerton Woollen Mills Company of Dhariwal is by far the largest of any concern there. The former, as their manager tells me, now employ about 1,800 or 2,000 people in their works and have lately erected a large model village for them. They make everything of wool and do not touch mixtures of any sort. They consume wool to the approximate quantity of 40,000 maunds in the year and confine their operations in India. Their flannels, broadcloths, Cashmere blankets and hosiery are largely patronized by the public and I have generally found them to be superior to similar imported articles in point of durability. One thing noticeable about their cloth is that it does not contract as do many imported ones in washing. Their business was started in 1876 and the capital employed is 35 lakhs of rupees. Their workmen are generally Indians but the proprietors are Englishmen. The Egerton Woollen Mills of Dhariwal have also the same object in view. They make woollen goods of all sorts in enormous quantities. Their goods are also all pure wool and they send them out to all parts of the country and employ about 1,000 people. The proprietors of both these mills are the same. In the hand industry the number of persons engaged is about 80,000, and it must be said with regret, that the number of workers is decreasing on account of foreign and mill competition. And yet the country blanket is still popular with the poor for its cheapness and durability. There are besides these some carpet making factories in Agra and Mirzapur. The former owned by a European firm is a flourishing concern but the industry in Mirzapur is declining on account of the inferior quality of the goods manufactured. The Government jails, especially in Agra, are also great places for the manufacture

of carpets and the latter's manufactures may be seen in many a palace in Europe. But the prisoners after they have been discharged have no opportunity of utilizing their skill and either take to manufacturing inferior goods or to other trades. In Muzaffarnagar the blanket industry is reviving under the impetus afforded to it by the local exhibitions. The blankets made there are very substantial and compare favourably in quality and weight with imported articles of similar description. The yarn employed is both indigenous and foreign, the former for the coarser and the latter for the finer kinds. The yarn made from wool imported from other parts of India like the Punjab, Rajputana, or Tibet is much softer and superior to that made from local wool. This is due to the want of attention in the breeding of sheep. Perhaps with greater attention in this direction some improvement might result. These are some of our chief industries. There are minor ones like the metal work of Benares and Moradabad, the brocades of Benares, and the furniture of Bareilly. But they are not of so universal importance as these, and I am sure that if greater attention both on the part of capitalists and men of education were directed towards each of these, we shall be saving millions of rupees each year besides affording profitable employment to thousands both educated and uneducated who are now dying for want of it. Capital is always shy in coming and because many of our people aim a little too high they fail. If they started with small beginnings, they are sure to be more successful. The most noticeable feature amongst the many colossal businesses now owned by Europeans is their small beginning, the steady perseverance of those who started them and if we wish to be successful, we shall have to do the same. In Delhi and other places bogus joint stock companies rise and disappear for want of honesty of purpose on the part of those who float them. Speculation and gambling are now great features in the commercial world everywhere in India and opium, wheat, silver, Government paper ruin every day more than they enrich thousands who engage in them. All this money should be saved and applied towards the improvement of industries in some of the branches suggested above and there will be no inducement to our people to get rich in one day and find themselves in the insolvent court the next.

**RESOLUTIONS PASSED AT  
THE INDUSTRIAL CONFERENCE AT BENARES.**

(1) That the Conference urges the Government of India and all Provincial Governments and administrations as also the people of India according to their power and their opportunities, (a) to found Technical Schools in all large centres for industrial education on an adequate scale of the Indian peoples, (b) to encourage and help Indian manufactures, (c) and to foster and extend the use of such manufactures in India in preference to foreign goods.

(2) That the Conference urges all Provincial Governments and administrations as well as the proprietors and Managers of private Schools and Colleges to add industrial classes like those of weaving, dyeing carpentry, &c., to the existing educational institutions when practicable so that a boy trained in such institutions may learn some manual industry. That the Conference specially invites the attention of Indian capitalists to the great importance of introducing the use of improved hand-looms among the weavers of India and recommends the establishment of weaving schools where boys may learn the use of hand-looms, among the towns and villages of all provinces in India.

(3) That this Conference urges Indian capitalists to establish at their own cost schools for spinning, dyeing, pottery, carpentry, and the manufactures of iron-ware and brass-ware in order to afford facilities to boys of all castes and classes

to learn such useful industries as a means of their livelihood.

(4) That when it is possible to raise large funds for industrial Education, this Conference recommends the placing of such funds in the hands of trustees with a view to the establishment of Technicological Colleges on the most modern methods adopted in Europe, America and Japan for the training of a large number of students in the various industries which are profitable in India.

(5) The permanent Committees be established at Bombay, Madras, Allahabad, Lahore and Nagpur for giving effect to the above recommendations, generally encouraging industries and making an industrial survey in their several provinces and compiling useful facts and suggestions for submission to the next Industrial Conference in December 1906. In order to carry out these items, such Committees are requested to raise suitable funds, appoint trustees, frame rules for the conduct of business and lay their accounts before the next Conference.

(6) That this Conference appoints Mr. R. N. Mudholkar as General Secretary, empowers the Chairman to appoint a permanent Assistant Secretary and establishment on suitable pay and allot a sum of Rs. 5,000 for meeting the expenses for the next 12 months.

**INDUSTRIAL INDIA.**

BY GLYN BARLOW, M.A.

*Principal, Victoria College, Palghat. Formerly Editor of "The Madras Times."*

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# THE INDIAN NATIONAL CONGRESS, *Twenty-First Session held at Benares.*

## THE PRESIDENTIAL ADDRESS.

By The Hon. Mr. G. K. GOKHALE, C.I.E.

FELLOW-DELEGATES, LADIES AND GENTLEMEN,—

**I** THANK you from the bottom of my heart for the great, the signal honour which you have conferred upon me by electing me to preside over your deliberations this year. As has been said by more than one of my predecessors, the Presidentship of the Congress is the highest distinction which it is in the power of our countrymen to bestow upon any one; and proud indeed is that moment in an Indian's life when he receives at your hands this most conspicuous mark of your confidence and your favour. As I, however, stand before you to-day, it is not so much the honour of the position, great as that is, as the responsibility which it imposes upon me, that occupies my thoughts. When I was first invited nearly four months ago to accept this office, we were able to see on the horizon only the small cloud—no bigger than a man's hand. Since then the sky has been overcast and for some time a storm has been raging; and it is with rocks ahead and angry waves beating around that I am called upon to take charge of the vessel of the Congress. Even the stoutest heart among us may well own to a feeling of anxiety in such a situation. Let us, however, humbly trust that in this holy city of Benares, the Divine guidance, on which we may securely throw ourselves, will not fail us, and that the united wisdom and patriotism of the delegates assembled will enable the Congress to emerge from the present crisis with unimpaired and even enhanced prestige and usefulness.

### THE PRINCE AND PRINCESS OF WALES.

Gentlemen, our first duty to-day is to offer our most loyal and dutiful welcome to Their Royal Highnesses the Prince and Princess of Wales on the occasion of this their first visit to India. The

Throne in England is above all parties—beyond all controversies. It is the permanent seat of the majesty, the honour and the beneficence of the British Empire. And in offering our homage to its illustrious occupants and their heirs and representatives, we not only perform a loyal duty, but also express the gratitude of our hearts for all that is noble and high-minded in England's connection with India. The late Queen-Empress, again, was known, within the limits of her constitutional position, to exercise during her reign her vast influence in favour of a policy of justice and sympathy towards the Indian people. We can never forget that the great Proclamation of 1858, on which we take our stand so largely in our constitutional struggle, was, not only in spirit but also in substance, her own declaration of the principles on which India was to be governed. The present King-Emperor has announced his resolve to walk in the footsteps of his mother, and we have no doubt that the Prince of Wales is animated by the same desire to see a policy of righteousness pursued towards India. We rejoice that His Royal Highness and his noble consort have come out amongst us to acquaint themselves personally with the ancient civilization of this country and its present condition. The Congress earnestly and respectfully wishes Their Royal Highnesses a most successful tour through India, and it humbly trusts that the knowledge they will acquire and the recollections they will carry back with them will constitute a fresh bond of sympathy and attachment between the Royal Family in England and the Princes and people of this country.

### THE NEW VICEROY.

The Congress also offers a most cordial and respectful welcome to Their Excellencies Lord and Lady Minto. The new Viceroy assumes the

responsibilities of his office at a critical juncture. The temper of the people, so sorely tried during the last three years, calls for the exercise of wise and statesmanlike conciliation on the part of those who are in authority, if further estrangement between the rulers and the ruled is to be prevented. I earnestly trust that such conciliation will be forthcoming. Meanwhile, a special responsibility rests upon us all to see to it that the immediate task that confronts His Excellency is not made more difficult than it already is. The difficulties of the situation are not of Lord Minto's creating, and he has a right to expect the co-operation of both the officials and the public in his endeavours to terminate a state of tension, which has already produced deplorable results and which cannot be prolonged without serious detriment to the best interests of the country.

#### LORD CURZON'S ADMINISTRATION.

Gentlemen, how true it is that to everything there is an end! Thus even the Viceroyalty of Lord Curzon has come to a close! For seven long years all eyes had constantly to turn to one masterful figure in the land,—now in admiration, now in astonishment, more often in anger and in pain, till at last it has become difficult to realize that a change has really come. For a parallel to such an administration, we must, I think, go back to the times of Aurangzebe in the history of our own country. There we find the same attempt at a rule excessively centralized and intensely personal, the same strenuous purpose, the same overpowering consciousness of duty, the same marvellous capacity for work, the same sense of loneliness, the same persistence in a policy of distrust and repression, resulting in bitter exasperation all round. I think even the most devoted admirer of Lord Curzon cannot claim that he has strengthened the foundations of British rule in India. In some respects his Lordship will always be recognized as one of the greatest Englishmen that ever came out to this country. His wonderful intellectual gifts, his brilliant powers of expression, his phenomenal energy, his boundless enthusiasm for work,—these will ever be a theme of just and unstinted praise. But the gods are jealous, and amidst such lavish endowments, they withheld from him a sympathetic imagination, without which no man can ever understand an alien people; and it is a sad truth that to the end of his administration Lord Curzon did not really understand the people of India. This was at the root of his many

inconsistencies and made him a perpetual puzzle to most men. And thus the man, who professed in all sincerity, before he assumed the reins of office, his great anxiety to show the utmost deference to the feelings and even the prejudices of those over whom he was set to rule, ended by denouncing in unmeasured terms not only the present generation of Indians, but also their remote ancestors and even the ideals of their race, which they cherish above everything else; he, who, in the early part of his administration, publicly warned the official classes that "official wisdom is not so transcendent as to be superior to the stimulus and guidance" of public opinion and who declared that in the present state of India "the opinion of the educated classes is one which it is not statesmanship to ignore or to despise," ended by trampling more systematically upon that opinion than any of his predecessors, and claiming for his own judgment and that of his official colleagues a virtual character of infallibility. The fact is that Lord Curzon came to India with certain fixed ideas. To him India was a country where the Englishman was to monopolize for all time all power and talk all the while of duty. The Indian's only business was to be governed and it was a sacrilege on his part to have any other aspiration. In his scheme of things there was no room for the educated classes of the country; and having failed to amuse them for any length of time by an empty show of taking them into his confidence, he proceeded in the end to repress them. Even in his last farewell speech at the Byculla Club in Bombay, India exists only as a scene of the Englishman's labours, with the toiling millions of the country—eighty per cent. of the population—in the background. The remaining twenty per cent., for aught they are worth, might as well be gently swept into the sea! Had Lord Curzon been less self-centred, had he had more humility in his nature, he might perhaps have discovered his mistake before it was too late. This would probably have enabled him to avoid giving so much offence and causing so much pain as he unhappily did during the last two years, but I doubt if the main current of his administration would even then have flowed in another channel. Lord Curzon's highest ideal of statesmanship is efficiency of administration. He does not believe in what Mr. Gladstone used to call the principle of liberty as a factor of human progress. He has no sympathy with popular aspirations, and when he finds them among a sub-

ject people, he thinks he is rendering their country a service by trying to put them down. Thus in his Byculla Club speech he actually stated that he had not offered political concessions to the people of India, because he "did not regard it as wisdom or statesmanship in the interests of India itself to do so"! Taking Lord Curzon at his highest, we find him engaged in a herculean attempt to strengthen the Englishman's monopoly of power in India and stem the tide of popular agitation and discontent by rousing the members of the bureaucracy to a sense of duty similar to his own and raising the standard of administrative efficiency all round. The attempt has failed, as it was bound to fail. Never was discontent in India more acute and widespread than when the late Viceroy laid down the reins of office; and as regards the bureaucratic monopoly of power, I think we are sensibly nearer the time when it will be successfully assailed.

One claim Lord Curzon advanced in his farewell speech at Bombay which it is necessary to examine a little. He told his hearers, as he had done once before—on the occasion of the last Budget debate—that even if he had incurred the hostility of educated Indians, the masses would be grateful to him for what he had done for them. This attempt to distinguish between the interests of the educated classes and those of the bulk of their countrymen is a favourite device with those who seek to repress the legitimate aspirations of our people. It is significant that Lord Curzon had never resorted to it till he had finally broken with the educated classes. We know of course that the distinction is unreal and ridiculous, and we know also that most of those who use it as a convenient means to disparage the educated classes cannot themselves really believe in it. Lord Curzon mentions the reduction of the salt-duty, the writing off of famine arrears, the increased grants to primary education and to irrigation, the attempt at Police reform as measures on which he bases his claim. The suggestion here is that he adopted these measures for the good of the masses in spite of the opposition—at any rate, the indifference—of the educated classes, when the plain fact is that it was the Congress that had been urging these measures year after year on the attention of Government and that it was only after years of persistent agitation that it was able to move the Government in the desired direction. Four years ago, when, with a surplus of seven crores or nearly five millions sterling in hand, the Government of India did not remit any

taxation, and I ventured to complain of this in Council and to urge an immediate reduction of the salt-duty, I well remember how Lord Curzon sneered at those who "talked glibly" of the burdens of the masses and of the necessity of lowering the salt-tax as a measure of relief! Lord Curzon was fortunate in coming to India when the currency legislation of Lord Lansdowne and Sir David Barbour had succeeded in artificially raising the rupee to its present level, thereby enabling the Government of India to save about four millions sterling a year on its Home remittances. This, with the recovery of the opium revenue, placed huge surpluses at Lord Curzon's disposal throughout his administration, and he never knew a moment of that financial stress and anxiety which his predecessors had to face for a series of years. Considering how large these surpluses have been, I do not think the relief given by Lord Curzon to the taxpayers of the country has by any means been liberal. He himself estimated last March the total amount of this relief at 7 millions sterling. He did not mention that during the same time he had taken from the taxpayers 33 millions sterling over and above the requirements of the Government. Again, how paltry is the relief given by the reduction of the salt-duty and the writing off of famine arrears, compared with the enormous injury done to the mass of our people by the artificial raising of the value of the rupee, which led to a heavy immediate depreciation of their small savings in silver, and which makes a grievous addition to their permanent burdens by indirectly enhancing their assessments and increasing their debts to the money-lender as prices adjust themselves to the new rupee! Much has been made of Lord Curzon's increased grants to primary education. Considering how little the State does in India for the education of the masses, it would have been astonishing, if with such surpluses Lord Curzon had not made any addition to the educational expenditure of the country. But if he has given a quarter of a million more to education, he has given five millions a year more to the Army; and with reckless profusion he has increased the salaries of European officials in many departments and has created several new posts for them. "A spirit of expenditure," to use an expression of Mr. Gladstone's, has been abroad in all directions during his time, and he has never practised the old-fashioned virtue of economy, with which the real interests of the people are bound up. Of course a ruler cannot labour as

devotedly as Lord Curzon has done for seven years for increased efficiency without removing or mitigating important administrative evils; but that is quite different from a claim to champion the special interests of the masses, as against their natural leaders and spokesmen, the educated classes of the community.

#### PARTITION OF BENGAL.

Gentlemen, the question that is uppermost in the minds of us all at this moment is the Partition of Bengal. A cruel wrong has been inflicted on our Bengalee brethren and the whole country has been stirred to its deepest depths in sorrow and resentment, as had never been the case before. The scheme of partition, concocted in the dark and carried out in the face of the fiercest opposition that any Government measure has encountered during the last half a century, will always stand as a complete illustration of the worst features of the present system of bureaucratic rule—its utter contempt for public opinion, its arrogant pretensions to superior wisdom, its reckless disregard of the most cherished feelings of the people, the mockery of an appeal to its sense of justice, its cool preference of Service interests to those of the governed. Lord Curzon and his advisers—if he ever had any advisers—could never allege that they had no means of judging of the depth of public feeling in the matter. All that could possibly have been done by way of a respectful representation of the views of the people had been done. As soon as it was known that a partition of some sort was contemplated, meeting after meeting of protest was held, till over five hundred public meetings in all parts of the Province had proclaimed in no uncertain voice that the attempt to dismember a compact and homogeneous Province, to which the people were passionately attached and of which they were justly proud, was deeply resented and would be resisted to the uttermost. Memorials to the same effect poured in upon the Viceroy. The Secretary of State for India was implored to withhold his sanction to the proposed measure. The intervention of the British House of Commons was sought, first, by a monster petition, signed by sixty thousand people, and later by means of a debate on the subject raised in the House by our ever-watchful friend,—Mr. Herbert Roberts. All proved unavailing. The Viceroy had made up his mind. The officials under him had expressed approval. What business had the people to have an opinion of their own and to stand in the way? To add insult to injury, Lord Curzon described the

opposition to his measure as 'manufactured'—an opposition in which all classes of Indians, high and low, uneducated and educated, Hindus and Mahomedans, had joined, an opposition than which nothing more intense, nothing more widespread, nothing more spontaneous had been seen in this country in the whole course of our political agitation! Let it be remembered that when the late Viceroy cast his stigma on those who were ranged against his proposals, not a single public pronouncement in favour of those proposals had been made by any section of the community; and that among the foremost opponents of the measure were men like Sir Jotindra Mohan Tagore and Sir Gurudas Banerji, Raja Peary Mohan Mukerji and Dr. Rash Behary Ghose, the Maharajas of Mymensing and Kamibazar,—men who keep themselves aloof from ordinary political agitation and never say a word calculated in any way to embarrass the authorities, and who came forward to oppose publicly the Partition Project only from an overpowering sense of the necessity of their doing what they could to avert a dreaded calamity. If the opinions of even such men are to be brushed aside with contempt, if all Indians are to be treated as no better than dumb, driven cattle, if men, whom any other country would delight to honour, are to be thus made to realize the utter humiliation and helplessness of their position in their own, then all I can say is "Goodbye to all hope of co-operating in any way with the bureaucracy in the interests of the people!" I can conceive of no graver indictment of British rule than that such a state of things should be possible after a hundred years of that rule!

Gentlemen, I have carefully gone through all the papers which have been published by the Government on this subject of Partition. Three things have struck me forcibly—a determination to dismember Bengal at all costs, an anxiety to promote the interests of Assam at the expense of Bengal, and a desire to suit everything to the interests and convenience of the Civil Service. It is not merely that a number of new prizes have been thrown into the lap of that Service—one Lieutenant-Governorship, two Memberships of the Board of Revenue, one Commissionership of a Division, several Secretaryships and Under-Secretaryships—but alternative schemes of readjustment have been rejected on the express ground that their adoption would be unpopular with the members of the Service. Thus, even if a reduction of the charge of the Lieutenant-Governor of Bengal had really become inevitable—a contention which the

greatest living authority on the subject, Sir Henry Cotton, who was Secretary to the Bengal Government under seven Lieutenant-Governors, does not admit—one would have thought that the most natural course to take was to separate Behar, Orissa and Chota Nagpore from Bengal and form them into a separate Province. This would have made the Western Province one of 30 millions in place of the Eastern. But this, says the Government of India, "would take from Bengal all its best districts and would make the Province universally unpopular." This was of course a fatal objection, for, compared with the displeasure of the Civil Service, the trampling under foot of public opinion and the outraging of the deepest feelings of a whole people was a small matter! But one can see that administrative considerations were really only secondary in the determination of this question. The dismemberment of Bengal had become necessary, because, in the view of the Government of India, "it cannot be for the lasting good of any country or any people that public opinion or what passes for it should be manufactured by a comparatively small number of people at a single centre and should be disseminated thence for universal adoption, all other views being discouraged or suppressed." "From every point of view," the Government further states, "it appears to us desirable to encourage the growth of centres of independent opinion, local aspirations, local ideals and to preserve the growing intelligence and enterprise of Bengal from being cramped and stunted by the process of forcing it prematurely into a mould of rigid and sterile uniformity." You will see that this is only a paraphrase, in Lord Curzon's most approved style, of the complaint of the people of Bengal that their fair Province has been dismembered to destroy their growing solidarity, check their national aspirations and weaken their power of co-operating for national ends, lessen the influence of their educated classes with their countrymen, and reduce the political importance of Calcutta. After this, let no apologist of the late Viceroy pretend that the object of the partition was administrative convenience and not political repression!

Gentlemen, it is difficult to speak in terms of due restraint of Lord Curzon's conduct throughout this affair. Having published his earlier and smaller scheme for public criticism, it was his clear duty to publish similarly the later and larger scheme, which he afterwards substituted for it. But in consequence of the opposition

which the first scheme encountered, he abandoned the idea of taking the public any more into his confidence and proceeded to work in the matter in the dark. For more than a year nothing further was heard of his intentions, and while he was silently elaborating the details of his measure, he allowed the impression to prevail that the Government had abandoned the Partition project. And in the end, when he had succeeded in securing the Secretary of States sanction to the scheme, it was from Simla, where he and his official colleagues were beyond the reach of public opinion, that he sprang the final orders of Government upon an unprepared people. Then suddenly came his resignation. And the people permitted themselves for a while to hope that it would bring them at least a brief respite, especially as Mr. Brodrick had promised shortly before to present further papers on the subject to Parliament, and that was understood to mean that the scheme would not be brought into operation till Parliament re-assembled at the beginning of next year. Of course, after Lord Curzon's resignation, the only proper, the only dignified course for him was to take no step, which it was difficult to revoke and the consequences of which would have to be faced, not by him, but by his successor; he owed it to Lord Minto to give him an opportunity to examine the question for himself; he owed it to the Royal visitors not to plunge the largest Province of India into violent agitation and grief on the eve of their visit to it. But Lord Curzon was determined to partition Bengal before he left India and so he rushed the necessary legislation through the Legislative Council at Simla, which only the official members could attend, and enforced his orders on 16th October last—a day observed as one of universal mourning by all classes of people in Bengal. And now, while he himself has gone from India, what a sea of troubles he has bequeathed to his successor! Fortunately there are grounds to believe that Lord Minto will deal with the situation with tact, firmness, and sympathy, and it seems he has already pulled up to some extent Lord Curzon's favourite Lieutenant, the first ruler of the new Eastern Province. Mr. Fuller has evidently cast to the winds all prudence, all restraint, all sense of responsibility. ~~Even if a fraction of~~ what the papers have been reporting be true, his extraordinary doings must receive the attention of the new Secretary of State for India and the House of Commons. There is no surer method of goading a docile people into a state of

dangerous despair than the kind of hectoring and repression he has been attempting.

But, gentlemen, as has been well said, even in things evil there is a soul of goodness, and the dark times through which Bengal has passed and is passing have not been without a message of bright hope for the future. The tremendous upheaval of popular feelings which has taken place in Bengal in consequence of the partition, will constitute a landmark in the history of our national progress. For the first time since British rule began, all sections of the Indian community, without distinction of caste or creed, have been moved by a common impulse and without the stimulus of external pressure to act together in offering resistance to a common wrong. A wave of true national consciousness has swept over the Province, and at its touch old barriers have, for the time at any rate, been thrown down, personal jealousies have vanished, other controversies have been hushed! Bengal's heroic stand against the oppression of a harsh and uncontrolled bureaucracy has astonished and gratified all India, and her sufferings have not been endured in vain, when they have helped to draw closer all parts of the country in sympathy and in aspiration. A great rush and uprising of the waters, such as has been recently witnessed in Bengal, cannot take place without a little inundation over the banks here and there. These little excesses are inevitable, when large masses of men move spontaneously—especially when the movement is from darkness into light, from bondage towards freedom—and they must not be allowed to disconcert us too much. The most astounding fact of the situation is that the public life of this country has received an accession of strength of great importance, and for this all India owes a deep debt of gratitude to Bengal. Of course the difficulties which confront the leaders of Bengal are enormous and perhaps they have only just begun. But I know there is no disposition to shrink from any responsibilities and I have no doubt that whatever sacrifices are necessary will be cheerfully made. All India is at their back and they will receive in the work that lies before them the cordial sympathy and assistance of the other Provinces. Any discredit that is allowed to fall on them affects all. They on their side must not forget that the honour of all India is at present in their keeping.

#### THE SWADESHI MOVEMENT.

Gentlemen, I will now say a few words on a movement which has spread so rapidly and has been hailed with so much enthusiasm all over the

country during the last few months—the *Swadeshi* movement. It is necessary at the outset to distinguish it from another movement, started in Bengal, which has really given it such immense impetus—the boycott of British goods. We all know that when our Bengalee brethren found that nothing would turn the late Viceroy from his purpose of partitioning Bengal, that all their protests in the press and on the platform, all their memorials to him, to the Secretary of State and to Parliament were unavailing, that the Government exercised its despotic strength to trample on their most cherished feelings and injure their dearest interests and that no protection against this of any kind was forthcoming from any quarter, they, in their extremity, resolved to have recourse to this boycott movement. This they did with a twofold object—first, as a demonstration of their deep resentment at the treatment they were receiving, and secondly, to attract the attention of the people in England to their grievances, so that those who were in a position to call the Government of India to account might understand what was taking place in India. It was thus as a political weapon, used for a definite political purpose, that they had recourse to the boycott; and in the circumstances of their position they had every justification for the step they took. And I can tell you from personal experience that their action has proved immensely effective in drawing the attention of English people to the state of things in our country. But a weapon like this must be reserved only for extreme occasions. There are obvious risks involved in its failure and it cannot be used with sufficient effectiveness, unless there is an extraordinary upheaval of popular feeling behind it. It is bound to rouse angry passions on the other side, and no true well-wisher of his country will be responsible for provoking such passions, except under an overpowering sense of necessity. On an extreme occasion, of course a boycotting demonstration is perfectly legitimate, but that occasion must be one to drive all the classes, as in Bengal, to act with one impulse, and make all leaders sink their personal differences in the presence of a common danger. It is well to remember that the term 'boycott,' owing to its origin, has got unsavoury associations, and it conveys to the mind before everything else a vindictive desire to injure another. Such a desire on our part, as a normal feature of our relations with England, is of course out of the question. Moreover, if the boycott is confined to British goods only, it leaves us full to purchase the



goods of other foreign countries, and this does not help the *Swadeshi* movement in any way.

Gentlemen, the true *Swadeshi* movement is both a patriotic and an economic movement. The idea of *Swadeshi* or 'one's own country' is one of the noblest conceptions that has ever stirred the heart of humanity. As the poet asks--

'Breathes there the man with soul so dead,  
Who never to himself hath said,—  
This is my own, my native land!'

The devotion to motherland, which is enshrined in the highest *Swadeshi* is an influence so profound and so passionate that its very thought thrills and its actual touch lifts one out of oneself. India needs to-day above everything else that the gospel of this devotion should be preached to high and low, to Prince and to peasant, in town and hamlet, till the service of motherland becomes with us as overmastering a passion as it is in Japan. The *Swadeshi* movement, as it is ordinarily understood, presents one part of this gospel to the mass of our people in a form which brings it within their comprehension. It turns their thoughts to their country, accustoms them to the idea of voluntarily making some sacrifice for her sake, enables them to take an intelligent interest in her economic development and teaches them the important lesson of co-operating with one another for a national end. All this is most valuable work, and those who undertake it are entitled to feel that they are engaged in a highly patriotic mission. But the movement on its material side is an economic one; and though self-denying ordinances, extensively entered into, must serve a valuable economic purpose, namely, to ensure a ready consumption of such articles as are produced in the country and to furnish a perpetual stimulus to production by keeping the demand for indigenous things largely in excess of the supply, the difficulties that surround the question economically are so great that they require the co-operation of every available agency to surmount them. The problem is indeed one of the first magnitude. Twelve years ago the late Mr. Ranade remarked at an Industrial Conference held at Poona: "The political domination of one country by another attracts far more attention than the more formidable, though unfelt, domination which the capital, enterprise and skill of one country exercise over the trade and manufactures of another. This latter domination has an insidious influence which paralyzes the springs of all the

varied activities, which together make up the life of a nation." The question of production is a question of capital, enterprise and skill, and in all these factors our deficiency at present is very great. Whoever can help in any one of these fields is, therefore, a worker in the *Swadeshi* cause and should be welcomed as such. Not by methods of exclusion but by those of comprehension, not by insisting on every one working in the same part of the field but by leaving each one free to select his own corner, by attracting to the cause all who are likely to help and not alienating any who are already with us, are the difficulties of the problem likely to be overcome. Above all, let us see to it that there are no fresh divisions in the country in the name of *Swadeshi*. No greater perversion of its true spirit could be imagined than that.

Take the question of cotton piece-goods, of which we import at present over 22 millions sterling worth a year. This is by far the heaviest item among our imports and our present *Swadeshi* agitation is directed mainly towards producing as much of these goods in our own country as possible. I have consulted three of the best experts available in India on this subject—Mr. Bezanji of Nagpore, the right hand man of the late Mr. Tata in mill matters; the Hon. Mr. Vithaldas Damodardhas, who has written an admirable paper on the cotton industry for the Industrial Conference and has kindly placed a copy of it at my disposal, and our friend Mr. Wacha. They are all agreed about the requirements and the difficulties of the situation. So far as the cotton fabrics are concerned, even strict Free Traders should have nothing to say against the encouragement, which the *Swadeshi* movement seeks to give to their manufactures in India. In the first place, many of the usual objections that may be urged against a system of State protection do not apply to helpful voluntary action on the part of consumers, such as the *Swadeshi* movement endeavours to promote. Moreover, the essence of Free Trade is that a commodity should be produced where the comparative cost of its production is the least and that it should be consumed where its relative value is the highest; and if accidental circumstances have thwarted such an adjustment in a given case, any agency which seeks to overcome the impediment works in the end in the interests of true Free Trade. Now everyone will admit that with cheap labour and cotton at her own door, India enjoys

exceptional advantages for the manufacture of cotton goods; and if the *Swadeshi* movement helps her to regain her natural position in this respect—a position which she once occupied but out of which she has been driven by an extraordinary combination of circumstances,—the movement works not against but in furtherance of true Free Trade. Even at present the Cotton Industry in India is an important one. It is the largest industry after agriculture in the country; it is also the only one—agriculture excepted—in which the Indians themselves have a substantial share. It is represented by a paid up capital of about 17 crores of rupees or a little over 11 millions sterling, the number of mills being about 200, with five million spindles and fifty thousand power-looms. In addition to this, there are, according to the Census of 1901, about a quarter of a crore of persons engaged in hand-loom weaving in the country. Our mills consume nearly 60 per cent. of the cotton produce of India and produce 58 crore lbs. of yarn. Of this quantity, Mr. Vithaldas tells us, about 23½ crore lbs. is exported to China and other foreign countries, about 13½ crores is used in our weaving mills, and about 19 crores is woven by hand-loom weavers, the remaining 2 crores going to the manufacture of rope and twine. In addition to this, 3 crore lbs. of yarn is imported from the United Kingdom and is consumed by the hand-looms. The hand-loom industry of the country thus absorbs, in spite of its hard struggles, about 22 crore lbs. of yarn, or nearly double the quantity woven by power-looms, and this is a most interesting and significant fact. The yarn used by the weaving mills produce about 55 crores of yards of cloth; of which about 14 crore yards is exported to foreign countries and about 41 crores is left for consumption in the country. If we put down the production of the hand-looms at about 90 crore yards, we have about 130 crore yards as the quantity of *Swadeshi* cloth consumed at present in India.

The quantity of piece-goods imported from the United Kingdom and retained for use in the country is about 205 crore yards a year. Of the total cloth consumed, therefore, over one-third is at present *Swadeshi*. This is an encouraging feature of the situation. But the imported cloth is almost all superior in quality. "While our mills," Mr. Vithaldas says, "produce the coarser cloth, say from yarn up to 30s

count and in a few cases up to 40s, the bulk of the imported cloth is of the finer quality using yarn over 30s. count. The Indian weaving mills are obliged to restrict themselves for the most part to weaving coarser cloth owing to the inferior quality of cotton now grown in the country." It may be noted that even from existing cotton, hand-looms can, owing to their greater delicacy of handling the yarn, produce finer cloth than the power-looms. Fortunately owing to the exertions of the Agricultural Department of the Bombay Government—exertions for which it is entitled to the best thanks of the whole country—Egyptian cotton has just been successfully introduced into Sind, and this year a thousand bales of a quality equal to very good Egyptian have been produced. A much heavier crop is expected next year and there is no doubt that its cultivation will rapidly extend. The main difficulty in the way of our manufacturing the quality of cloth that is at present imported is one of capital. Mr. Wacha estimates that if the whole quantity of 205 crore yards is to be produced by mills, the industry requires an additional capital of about 30 crores of rupees. Even if we proposed to spread this over ten years, we should require an addition of 3 crores of rupees every year. Now if we turn to the Statistical Abstract of British India, we shall find that the total increase in the capital invested in cotton mills during the last ten years has been only about 3 crores,—an amount that Mr. Wacha wants every year for ten years. The normal development of the mill industry is thus plainly unequal to the requirements of the situation. Moreover, it is well to remember what Mr. Bezanji says—that the present mill-owners must not be expected to be very keen about the production of finer cloth, because its manufacture is much less paying than that of the coarser cloth. This is due to various causes, the principal one among them being that English capital, similarly invested, is satisfied with a smaller range of profits. Capital from other quarters must, therefore, be induced to come forward and undertake this business. If we again turn to the Statistical Abstract, we shall find that our people hold about 50 crores of rupees in Government Securities and about 11 crores in Postal Savings Banks. In the Presidency and other Banks, the private deposits stand at about 33 crores of rupees, but there are no means of ascertaining how much of the amount is held by Indians. Considering the extent of the

country and the numbers of the population, these resources are, of course, extremely meagre. Still they might furnish some part of the capital needed. In this connection, may I say that a special responsibility now rests in the matter on the Aristocracy of Bengal! And this is not merely because the *Swadeshi* movement is being so vigorously advocated in their Province, but also because, owing to the Permanent Settlement of Bengal, they are enabled to enjoy resources which, in other parts of India, are swept into the coffers of the State. If sufficient capital is forthcoming, Mr. Bezanji's patriotism may, I am sure, be relied on to secure for the undertaking whatever assistance his great capacity and unrivalled knowledge can give. It must, however, be admitted that capital will come forward only cautiously for this branch of the business. But the hand-loom is likely to prove of greater immediate service. Mr. Vithaldas looks forward to a great revival of the hand-loom industry in the country, and I cannot do better than quote what he says on this point in his paper. "This village industry," he says, "gives means of livelihood not only to an immense number of the weaver class, but affords means of supplementing their income to agriculturists—the backbone of India—who usually employ themselves on hand-loom, when field work is unnecessary, and also when, owing to famine, drought or excessive rains, agricultural operations are not possible. Now the apparatus with which they work is nearly two centuries behind the times. Mr. Havell, Principal of the Calcutta School of Arts, Mr. Chatterton of the Madras School of Arts, and Mr. Churchill of Ahmednagar, along with many others, are doing yeoman's service by taking keen interest in the question of supplying economical and improved apparatus to the hand-loom weavers. Mr. Havell has pointed out that in preparing the warp our hand-loom weavers are incapable of winding more than two threads at a time, though the simplest mechanical device would enable them to treat 50 or 100 threads simultaneously. The latest European hand-loom, which successfully competes with the power-loom in Cairo and in many places in Europe, can turn out a maximum of 48 yards of common cloth in a day. Mr. Havell is satisfied that the greater portion of the imported cotton cloth can be made in the Indian hand-loom with great profit to the whole community. The question of the immediate revival of the hand-loom weaving industry on a commercial basis demands the most earnest attention of every well-wisher of

India and evidence gives promise of a successful issue to efforts put forward in this direction." The outlook here is thus hopeful and cheering; only we must not fail to realize that the co-operation of all who can help—including the Government—is needed to overcome the difficulties that lie in the path.

#### OUR AIMS AND ASPIRATIONS.

Gentlemen, this is the twenty-first session of the Indian National Congress. Year after year, since 1885, we have been assembling in these gatherings to give voice to our aspirations and to formulate our wants. When the movement was first inaugurated, we were under the influence of that remarkable outburst of enthusiasm for British Rule, which had been evoked in the country by the great Viceroyalty of the Marquis of Ripon. That best beloved of India's Viceroys was not content to offer mere lip-honour to the principle that righteousness alone exalteth a nation. He had dared to act on it in practice and he had braved persecution at the hands of his own countrymen in India for its sake. Lord Ripon's noblest service to this country was that he greatly quickened the processes, by which the consciousness of a national purpose comes to establish itself in the minds of a people. The Congress movement was the direct and immediate outcome of this realization. It was started to focus and organize the patriotic forces that were working independently of one another in different parts of the country so as to invest their work with a national character and to increase their general effectiveness. Hope at that time was warm and faith shone bright, largely as a result of Lord Ripon's Viceroyalty, and those who started the Congress believed that by offering their criticism and urging their demands from a national platform, where they could speak in the name of all India, they would be able to secure a continuous improvement of the administration and a steady advance in the direction of the political emancipation of the people. Twenty years have since elapsed, and during the time much has happened to chill that hope and dim that faith, but there can be no doubt that work of great value in our national life has already been accomplished. The minds of the people have been familiarized with the idea of a united India working for her salvation; a national public opinion has been created; close bonds of sympathy now knit together the different Provinces; caste and creed separations hamper less and less the pursuit of common aims; the dignity of a consciousness of national existence has spread over the whole land. Our record

of political concessions won is, no doubt, very meagre, but those that have been secured are of considerable value; some retrogression has been prevented; and if latterly we have been unable to stem the tide of reaction, the resistance we have offered, though it has failed of its avowed purpose, has substantially strengthened our public life. Our deliberations have extended over a very wide range of problems; public opinion in the country is, in consequence, better informed, and the Press is steadily growing in authority and usefulness. Above all, there is a general preception now of the goal towards which we have to strive and a wide recognition of the arduous character of the struggle and the immense sacrifices it requires.

The goal of the Congress is that India should be governed in the interests of the Indians themselves, and that, in course of time, a form of Government should be attained in this country similar to what exists in the self-governing Colonies of the British Empire. For better, for worse, our destinies are now linked with those of England, and the Congress freely recognises that whatever advance we seek must be within the Empire itself. That advance, moreover, can only be gradual, as at each stage of the progress it may be necessary for us to pass through a brief course of apprenticeship, before we are enabled to go to the next one; for it is a reasonable proposition that the sense of responsibility, required for the proper exercise of the free political institutions of the West, can be acquired by an Eastern people through practical training and experiment only. To admit this is not to express any agreement with those who usually oppose all attempts at reform on the plea that the people are not ready for it. "It is liberty alone," says Mr. Gladstone in words of profound wisdom, "which fits men for liberty. This proposition, like every other in politics, has its bounds; but it is far safer than the counter doctrine, wait till they are fit." While, therefore, we are prepared to allow that an advance towards our goal may be only by reasonably cautious steps, what we emphatically insist on is that the resources of the country should be primarily devoted to the work of qualifying the people, by means of education and in other ways, for such advance. Even the most bigoted champion of the existing system of administration will not pretend that this is in any degree the case at present. Our net revenue is about 44 millions sterling. Of this very nearly one-half is now eaten up by the Army. The Home Charges, exclusive of their military portion, absorb nearly one-third. These two,

between them, account for about 34 millions out of 44. Then over 3 millions are paid to European officials in civil employ. This leaves only about 7 millions at the disposal of the Government to be applied to other purposes. Can any one, who realises what this means, wonder that the Government spends only a miserable three-quarters of a million out of State funds on the education of the people—primary, secondary and higher, all put together! Japan came under the influence of Western ideas only forty years ago, and yet already she is in a line with the most advanced nations of the West in matters of mass education, the State finding funds for the education of every child of school-going age. We have now been a hundred years under England's rule, and yet to-day four villages out of every five are without a school house and seven children out of eight are allowed to grow up in ignorance and in darkness! Militarism, Service interests and the interests of English capitalists,—all take precedence to-day of the true interests of the Indian people in the administration of the country. Things cannot be otherwise, for it is the Government of the people of one country by the people of another; and this, as Mill points out, is bound to produce great evils. Now the Congress wants all this should change and that India should be governed, first and foremost, in the interests of the Indians themselves. This result will be achieved only in proportion as we obtain more and more voice in the government of our country. We are prepared to bear—and bear cheerfully—our fair share of the burdens of the Empire, of which we are now a part, but we want to participate in the privileges also, and we object most strongly to being sacrificed, as at present, in order that others may prosper. Then the Congress asks for a redemption of those promises for the equal treatment of Indians and Englishmen in the Government of this country, which have been so solemnly given us by the Sovereign and the Parliament of England. It is now three-quarters of a century since the Parliament passed an Act, which, the Court of Directors pointed out, meant that there was to be no governing caste in India. The governing caste, however, is still as vigorous, as exclusive as ever. Twenty-five years later, the late Queen-Empress addressed a most memorable Proclamation to the Princes and people of India. The circumstances, connected with the issue of that Proclamation, and its noble contents will always bear witness to the true greatness of that great sovereign and will never cease to shed lustre on the English name. The Proclamation

repeats the pledges contained in the Charter Act of 1833, and though an astounding attempt was made less than two years ago by the late Viceroy to explain away its solemn import, the plain meaning of the royal message cannot be altered without attributing what is nothing less than an unworthy subterfuge to a Sovereign, the deep reverence for whose memory is an asset of the Empire. That the Charter Act of 1833 and the Queen's Proclamation of 1858 have created in the eyes of reactionary rulers a most inconvenient situation is clear from a blunt declaration, which another Viceroy of India, the late Lord Lytton, made in a confidential document, which has since seen the light of day. Speaking of our claims and expectations based on the pledges of the Sovereign and the Parliament of England, he wrote: "We all know that these claims and expectations never can or will be fulfilled. We have had to choose between prohibiting them (the Natives of India) and cheating them, and we have chosen the least straightforward course. Since I am writing confidentially, I do not hesitate to say that both the Governments of England and of India appear to me, up to the present moment, unable to answer satisfactorily the charge of having taken every means in their power of breaking to the heart the words of promise they had uttered to the ear." "We accept Lord Lytton as an unimpeachable authority on the conduct of the Government in evading the fulfilment of the pledges. We deny his claim to lay down that our claims and expectations never can or will be fulfilled."

Our whole future, it is needless to say, is bound up with this question of the relative positions of the two races in this country. The domination of one race over another—especially when there is no great disparity between their intellectual endowments or their general civilization—inflicts great injury on the subject race in a thousand insidious ways. On the moral side, the present situation is steadily destroying our capacity for initiative and dwarfing us as men of action. On the material side, it has resulted in a fearful impoverishment of the people. For a hundred years and more now India has been, for members of the dominant race, a country where fortunes were to be made to be taken out and spent elsewhere. As in Ireland the evil of absentee landlordism has in the past aggravated the racial domination of the English over the Irish, so in India what may be called absentee capitalism has been added to the racial ascendancy of Englishmen. A great and ruinous drain of wealth from the country has gone

on for many years, the net excess of exports over imports (including treasure) during the last forty years amounting to no less than a thousand millions sterling. The steady rise in the death-rate of the country—from 24 per thousand, the average for 1882—84, to 30 per thousand, the average for 1892—94, and 34 per thousand, the present average,—is a terrible and conclusive proof of this continuous impoverishment of the mass of our people. India's best interests—material and moral—no less than the honour of England, demand that the policy of equality for the two races promised by the Sovereign and by Parliament should be faithfully and courageously carried out.

#### THE BUREAUCRACY.

Gentlemen, as I have already observed, the manner in which the Partition of Bengal has been carried out furnishes a striking illustration of the worst features of the present system of bureaucratic rule. Happily these features are not always so conspicuously in evidence. No one also denies that a large proportion of the members of the bureaucracy bring to their work a high level of ability, a keen sense of duty and a conscientious desire, within the limits of the restricted opportunities permitted by the predominance of other interests, to do what good they can to the people. It is the system that is really at fault—a system which relegates the interests of the people to a very subordinate place and which, by putting too much power into the hands of these men, impairs their sense of responsibility and develops in them a spirit of intolerance of criticism. I know many of these men are on their side constantly smarting under a sense of unfair condemnation by our countrymen. They fail to realize that if the criticism that is passed on their actions is sometimes ill-informed and even unjust, this is largely due to the veil of secrecy which carefully hides official proceedings from the view of the people in India. Moreover, theirs are at present all the privileges of the position and they must bear without impatience or bitterness its few disadvantages. I have already said that our advance towards our goal can only be gradual. Meanwhile there is a great deal of work to be done for the country in which officials and non-officials could join hands. A considerable part of the way we could both go together, but it can only be on terms consistent with the self-respect of either side. In old times, when British rule was new and its higher standards and its more vigorous purposes excited general admiration, the Englishman's claim to a privileged position, even outside the sphere of official

duties, was allowed to pass unchallenged. That is now no longer possible, and those officials, who expect the Indians to approach them with bated breath and whispering humbleness—and the type is not confined to the new Eastern Province exclusively—not only make useful relations between the two sides impossible but do more harm to their own class than they imagine. In one respect the gulf between the official and educated classes of the country is bound to widen more and more every day. The latter now clearly see that the bureaucracy is growing frankly selfish and openly hostile to their national aspirations. It was not so in the past. In a most remarkable letter which I had the honour to receive, while in England, two months ago, from Mr. Hodgson Pratt—great and venerated name among all lovers of peace—he tells us with what object Western education was introduced into this country. “Fifty years ago,” writes Mr. Pratt, who in those days was a member of the Bengal Civil Service, “while India was still under the Government of the East India Company, it was considered both just and wise to introduce measures for national education on a liberal scale with adequate provision of schools, colleges, and universities. This event was hailed with lively satisfaction by the native population as heralding a new era of social progress, and as satisfying the active intelligence of the Hindus. Now it must be observed that the character of the teaching thus inaugurated by Englishmen would necessarily reflect the ideals, which have for centuries prevailed among them. In other words, Indian youths would be brought up to admire our doctrines of political liberty, popular rights, and national independence; nor could it ever have been supposed that these lessons would fall upon deaf ears and cold hearts. On the contrary, the inevitable result of such teaching was clearly perceived by the Government of those days, and was regarded in a generous spirit. In support of this assertion I may mention that at the time of the inauguration of these measures I accompanied the then Lieutenant-Governor of Bengal (Sir Frederick Halliday) on one of his winter tours through the province. Naturally he called the attention of those, who attended the public meetings held by him, to the now education policy, and he always took occasion to declare that the schools would promote one of the leading purposes of British rule, *which was to prepare the people for self-government*. It certainly was not supposed that at any subsequent time a policy would be adopted, which would disappoint the legitimate

hopes thus created.” Now, however, that the time has come for the bureaucracy to part with some of its power in favour of the educated classes, all kinds of excuses are brought forward to postpone what is no doubt regarded as the evil day. One favourite argument is that the educated classes are as yet only a very small fraction of the community. The hollowness of this plea was well exposed by the late Mr. George Yule in his address as President of our National Congress in 1888. Quoting Prof. Thorold Rogers, he pointed out that a hundred years ago, not one man in ten or one woman in twenty knew how to read and write in England. Going another century or two back, he added, the people of England, man and boy, high and low, with the exception of a mere handful, were steeped in the grossest ignorance, and yet there was a House of Commons. We have now in this country about 15 million people who can read and write, and about a million of these have come under the influence of some kind of English education. Moreover, what we ask for at present is a voice in the Government of the country, not for the whole population, but for such portion of it as has been qualified by education to discharge properly the responsibilities of such association. Another argument, brought forward in favour of maintaining the present bureaucratic monopoly of power, is that though the educated classes make a grievance of it, the mass of the people are quite indifferent in the matter. Now, in the first place, this is not true. However it may suit the interests of the officials to deny the fact, the educated classes are, in the present circumstances of India, the natural leaders of the people. Theirs is the Vernacular Press, the contents of which do not fail to reach the mass of our population; in a hundred ways they have access to the minds of the latter; and what the educated Indians think to-day, the rest of India thinks to-morrow. Moreover, do the officials realise how their contention condemns their rule out of their own mouth? For it means that only so long as the people of India are kept in ignorance and their faculties are forced to lie dormant, that they do not raise any objection to the present system of administration. The moment education quickens those faculties and clears their vision, they range themselves against a continuance of the system!

#### OUR IMMEDIATE DEMANDS.

Gentlemen, a number of important questions will come up before you for discussion during the next two days, and following the practice of

previous Congresses, you will, no doubt, record after due deliberation, your views on them in the form of resolutions. This is, of course, necessary; but may I suggest that for purposes of effective agitation in the immediate future, we should now concentrate our main energies on certain selected portions of our programme? Speaking broadly, most of the reforms that we have been advocating may be grouped under four heads:—(1) those which aim at securing for our people a larger and larger share in the administration and control of our affairs; these include a reform of our Legislative Councils, the appointment of Indians to the Secretary of State's Council and the Executive Councils in India, and a steady substitution of the Indian for the European agency in the public service of the country; (2) those which seek to improve the methods of administration, such as the separation of Judicial from Executive functions, Police Reform, and similar proposals; (3) those which propose a readjustment of financial arrangements with the object of securing a reduction of the burdens of the taxpayers and a more efficient application of our resources; under this head come a reduction of military charges, the moderating of land assessments and so forth; and (4) those which urge the adoption of measures, calculated to improve the condition of the mass of the people; these include a vigorous extension of primary education, facilities for industrial and technical instruction, grants for improved sanitation, and a real attempt to deal with the alarming indebtedness of the peasantry. Now what I would most earnestly and respectfully suggest is that we should select from each group such reforms as may be immediately urged with the greatest effect and press them forward in this country and in England with all the energy we can command. In my humble opinion, our immediate demands should be:—(1) A reform of our Legislative Councils, raising the proportion of elected members to one-half, requiring the budgets to be formally passed by the Councils, and empowering the members to bring forward amendments, with safeguards for bringing the debates to a close in a reasonable time. The Presidents of the Councils should have the power of veto. The Viceroy's Legislative Council consists at present of 25 members, of whom only five are elected, one by the Chamber of Commerce of Calcutta—a body of Europeans—and the other four by four provinces. We must ask for the proportion of elected members to be now raised to 12. Of this number, two seats might be given, one to commerce and one to certain industries, and the

remaining ten should be assigned to different provinces, two to each of the three older provinces, and one each to the remaining. And, to begin with, the right of members to move amendments may be confined to one amendment each. The two members for commerce and industries will generally be Europeans, and they will ordinarily vote with Government. Thus even if all the ten provincial members voted together, they would be only 10 out of 25. Ordinarily they will not be able to carry a motion against the Government, but on exceptional occasions they may obtain the support of two or three men from the other side, and then the moral effect of the situation will be considerable. In the provincial Legislative Councils, we must have an increase in the number of members, each district of a province being empowered to send a member. The objection that these bodies will, in that case, be somewhat unwieldy is not entitled to much weight.

(2) The appointment of at least three Indians to the Secretary of State's Council, to be returned, one each, by the three older provinces.

(3) The creation of Advisory Boards in all Districts throughout India, whom the heads of districts should be bound to consult in important matters of administration concerning the public before taking action. For the present, their functions should be only advisory, the Collectors or District Magistrates being at liberty to set aside their advice in their discretion. Half the members of a Board should be elected representatives of the different Talukas or subdivisions of the district and the other half should consist of the principal District Officers and such non-official gentlemen as the head of the district may appoint. These Boards must not be confounded with what are known as District Local Boards. There is, at present, too much of what may be called Secretariat rule, with an excessive multiplication of central departments. District administration must be largely freed from this, and reasonable opportunities afforded to the people concerned to influence its course, before final decisions are arrived at. If such Boards are created, we may, in course of time, expect them to be entrusted with some real measure of control over the district administration. The late Mr. Ranade used to urge the importance of such Boards very strongly. If ever we are to have real local government in matters of general administration, the creation of these Boards will pave the way for it. One great evil of the present system of administration is its secrecy.

This will be materially reduced, so far as district administration is concerned, by the step proposed.

(4) The recruitment of the Judicial Branch of the Indian Civil Service from the legal profession in India.

(5) The separation of Judicial and Executive functions.

(6) A reduction of military expenditure.

(7) A large extension of primary education.

(8) Facilities for industrial and technical education.

(9) An experimental measure to deal with the indebtedness of the peasantry over a selected area.

I think, gentlemen, if we now concentrate all our energies on some such programme, we may, within a reasonable time, see results, which will not be altogether disappointing. One thing is clear: The present is a specially favourable juncture for such an effort. In our own country, there is sure to be a great rebound of public opinion after the repression to which it has been subjected during the last three years. And in England, for the first time since the Congress movement began, the Liberal and Radical party will come into real power. My recent visit to England, during which I enjoyed somewhat exceptional opportunities to judge of the situation, has satisfied me that a strong current has already set in there against that narrow and aggressive Imperialism which only the other day seemed to be carrying everything before it. The new Prime Minister is a tried and trusted friend of freedom. And as regards the new Secretary of State for India, what shall I say? Large numbers of educated men in this country feel towards Mr. Morley as towards a Master, and the heart hopes and yet it trembles, as it had never hoped or trembled before. He, the reverent student of Burke, the disciple of Mill, the friend and biographer of Gladstone,—will he courageously apply their principles and his own to the government of this country, or will he too succumb to the influences of the India Office around him and thus cast a cruel blight on hopes which his own writings have done so much to foster? We shall see; but in any case his appointment, as Secretary of State for India, indicates how strongly favourable to our cause the attitude of the new Ministry is. Mr. Ellis, the new Under-Secretary of State for India, is openly known to be a friend of our aspirations. A more gratifying combination of circumstances could not be conceived and it now rests with us to turn it to the best advantage we can for our Motherland.

#### CONCLUSION.

Gentlemen, one word more and I have done. I have no wish to undertake the difficulties that lie in our path, but I am convinced more than ever that they are not insuperable. Moreover, the real moral interest of a struggle, such as we are engaged in, lies not so much in the particular readjustments of present institutions, which we may succeed in securing, as in the strength that the conflict brings us to be a permanent part of ourselves. The whole life of a people, which is broader and deeper than what is touched by purely political institutions, is enriched even by failures, provided the effort has been all that it should be. For such enrichment, the present struggle is invaluable. "The true end of our work," said Mr. Ranade nine years ago, "is to renovate, to purify, and also to perfect the whole man by liberating his intellect, elevating his standard of duty, and developing to the full all his powers. Till so renovated, purified, and perfected, we can never hope to be what our ancestors once were—a chosen people, to whom great tasks were allotted and by whom great deeds were performed. Where this feeling animates the worker, it is a matter of comparative indifference in what particular direction it asserts itself and in what particular method it proceeds to work. With a liberated manhood, with buoyant hope, with a faith that never shirks duty, with a sense of justice that deals fairly by all, with unclouded intellect and powers fully cultivated, and, lastly, with a love that overleaps all bounds, renovated India will take her proper rank among the nations of the world, and be the master of the situation and of her own destiny. This is the goal to be reached—this is the promised land. Happy are they, who see it in distant vision; happier those who are permitted to work and clear the way on to it; happiest they, who live to see it with their eyes and tread upon the holy soil once more. Famine and pestilence, oppression and sorrow, will then be myths of the past, and the gods will once again descend to the earth and associate with men, as they did in times which we now call mythical." Gentlemen, I can add nothing that may be worthy of being placed by the side of these beautiful words. I will only call to your minds the words of another great teacher of humanity who asks us to keep our faith in spite of trying circumstances and warns us against the presumption of despairing, because we do not see the whole future clearly before our eyes:—

"Our times are in His hand  
Who saith 'A whole I planned, [afraid.]  
Youth shows but half; trust God: see all, nor be



# THE ALL-INDIA TEMPERANCE CONFERENCE.

## PRESIDENTIAL ADDRESS.

By Sir BHALCHANDRA KRISHNA, Kt.

### EXPRESSION OF THANKS.

BROTHER DELEGATES AND GENTLEMEN,

ALLOW me first to thank you heartily for having done me the high honour of electing me President of this Conference. This chair was occupied last year in Bombay by that veteran temperance reformer, Mr. Samuel Smith, M.P., President of the Anglo-Indian Temperance Association, and I feel no little diffidence and hesitation in taking the place of so distinguished a worker in the cause of temperance. When my good friend Mr. Chintamani, on behalf of the Reception Committee of this Conference, offered me the Presidentship, I felt I was too ill-qualified to accept it. At the same time, I thought it was a call of duty which I could not refuse. I have, therefore, ventured to accept this onerous office, trusting to your indulgence and help in carrying the proceedings of the Conference to a successful issue.

### THE UTILITY OF AN ALL-INDIA CONFERENCE.

The idea of an All-India Temperance Conference occurred to some temperance workers in Bombay last year for the first time, and you may remember what a successful gathering it was. The meeting together of so many leading men in different walks of life from all parts of India for the Congress suggested the thought that as in politics, in industry, in theism, and social reform the best workers from all parts of the country congregated in some important place in Christmas week, the opportunity might well be utilized to bring together the leading temperance workers in different parts of the country, to take stock of the work done during the year, and to devise plans for further action. Such a gathering serves as an excellent focus of enlightened public opinion and a convenient centre for the exchange of views. We temperance workers have one common object at heart, but the conditions of our work are different in different places. We are thus often embarrassed by the diversity of our systems and

principles of action. When we meet together in such a gathering, we can compare notes at first hand, and profit by each other's counsel and experience. Even the company of fellow-workers is stimulating to one another. There is occasion for self-examination and correction of errors. There is, moreover, a chance of inspiration for zealous work and for concerted action. Thus the cause of temperance is sure to profit by this meeting together of its leading exponents. Let me call on you, gentlemen, to make the best use of this opportunity to know one another, to gather information, and to make compacts of co-operation on parallel lines. Such a meeting even once a year may lead to lasting friendships, to the removal of apathy and prejudices, and to a correct appreciation of each other's aims, aspirations and methods of work. If when we part, we part as better friends and fellow-workers, this Temperance Conference will not have met in vain.

### THE SCOPE OF TEMPERANCE WORK.

To temperance workers such as you all are, it is hardly necessary for me to define the scope of temperance work. Canon Wilberforce in a lecture delivered in Bombay defined temperance as meaning total abstinence. In common parlance temperance means moderation, and in that sense moderate drinking may appear to be permissible. But drinking is such an insidious vice that small beginnings often lead to great excesses. It has, therefore, been found necessary to hold the temperance standard aloft as signifying total abstinence. We know that total abstinence for the whole population of this country is not a practicable measure. Some amount of drinking is perhaps inevitable, and as long as it is moderate it may not be very harmful. But this moderate stage rarely lasts long, and, therefore, those who have to fight the demon of drink have need to take the extreme position of total abstinence. There is a familiar saying that if you wish to hit the chimney top, you must aim at the sky. Similarly even though our practicable object may be

to prevent intemperance, we must work for total abstinence as our goal.

#### TEMPERANCE SOCIETIES AND THEIR WORK.

The cause of temperance requires a two-sided activity. Our first duty is with the people. Our main aim is to prevent or at least to check the growth of intemperance. With that view we seek to reach the people and try to save them from temptations, to warn them by advice, and wean them away from intemperate habits. We approach them by means of lectures and by the dissemination of temperance literature and by personal exhortation to abstain from the vice of drink. In India there are in all 301 temperance organizations doing their best to mitigate the evil of drink in a variety of ways. Thus in the Punjab there are several temperance associations, the most important of which are the Temperance Society of Amritsar and the Deva Samaj of Lahore. The first of these organizations keeps a reading room where special meetings are held on Sundays and Wednesdays, at which temperance lectures are delivered. A Band of Hope is organised and preachers are sent from town to town and city to city to educate the people in temperance principles. Branch Associations have been organised and tracts and leaflets are freely distributed. The Director of Public Instruction of the Punjab has given the Society an assurance that temperance lessons will be introduced in Vernacular text-books when they will be next revised, but, in the meanwhile, he has granted them permission to deliver temperance lectures in schools. The Deva Samaj of Lahore is an organization for social reform, and coupled with this work the Samaj is doing excellent work in regard to temperance. The Samaj has succeeded in reclaiming many persons from the vice of drink. In the United Provinces the Temperance Societies have banded themselves together in the United Provinces Temperance Council which has just been brought into existence through the efforts of our energetic Secretary, Mr. Chintamani. At Cawnpore the Caine Lecturing League employs a number of agents to visit different places, to organise meetings and deliver lectures. Here as elsewhere the names of the late Mr. Caine and the Rev. Thomas Evans are memorialized by numerous Temperance Societies being named after them. In Bengal and Assam there are several associations distributed over the provinces, each of them doing some good work in its own way. The Temperance Federation at Calcutta,

though only a year and a half old, is doing splendid work by successfully appealing to the Abkari authorities to close several liquor-shops, by publishing tracts, supplying the press with information on temperance topics, and organising Bands of Hope. The Federation distributes its work among sub-committees and thus has succeeded in getting a lot of useful work done. There is quite a large number of Temperance Societies in the Madras Presidency doing very useful work. In the city of Madras there is the Madras Temperance League, which has brought about union between the various scattered units in the city. Under its auspices a Temperance Congress was held there last February which sat for three days and discussed many valuable papers on various phases of the temperance question. In addition to these public associations, there are caste organisations at different places which have attained considerable success in arresting the growth of the drinking habit in those particular castes. Thus the Kayasthas in Upper India have formed various Temperance Societies which are exerting a very healthy influence over the whole community. Wine drinking at all marriage feasts, ceremonies and public entertainments is all but abolished. In the Bombay Presidency there are 41 Temperance Societies affiliated, like their sister organisations in other parts of India, to the Anglo-Indian Temperance Association. In Gujarat and Kathiawar many towns have Temperance Societies. The Societies at Baroda, Ahmedabad, Rajkot and Jamnagar are doing very useful work. In Belgaum, as in Upper India, there is a caste organisation which, I have heard, has succeeded in effectually stopping drinking among particular castes. The resolutions among these castes may perhaps prove transitory, nevertheless they are valuable as showing a spirit of resistance to vice. In Bombay City there are in all 14 temperance organisations. Of these the Indian Temperance Association founded in 1887 and the Bombay Temperance Council founded in 1896, are the principal agencies for public work in the temperance cause. The Indian Temperance Association confines its energies to educational and reclaiming work among the people, while the Bombay Temperance Council takes up the work of representations to Government on legislative as well as executive measures. The Temperance Association organises public lectures and has up to now employed one public speaker to go about among the poorer classes such as mill-hands and labourers and speak to them on the

evils of intemperance. He gives about a hundred lectures in a year. Another lecturer has recently been employed. The good work done by the Association among the mill-hands has received acknowledgment from the Commissioner of Police as well as the Government of Bombay. There have been three Temperance Conferences held in Bombay the first of which met under the auspices of the Indian Temperance Association and the other two were convened by the Bombay Temperance Council. The memorials submitted to the Government by these Conferences were very favourably received and have succeeded in inducing the Government to prohibit the sale of liquor to children under 14, and to order the closing of six liquor-shops at fairs, the propriety of which Government considered doubtful. As regards local option, the Abkari Department fixed a limit of 30 or 40 paces on either side of a proposed shop and the houses immediately in front within which limit the residents should be consulted as to the opening of a new liquor-shop. Government considered the limit too narrow and have fixed a radius of a hundred yards in the locality, though in our memorial we had asked for a furlong. Another point gained is the time allowed for appeal against the Collector's order granting a licence. Formerly the licence granted by the Collector had to be confirmed by the Commissioner before a new liquor-shop was opened. The new regulation allows 14 days for appeal to the Commissioner against the Collector's order. A further important success won by the third Conference is an assurance from the Vernacular Text-book Committee about the introduction of temperance lessons in the Vernacular Readers. Thus the Indian Temperance Association and the Bombay Temperance Council between them do valuable work. Let me take this occasion also to notice the work done by some other organisations in Bombay, notably the Royal Army Temperance Association under its energetic Secretary the Rev. Mr. Bateson, the Independent Order of Good Templars, and the Independent Order of Rechabites. These Orders are open to the natives of India and many of our countrymen have joined them as members. They hold weekly meetings at their Lodges and Tents, where, in addition to their own special business they do what is called "temperance teaching." They work among juveniles through the agency of juvenile Lodges and Tents. There is further the Women's Christian Temperance Union which works among ladies, and does yeoman's service to the tem-

perance cause. All these organisations have their special monthly magazines. The Royal Army Temperance Association conducts a magazine called "On Guard," the Independent Order of Good Templars have "The British Indian Templar," the Rechabites have "The Indian Rechabite" and the Women's Temperance Union have "The White Ribbon." All these Associations work in concert with the Bombay Temperance Council and are represented in the Council by their delegates.

#### THE POSITION OF TEMPERANCE WORKERS TOWARDS GOVERNMENT.

The action we take with respect to Government measures fills a large part of our activities and brings us into frequent communication with Government. The Government seek to regulate the traffic in liquor. They have a vast all-pervading department which earns revenue and makes elaborate regulations for the conduct of the traffic as well as the protection of the revenue. The Government have declared that it is the restriction of the sale of liquor and not the raising of revenue that is the guiding principle of their policy. Thus the Secretary of State in a despatch dated 14th March 1889 observes: "The taxation of the sale of intoxicating liquors is imposed primarily in order to restrain the consumption of such liquors, and not for the purpose of making money out of their sale." In a letter to the Government of Bombay dated 21st April 1904, the Government of India write: "The subject is one which the Government of India regard as a vital importance to the welfare of the community, and it cannot be too strongly impressed on the administering officers that the Government policy is to discourage drinking and to do all that is possible, without undue interference with the liberty of the subject, to suppress the degrading and demoralizing habit of intoxication." Elsewhere in the same letter the Government remark: "It should be made clear that the Government is on the side of abstinence." Here, therefore, we have an assurance that the objects of the Government and of temperance workers are identical. Our position, therefore, is no longer one of opposition but of co-operation. We have no desire to embarrass the Government, and do not approach the subject in a spirit of fault-finding. Our only object is to help Government in the detection and correction of abuses. We readily and gratefully acknowledge that the policy of the Government at its head-quarters is in entire accord with

the objects of the temperance movement in India. In the lower ranks of the service, however, there still lurks the spirit of the old revenue policy, and when an attempt is made to correct their errors they accuse us of deliberate opposition to Government. But let me repeat that we have no wish to take up a position of wanton opposition. We recognize that the present attitude of the Government is in consonance with the objects of temperance, and when we find that any measures of Government are not in conformity with their declared attitude we endeavour to obtain their correction. In doing so we really help Government to make their measures conform to their own declared policy. It is thus for a friendly interchange of opinions and exposure of errors with a view to their correction, that we approach Government, and we trust that the Government will reciprocate our friendliness and honest endeavour for mitigation of vice and suffering.

#### OPINIONS OF SOME OFFICERS.

Another welcome and hopeful circumstance worthy of note is that some high Government officials have recently pronounced opinions and made recommendations in entire harmony with the temperance programme. Sir Frederick Lely when Additional Member of the Viceroy's Council wrote a note on Abkari administration which is a true *vide necum* of the Temperance reformer. Sir Frederick was Revenue Commissioner N. D. in the Bombay Presidency, and his opinions as to the temper of subordinate Revenue Officers towards temperance and the expediency of specific measures are entitled to great weight. He makes a frank admission that though the Government of India's policy is directed to promote abstinence, subordinate Revenue Officers are still attached to the policy of promoting revenue. The Government of India express a pious wish that this may not be true, and affirm their principles once more. The Government of Bombay, however, repudiate the idea entirely. Our experience is that Sir Frederick Lely has uttered the exact truth, however unpalatable it may be to Government. In regard to the farming system, the number and location of shops in towns and villages, the opening of shops at fairs and like gatherings and cognate subjects, Sir Frederick Lely makes suggestions identical with those made by ourselves. The Government of Bombay as well as the Government of India do not in the main accept Sir Frederick's suggestions, but the note

is a valuable acquisition in itself, and is important as having elicited an expression of opinion from the two Governments which is in no small measure helpful to us. Other distinguished men high in the Government service have given expression to pronounced temperance views. Presiding at a meeting of the Army Temperance Association, a late Viceroy remarked: "It would be an excellent thing if every commanding officer were told that he himself would be judged by the sobriety of his regiment and that a flourishing canteen fund would be looked upon as the mark of a bad Colonel." If the same principles continue to prevail among high Government officers, we may count upon meeting with sympathy and consideration in regard to our efforts.

#### THE EXCISE COMMITTEE.

Last August Government was pleased of its own motion to appoint an Excise Committee to inquire into the working of the Abkari administration. The Committee is composed entirely of officials. With a view to secure non-official representation on the Committee, the Bombay Temperance Council petitioned the Government of India begging that a non-official member from each province should be added to the Committee. The Government of India declined to make any such appointment on the ground that no new principles of Excise administration were intended to be evolved, that the policy already laid down was not open to discussion, that only the details of Excise administration in each province were to be examined, and that such examination would be best conducted by a strong Departmental Committee. We think, on the other hand, that a purely Departmental Examination is apt to be one-sided, that the presence of non-official members would have supplied a corrective to official one-sidedness, and would thus have added strength to the deliberations of the Committee. I had a verification of this opinion when I was examined as a witness before the Committee in Bombay a few days ago. The Bombay Temperance Council submitted a statement to the Committee, and myself and Mr. Gilder, the Secretary to the Temperance Council appeared as witnesses. The Committee received us courteously, but we could observe a disposition to treat our statements as made in a spirit of hostility to Government. I assured the Committee that we had no offensive or hostile intention, and that we co-operated with Government according to our lights. The statement submitted by the Bombay Temperance Council dwelt upon the

growth of the revenue, the farming system, local option, the opening of liquor-shops at fairs and gatherings, notices of application for liquor-shops, women at liquor bars, and removal of restrictions on toddy. In our evidence we amplified these points, and there was, I believe, a satisfactory representation of the non-official view before the Committee. How far it will be effective in moulding the eventual decisions of the Committee we must leave the future to show.

#### THE GROWTH OF ABKARI REVENUE.

A point of standing dispute between the Government and temperance workers is the growth of Abkari revenue and the inferences it suggests. The fact of the growth is undoubted. In two decades from 1880-81 to 1901 the gross Excise revenue rose from Rs. 31.4 millions to 59.1 millions. It is remarkable that there has been an increase of about two millions every successive year. Thus in 1881-82 the revenue rose to Rs. 34.3 millions, in 1882-83 to 36.1 millions, in 1883-84 to 38.4 millions, in 1884-85 to 40.1 millions. This continuous increase was kept up till 1896-97 and the next two years which were famine years. But in the succeeding years it again rose in the same proportion. Thus in 1899-1900 the revenue rose to 57.9 millions, in 1900-01 to 59.1 and in 1901-02 to 61.2 millions. The question is, what does this growth imply? In the popular view it signifies increased consumption of liquor which means increase of drunkenness. The Government strongly maintain that "the increase is not due to any increase of the drinking habit but merely to improved administration, to the suppression of illicit distillation and sale, and the great and general increase in the rate of taxation." To my mind the plea of improved administration is not sufficient to account for so large an increase. Increased revenue must be due to increased sales of liquor and increased sales must mean increased drunkenness. When the officers of the present day explain the increase of revenue on the ground of improved administration they must remember that they are casting a reflection on their predecessors, and that hereafter they may themselves be liable to the same reflection at the hands of their successors. The fact is the Abkari, like every other Revenue Department, has a bias in favour of increasing revenue and it cannot justify its existence except by a continuous increase. In spite of the declarations of the Government of India that the increase of revenue should not be

the aim of Abkari administration, the fact remains that Revenue Officers are unable to shake themselves off from their natural bias in favour of increasing the revenue. The Revenue Officers as well as the Government may protest against such a suggestion, but I fear the facts are too strong for them. Sir Frederick Lely in his memorandum observes: "The Abkari Department is often not in accord with the spirit of the Supreme Government, and not in line with the best moral sense of the country." He mentions instances of the Collector of Ahmedabad having declined to close shops in the vicinity of mills on the ground that there was a demand for liquor at the shops. In 1899 the Hon. Mr. (now Sir Henry) James, C.S.I., I.C.S., Member of Council of the Government of Bombay, in reply to a speech of the Hon. Sir P. M. Mehta, with reference to the opening of a country liquor shop at Matheran against the unanimous opposition of the local property owners, said: "My Honorable friend wants more expenditure on the police and on the plague, and if every respectable gentleman were to say I have a syce who is not a temperate person, I do not want him to get intoxicated, and as drink is only a luxury, you should stop him from getting liquor, whence is the Government Excise revenue to come from?" In 1886 there was a movement in the Thana and Colaba districts of the Bombay Presidency in favour of total abstinence, when the Abkari Commissioner wrote to the Government of Bombay: "The question for decision is, shall we sit quiet and allow the movement to continue and to spread and thereby to forfeit a large amount of revenue, or are measures to be adopted which will bring the people to their senses." On other like occasions of popular movements the Revenue Officers have shown sympathy to the Abkari farmer, rather than to the people.

#### THE FARMING SYSTEM.

The root of the evil lies to my mind in the farming system. The farmer is a trader and not a philanthropist. He has an obvious interest in pushing up the sale of liquor and devises measures to serve his purpose to the best advantage. He becomes a power and even a terror to the country people. In all his dealings he has the sympathy of the local Revenue Officers, and he is able to have a free hand in securing the widest circulation to his wares. The sympathy is so strong that on one occasion the Government of Bombay remitted to the Abkari farmer of Khandesh a sum

of six lakhs, and when questioned as to why the remission was made the Government replied simply that they thought it expedient to do so. This means that the farmer was given a bonus from the public revenue to recompense him for the loss caused by insufficient consumption of liquor. Writing about the farming system, Sir Frederick Lely points out how the farmer assumes a semi-official position and is able to break down popular temperance movements. He mentions an instance in which the Hindu Ghanchis or oil-pressers of Surat were made to abandon their resolution not to drink at caste feasts. With respect to the Thana and Colaba movements mentioned above, the Collector wrote: "The contractor whose business the movement ruins has, I believe, (but I have not been at much pains to enquire by what means) tried to induce his customers to return to him." In 1895 the Abkari farmer for Ahmednagar, Poona, and Dharwar in the Bombay Presidency forced the sale of country liquor amounting to about 9,806 gallons, as it was the last year of the contract, and on complaint being made, the Government replied that the farmer was justified in managing his business in the manner which he thought most advantageous to himself." In this way the Abkari farmer rules supreme and makes futile all the declarations of Government in favour of abstinence. We recognize that the Government are as earnest as ourselves in seeking to promote temperance and that they have no wish to make a profit out of the vice of the people, but so long as the farming system lasts all the good intentions of the Government will become nugatory, and the forcing up of the consumption of liquor will go on unabated. The prospect of increasing revenue serves as a bait and a stimulus to Revenue Officers to support and sympathise with the Abkari farmer and to connive at, if not to actually encourage, his efforts to push up sales. The Government have abolished the system of farms in regard to the collection of land-revenue. We wonder why they retain it with reference to so pernicious a source of revenue as the Abkari.

#### LOCATION OF SHOPS.

One point which brings temperance workers into frequent conflict with Revenue Officers is the location of shops. The farmer with an eye to business naturally seeks to place his shops in highly frequented localities. The temperance worker, on the other hand, is anxious that the shops should be removed from public haunts as

far as possible. Sir Frederick Lely, in his memorandum already referred to, writes: "Numerous shops exist on frequented high roads, in bazaars, near markets, near mills veritable traps to catch the weak, the thirsty, the tired, at their most susceptible moments. . . . The fact remains that they attract by sight and smell many customers who would not enter them if they were not thrust upon their notice." Sir Frederick suggests that liquor-shops should be removed to not less than half a mile from places of common resort. A radius of half a mile beyond the outskirts of a village will hardly afford sufficient protection to the villagers from the temptations of a grog-shop. But it will be better than placing a shop in the heart of a village which is the present practice. A distance-limit will be a very desirable reform. It should be tried as an experiment in selected places and watched how far it is effective in reducing the attendance of villagers at liquor-shops. The number of shops in the vicinity of a village should likewise be greatly restricted. On the high road between Lonavla and Karla in Poona district, a distance of five miles, I have noticed four grog-shops. You may imagine what havoc these shops may be making on the slender means of the poor villagers. Our villagers are notoriously impecunious, but whether in good or bad years the liquor-seller drives a roaring trade. The money-lender is ordinarily run down as the cause of the people's misery, but to my mind the liquor-seller is a much more potent cause of their ruin. Government have made many laws to protect the impecunious ryot from the money-lender, but if they could abolish the liquor-seller they would be conferring a more genuine boon than any number of laws about agriculturists' relief. As regards towns, Sir Frederick Lely's idea is to congregate liquor-shops in a particular locality. It is certainly desirable that such shops should not be allowed to spread all over a town, but confining them to one locality may not be practicable. The Government of India do not approve of the suggestion about concentration as well as the distance-limit. But the Government agree that such shops should not be in the vicinity of places of public resort. The Bengal rules in regard to the location of liquor-shops provide: "No liquor-shop should be opened in a bazaar or at the entrance to a bazaar, or near a bathing ghat or any other place of public resort, school, hospital, place of worship, factory, in the interior of a village, at the side of a road leading to a bathing ghat or other place of waste supply.

In some districts, the side of a main road or a village inhabited by aborigines of known drinking habits should also be avoided. A liquor-shop should not be inaccessible to persons requiring liquor, but it should not be in such a situation as to obtrude itself on the attention of the public, or to render persons passing by subject to annoyance from persons drinking." The Government of India approve of the Bengal rules and apparently desire that they should be adopted in other provinces. The Government of Bombay has, I am glad to say, adopted them. In other provinces, too, temperance workers may, I think, well exert themselves to obtain the adoption of the Bengal rules.

#### TEMPORARY SHOPS AT FAIRS.

The opening of liquor-shops at melas, fairs, cricket and other matches, and like gatherings is a point which deserves to be seriously pressed on the attention of the Government. Sir Frederick Lely mentions the subject in his memorandum and recommends that such shops should be absolutely forbidden, except in special cases, with the sanction of the Commissioner. The objection to open such shops at public gatherings is obvious. If it is objectionable to keep liquor-shops near places of public resort like bazars and bathing ghats, it will be much more objectionable to obtrude them on the public notice at places where many people congregate for festive or like purposes. In the case of a religious fair there is an additional objection on the ground of religion, as the presence of the shops is apt to lead the people away from the very purpose for which they meet. It is true that when persons have a craving for drink they will seek to satisfy it in every possible manner. But if there are no shops at hand, their indulgence is likely to be restricted. In any case, the absence of shops will save many people from taking liquor who are drawn into the vortex only by the presence of temptation or the example of others. The Government of India leave the question open, and suggest that local Governments should frame rules according to local conditions. The Government of Bombay was in one case good enough to stop certain shops of this description, but the precedent cannot be relied on as establishing a uniform rule.

#### LOCAL OPTION.

Local option is an allied subject which deserves notice. This principle has already received fair recognition from the Government. It has been

ruled that residents within a certain radius of a proposed shop have a right to be consulted as regards its location, and in case of local opposition the shop should be disallowed. Members of Municipalities also have a right to express opinion in regard to the choice of a site. These rules are fairly good in their scope, but are not worked in the spirit in which they are framed. There are numerous instances in which the opinion of local residents is set at naught. Even with regard to the opinion of Municipal Commissioners, the Government of Bombay observes: "It is not possible to undertake to accept it in all cases." It is necessary that a more respectful and sympathetic attitude should be cultivated by Revenue Officers towards public opinion in regard to the location or multiplication of liquor-shops in a given locality. The concession of local option has been so far only nominal. To be effective there must be cultivated among the people themselves a sense of responsibility and indignation against a moral wrong. The people must be prompt in resisting encroachments on their moral susceptibilities and must be active and energetic in their endeavours to remove a threatened cause of evil. They must seize the right opportunities to protest against any defiling of respectable surroundings, and must not rest until the apprehended danger is past. Unless public opinion gains steadiness and strength, a mere declaration of principle by Government would be of little avail.

#### BAR-MAIDS.

The employment of woman at liquor-shops has long been a subject of correspondence between the Bombay Temperance Council and the Government of Bombay. In Burma the employment of bar-maids is prohibited by special legislation, and in Calcutta there are executive orders prohibiting such employment. In Bombay the Government is not yet satisfied that there is anything offensive or objectionable in the presence of woman at liquor-bars. The Government say that they do not consider that the profession of bar-maids is disreputable but it seems to be ignored that whether disreputable or otherwise, the fact is that they stimulate the consumption of drink. There is good reason to apprehend that the class of women who are employed as bar-maids are not such as good people would like to associate with. But assuming they are as pure as angels, the question is whether or not their presence has the effect of drawing young men into the meshes of drink. A little observation will satisfy any one

that the presence of bar-maids is most injurious to the morals of those who visit the bars. It will, therefore, behove the Government to reconsider this question when it comes before them on a fresh representation from the Temperance Council. This subject was pressed on the attention of the Excise Committee when they were in Bombay. If the evil exists in other provinces, the temperance workers there should make representations to their respective Governments. The example of Burma and Calcutta is an assurance that some day our Government, too, may be induced to accept our view. Meanwhile, let us not cease to press the subject on the attention of the Government.

#### TODDY AND MHOWRA.

The restrictions on toddy and mhowra flowers is a fruitful subject of controversy in the Bombay Presidency. Unfermented toddy is admitted by experts to be a healthful drink. In large tracts of country toddy as well as mhowra flowers are used as food by jungle tribes and other poor classes. The restrictions now imposed drive the people to use alcoholic liquors. The cess on toddy trees up to 1858 was not more than Rs. 3 per tree. It then began to rise by jumps—to Rs. 6 between 1859—1873, to Rs. 9 in 1876—77, to Rs. 12 in the first half year of 1878 and to Rs. 15 in the next half, and lastly to Rs. 18 in 1880. In 1885 it was reduced to Rs. 12 at which figure it stands at present. The cess is still very prohibitive and makes the drawing of toddy unprofitable. On mhowra flowers too recent legislation has imposed manifold prohibitions. The history of mhowra legislation in Bombay is remarkable as showing how persistent the Abkari Department is in carrying through a particular piece of legislation against public opinion. The Mhowra Bill ran the gauntlet of a veto from the Government of India on two different occasions. Eventually the Government succeeded in getting their Bill passed. This persistency ought to teach us a lesson of continued effort. We too when our prayers in a particular case are not heard, must strive strenuously to work at the accomplishment of our object until we succeed.

#### CONCLUSION.

I have thus endeavoured to briefly pass in review the main temperance topics which are the subject of the resolutions that will be placed before you. Let me now say to you a word of warning and exhortation. Our cause is a moral one. Though in some matters it has a political

aspect, it is not political in the strict sense of the expression. Some officers of Government and their followers in official and non-official classes fight shy of the Congress on the ground that it deals with political propaganda. There is no reason for any such apprehension with respect to our Conference. It has a wide platform on which officials and non-officials, Anglo-Indians and natives, men of all classes and creeds, professions and walks of life may meet and join hands for the furtherance of morality and purity among the people at large. It is unhappily only too true that from whatever cause drunkenness is largely prevalent not only among the masses of our people but higher classes as well. Mr. Natesan in a paper read before the Temperance Congress at Madras in February last gives the testimony of several leading gentlemen in the country on both sides of the question, and concludes that among the educated, the middle and the lower classes, the vice of drinking is largely spreading. This is a conclusion which confronts us everywhere. Whether we look to the figures of revenue and consumption or consider our actual everyday experience, the truth is brought home to us that the evil of drink has got a firm and wide hold on our society. We have, therefore, this existing fact to face, and to take measures for mitigating the evil. To rescue people from the grip of misery and ruin is a noble mission, and temperance workers must not be backward in undertaking it against any odds. Whether the work is to be done directly among the people by way of reclaiming them from habitual drunkenness or whether Government are to be approached for correcting any measures likely to encourage intemperance, the temperance worker must put himself forward without sparing either time, money or personal labour. The people themselves, if they are properly worked upon, have a strong motive to abstain from drink. To Hindus and Mahomedans there are religious injunctions of the most absolute character to abjure drink as the vilest of sins. The Hindu law-givers denounce drinking as a *Mahapatak* or great sin, classing it with offences so grave as murder. The Mahomedan law-givers are equally emphatic. Our people ought, therefore, to require no great encouragement or effort to abstain from an indulgence which is so strongly denounced by their religions, and to which they ought to have a natural abhorrence. Facilities of temptations, momentary weakness, the example of evil company, and like causes may lead men astray. When a man makes a slip



once, the subsequent fall is easy. Drinking does unhappily exercise a potent fascination on the confirmed drunkard, but no effort should be spared to remove temptations from his reach, and win him over to the path of righteousness. I have, therefore, earnestly to request you to work with a whole heart for the cause you have undertaken. There is no occasion to lose heart. It is an undeniable fact that drinking is on the in-

crease; as a general result, nevertheless, there is not evidence wanting to show that from revivalism in religion and other causes the educated classes in some places are showing a tendency to be free from the vice. The Government too have expressed a resolution to befriend abstinence. We have, therefore, every ground to be hopeful. Our cause is righteous, and we may rest assured that it will be blessed by Providence with success.

## THE INDIAN SOCIAL CONFERENCE.

### PRESIDENTIAL ADDRESS.

By PUNDIT JWALA PRASADA, M. A., C. S.

LADIES AND GENTLEMEN,

“SOME are born great, some achieve greatness and some have greatness thrust upon them.” I feel keenly that to-day I come within the last category. When I think of the brilliant series of the foremost sons of India that have filled the Presidential Chair at the sessions of this Conference in the past years, my heart sinks within me and I feel how unworthy I am of the high honour it has pleased you to confer on me by asking me to preside over your deliberations. Your commands have been obeyed, ladies and gentlemen, and I have come out of my seclusion though with extreme diffidence. I crave your kind indulgence, therefore, and hope you will regard my many shortcomings with leniency.

It has been the custom for the President to deliver a short address before the commencement of the regular business of this Conference—and though any remarks which I make will be but flat and tasteless after the masterly inaugural address of the General Secretary to which we have had the privilege of listening, yet I hasten to comply with the established custom.

The laws of evolution, ladies and gentlemen, act upon human society as upon all things in this universe. Human society like other things, superior or inferior, cannot remain in a state of stagnation, but by the force of those laws it must make a move. The direction which the movement will take, whether it will have an upward tendency or the reverse, depends upon various causes. Here, in India, we witness at the present

day the almost unique spectacle of a civilisation which traces its origin to hoary antiquity, confronted with another which may justly be termed the most advanced which circumstances have evolved in modern times in the West.

It is but natural that the two act and react on each other, and in the ferment thus generated arise conditions which require very serious consideration on the part of those that are interested in the country. Nations like individuals have their own tendencies, their own idiosyncrasies and their own manners of thought and it is essential that due allowance should be made for all these items before devising the lines which social reform should take. It will not do hastily and without due deliberation to put new wine into old bottles and burst them. The tendency of one section of social reformers with us, who may be aptly termed ultra-radical, is to advocate the immediate and complete removal of social customs which, to them, are obnoxious and the substitution in their place of others more in unison with Western notions. Theoretically this scheme of social reform would be perfect, but, unfortunately, it is not at all practicable, nor should I say is its introduction quite desirable.

Changes to be perfect and lasting must be the outcome of gradual and sustained action—they must be accepted by the masses—and not forced on them. The duty of the educated classes who are naturally expected to take the lead in such matters is manifest. They must try to educate public opinion and should gently help their backward brethren to see where reform is badly needed. In effecting this, success cannot be hoped for

by harsh and violent urging of unpleasant truths so much as by gradually leading the backward classes to evolve the ideas so to speak out of their own minds. Such is the perversity of human nature that what it can be persuaded to believe is the outcome of its own deliberations is always acceptable—what is supposed to be the opinion of another is always viewed with doubt and mis-giving.

In this connection it must be noted that example is a very potent factor in the introduction of changes. With us we will have to confess that practice does not yet follow conviction except in a few isolated cases. How often do we see people who have received the benefit of education—as it goes on in India at the present day deploring the existence of such and such a custom, denouncing it in scathing terms, characterising it as the cause of the ruin of India and yet when the time of trial comes, woeful is the result! Reason yields to unreason, education is overpowered by ignorance,—and the energies of the erstwhile advocate of reform are now spent in devising plausible excuses to justify the action diametrically opposed to the preaching. Leaders like these will never raise a country.

On the other hand, there is the ultra-conservative class, numerically the strongest, with unbounded respect for immemorial custom, who view any attempt at reform not only with suspicion but with positive abhorrence. The attitude taken by these gentlemen is not only one of obstruction, but they are prone very often to even persecute the advocates of reform, specially such among them as have taken any practical action. Totally oblivious of the fact that with the lapse of centuries, the circumstances and conditions of this country along with those of the world have changed they are content to maintain an attitude of stolid indifference. To take a few concrete examples, the standard of living is day by day growing higher and higher, new wants and new aspirations are being developed among us, the pastoral simplicity of the country is a thing of the past and we are being drawn into the keen competition for bread which is a characteristic of the present times. The question is, are we quite prepared for the struggle? Calm reason tells we are not. We might, with marvellous self-complacency, regard ourselves as perfect, deem all our institutions and social customs as absolutely above reproach. We might, as we do, serenely contemplate the glory of our ancestors, live so to speak in a paradise of

our own making without attempting to fit ourselves to the times, yet will this help us? No. We must set ourselves manfully to eradicate the many evils which have crept into our society, which, besides being highly prejudicial to us, are unreasonable and have got no kind of Sastric sanction.

To my mind those from whom most can be expected are they who strike the happy mean between the ultra-radicals and the ultra-conservatives, who realising the pernicious nature of the evils from which our society suffers are bold enough to attempt to do their duty; remembering that it is only reform they are aiming at and not essaying a fresh constitution. The path of these reformers will not be smooth, troubles and persecution will menace them at every step but the idea that they are doing a sacred duty should be their prop and main stay. The prospect is gloomy, no doubt, but as a great writer has said "minds may doubt and hearts may fail, when called to face new modes of thought or points of view, but the time must come when what is false in all things will fade and what is true will no more seem strange." As an example, I may state, that barely a century ago the rite of "Sati" was practised in this country. It used to receive the sanction of custom; what is more. It was regarded as not only sanctioned but enjoined by religion and there was an uproar when that pioneer of Hindu reform, Raja Ram Mohan Roy raised his voice against it. The humane instincts of our British rulers led them to take up the question promptly, and within a short time, the rite was effaced from the land. Who among us at the present day even thinks of the rite of "Sati" or regrets its abolition? Thus I say will truth ultimately prevail despite prejudice and the obstacles of custom.

That the thinking portion of this vast continent is awakening to the necessity of doing something in the direction of national reform is apparent. This very Conference which has held its sittings annually for several years furnishes the best proof that our leaders are realising the urgency of immediate action. In addition to this, all over the country we hear of sectional Conferences and Sabhas, all attempting to ameliorate the social conditions obtaining in their immediate spheres. These I take to be the visible signs of the spirit of reform which has been aroused in India. It has been urged by some critics that these sectional Conferences serve to dissipate energy and are an obstacle in the way of concerted

action. I hold this criticism to be short-sighted. The peculiar circumstances of the country and the peculiar lines of thought of the people inhabiting it have, in the course of centuries, evolved a social system in which each section is, so to say, confined in its own water-tight compartment. At present, it is almost impossible to undertake concerted action which could exercise a simultaneous influence over all sections. The elevation of each section must be worked out by itself and when the happy day dawns which sees the various sections well advanced on the path of reform then may India congratulate itself that it is within measurable distance of national reform. All the Caste Conferences and Sectional Sabhas are, therefore, to my mind working and working potently towards bringing about the consummation which all of us here assembled so devoutly desire. May success attend their efforts.

According to the rules of business at these Conferences, resolutions relative to points needing reform will now be submitted to you for consideration and then able gentlemen in charge of the various resolutions will explain why the particular reform is needed. Permit me, however, to allude briefly to one or two points which I think are deserving of special consideration.

Science recognises the fact that perpetual inbreeding without the introduction of fresh blood leads to physical deterioration and final extinction. The figures of the last Census are deserv-

ing of special study in this connection. They show most unmistakably that some sub-castes are rapidly on the way to extinction. Is it not desirable to try and put a check on this decay and would it be unwise to extend the sphere, within which marriages are contracted, to some extent?

Again we talk of our nationality and yet how very distinct, almost insulated from each other, are the sub-castes of the same parent caste. To realise our dream of nationality—would it not be desirable to make a beginning and try to bring about some fusion of the sub-castes?

Another, and to my mind, a most important point is the elevation of the lower classes among us. We admit no converts and we can, therefore, ill afford to drive away even the lowest from among us. The spirit of self-preservation alone should prompt us to try and help in the elevation of the lower classes and we should not by our needless stand-alone-ness goad them into seeking admission into other communities where they will be cordially welcomed.

Ladies and Gentlemen—I fear I have trespassing too much on your time. I thank you for the patient hearing you have given me—and now let me conclude with the fervent hope that after we have passed our resolutions, each one of us will leave this hall with the firm resolve to carry these resolutions as far as may be in practice under the blessing of Providence.

## MAHOMADAN EDUCATIONAL CONFERENCE. THE PRESIDENTIAL ADDRESS.\*

By the Hon'ble Mr. SYED MAHOMAD HUSSAIN.

**T**HE Educational Conference, which opened at Aligarh on Thursday, the 28th December, is being presided over this year by Masherud-daula Mumtazul-Mulk, the Honourable Khan Bahadur Khalifa Syed Mahomad Hussain of Patiala. There were about 1,000 delegates representing all parts of Mahomadan India. In his opening address, the President rebutted the criticisms of those who said that these conferences did no good. Addressing such persons, he said:—

"I beg them earnestly to consider whether it is not profitable for men holding different views in different parts of the country to gather together

every year for the discussion of this question of education, to exchange their views on this subject, to bring them to a focus and then to carry them to distant parts of the country; and whether it is not the observance of this practice which has not only kept alive the thought of education amongst us, but has let it grow and develop. But for this the thought would have died with Sir Syed long ago, or would have lost in strength by the removal of the force which kept it together. I am convinced that if after the death of Sir Syed the meetings of the Conference had not been continued, as they have been by the noble

\* Some portions of the address are omitted for want of space.

efforts of that true Mohsin of our country, Nawab Mohsin-ul-Mulk, the problem of Mahomadan education would have remained unsolved and the conflicting notions prevailing about it would have nullified every attempt to revive it. The sittings of the Conference at one time in Calcutta, the capital of India, and at another in Madras and Bombay, the Punjab and Lucknow, and then in the Imperial City of Delhi on the memorable occasion of the magnificent Coronation Durbar, are manifest proofs of the success of the Conference and the intellectual advancement of our community. If an example were still needed to illustrate my remarks, I would point to the unexampled generosity of that liberal-minded donor of our community, Mr. Naina Pillai Marakayar who has just proposed with the advice of his enlightened friend, Sultan Mohi-uddin Sahib, Deputy Collector, of Tanjore, to found a big institution on the model of the Aligarh College for the education of the Mahomadans, of the so-called benighted province of Madras about 2,000 miles away from here. This is decidedly a result of the Madras Conference. Similarly the success of Nawab Mohsin-ul-Mulk's deputation to Burma, and the reasonable measure of success achieved last year in Lucknow are the results of the useful discussions and deliberations that always take place in this national assembly. The generosity and liberal-mindedness displayed by our friend Mr. Naina Pillai leads us to hope that the day is not far distant when the rich and magnanimous Mahomadans of Bombay and Rangoon will take similar steps to furnish means for the establishment of the Mahomadan University.

#### A MAHOMADAN UNIVERSITY.

Speaking of this praiseworthy generosity of Mr. Naina Pillai, some have said that it would have been better still, had the donation been devoted to the expansion of the Aligarh College into the desired University. I am not opposed to this view. On the contrary, I think that when the Aligarh College has been made the University we all desire it to be, it will turn out more and better young men of Islam, accomplished in the several branches of learning. On the other hand, the idea of the Mahomadans having separate schools and colleges in their separate provinces is by no means an unwelcome one. It shows that the nation as a whole is awakening to the needs of education. But better by far to accumulate the energy of the whole nation in one common centre than to let it get dis-

persed by individuals confining their separate energies to their separate spheres. Let us, therefore, first devote our energies to making the Aligarh College a Mahomadan University, and then try to extend its branches to other parts of India, and, may be, to other Mahomadan countries abroad. This latter idea, let us fervently hope, the enterprising men of our coming generations will carry into effect. Gentlemen, the light of knowledge that we want to spread amongst our community, the love for learning, that we want to generate in the hearts of Mahomadans, the kind of men and the kind of good and worthy Mussulmans that we want to see in our present and our coming generations, these and other objects for which Sir Syed had laid the foundation of a Mahomadan University by founding the Aligarh College, can never be attained so long as we do not bring to bear the collected energy of our whole community to complete and consolidate the means of our education and to bring it under our full and free control by converting the College into a Mahomadan University. Gentlemen, the object of holding this session of the Conference at Aligarh is particularly to enable those gentlemen, who have not yet had an opportunity of seeing the College and its internal management and who have only heard of it and its doings through the means of newspapers alone, to see for themselves what sort of teaching institutions the Conference is in favour of, and in what manner it wants the students to be kept and cared for. This will bring their imagination into play and lead them on to consider how much more productive of good the College will be, when it has developed into a University, and to make a correct estimate of the great benefits already derived from the humble efforts of those who have concentrated their energies in Aligarh. Had these efforts not been concentrated in one place as they have been, then, little and scattered efforts as they were in themselves, they would not have been productive of all these benefits. Those of you, gentlemen, who happened to be here during the last session of the Conference held at Aligarh will see how greatly the College has progressed during the ten years that have since elapsed, and what good the yearly discussions of the Conference and the constant attention of the managers of the College have done to it. Nawab Mohsin-ul-Mulk has kindly consented to read out to you a report dealing with the progress which the College has made during the past ten years, and I leave that subject to him."

## MAHOMADANS AND SCIENTIFIC TEACHING.

Going on to speak of the education to be imparted to Mahomadan youths, the President followed Mr. Theodore Morison's advice last year in enforcing the importance of a study of Arabic, without which no man could be a thorough Mahomadan. As to modern subjects, he went on to say :—

Gentlemen, the present is the age of arts, industry and commerce, and the honour and power of countries and nations in this age depends not on religion, not on population, not on the extent of dominion, but on art, industry, and commerce. And success in these can never be achieved so long as their edifice is not built on the strong foundation of science. The inhabitants of the commercial cities of India pick up some knowledge of the ways of making money from what they see of the practice of the civilised nations that they come in contact with, but of art, industry, and commerce they know nothing. They lack originality and inventive genius which are so very necessary for art, industry and commerce and which can never be had without science and without visiting other nations and countries, and specially those of the continent of Europe, with a view to learn their scientific ways and methods, and to take lesson from their enterprise, courage and perseverance, their habits, character and thought. It is not sufficient to be content with a mere degree of B.A.; and to consider it as the end of high education. Mahomadan students can never hope to shine and prosper in the world so long as they have not attained high proficiency in the various branches of art and science. Let the efforts of those, therefore, who wish well for the advancement of the followers of Islam be divided into two parts, the one part to be spent towards making Mussalmans, Mussalmans not only in name but in the true sense of the term, the other part to be directed towards making them learned in liberal studies and proficient in sciences and arts so as to make them a useful instrument for the material advancement of themselves and others. Mere knowledge or mere wealth is not enough. The possession of both is required for national advancement, as is evident from the condition of the nations of Europe and from what we have seen of the rise of the young nation of Japan living so close, almost next door to us—which forty or fifty years ago was nowhere in the race of nations. Mere trading or ordinary

dealing in merchandise when it is divorced from the light of knowledge and the capacity of invention is not conducive to much honour in this world. A few years ago I asked a friend of mine in Bombay who belonged to the commercial community of the Khejas, to let me have a few books on his religion. I took care to tell him that I asked for these books only for information, and not for the sake of any religious discussion or controversy. But I was told in reply that the Khejas knew no more than repeating the *Kalima* in Arabic and keeping account in Gujanti. The same is the condition I witnessed of the Maimans, and this is to be greatly deplored, for wealth without knowledge, and knowledge without wealth are equally useless. Neither of these without the other can help a nation to attain to that degree of superiority and greatness which should be its aim and object. Truly, it is as an experienced and learned man of ours that has put it in this couplet:

'Experience at least has revealed to me this truth, that the value of man is through knowledge and the value of knowledge through wealth.'

## AN APPEAL FOR PROGRESS.

Sir Syed Ahmed opened a subscription for a Civil Service Fund. His idea was to open a preparatory class in the College in which to prepare a selected number of students for being sent to England to compete for the Civil Service Examination. I admire this idea and I joined the subscription with great pleasure. The amount of annual subscription required was trifling, yet it is to be regretted that it had to be discontinued after some time owing to the apathy of the community. If the well-wishers of the community can establish funds by subscription to provide for classes for Civil Service Examination and for scientific and professional education at Aligarh, or if the well-to-do people of our community can manage to improve the present method of sending their sons to Europe, America and Japan for education or, in the case of boys not able to proceed to foreign countries, to have them educated in Engineering, Medicine and Agriculture in this very country (which thanks to the kindness of Government is not without such schools and colleges) Mahomadans can free themselves from the meshes of poverty and adversity in which they are at present entangled. This is what the provident and economic races of the Hindus and the Parsees are doing in this very country. They save

money, as best they can, to spend it in having their children educated in Europe, America and Japan in the various sciences and professions of this age. Young men proceeding to foreign countries would secure not only the education for which they go, but would have also courage, boldness, and daring engendered in them; what they would gain by living in foreign countries in intimate intercourse with men of other nations in intellectual and moral expansion, in self-respect and self-help is evident.

Gentlemen, a reliable Mahomadan friend of mine who had, as a tradesman, been to England, France, Constantinople, Egypt and other countries and was acquainted with the fallen condition of Mahomadans, once told me in this connection an interesting as well as an instructive story of Mahomad Ali Pasha, the first Khedive of Egypt, who was a most able man and a great statesman amongst the Asiatic Mussalman Rulers of his time. The Pasha had all along been urging his ignorant and untrained nobles to go for education to Europe. But the nobles would not listen to him. He told them at last that since they would not act as he advised them to do, he would send their dependents and even slaves to Europe and would place them over their heads on their return. And he actually did what he had threatened. Gentlemen, the little light of knowledge and wisdom that you see glimmering in Egypt and Constantinople is the result of such wise measures. But although it is easy to send students to distant countries by the use of superior force, the results thus achieved will not be so abiding and useful as those which would be the outcome of what we do of our own free will in this matter. While on the subject I would beg leave to submit that in our Province of the Punjab, nay in the whole of India, the Sikhs number only about twenty lakhs, and of these, with the exception of a few ruling princes and some petty chiefs, all are agriculturists. Yet our generous princes and the Sikh gentry and peasantry have only lately in the April of 1904 contributed about twenty lakhs of rupees towards the Khalsa College Fund at Amritsar for the advancement of their nation. This, as also the generosity displayed by a single individual, Mr. Naina Pillai, from amidst us is, I would not say, a thing which must put to shame our Mussalman Princes and big Taluqdars and wealthy merchants, but a thing to be copied by them. Cannot the six crores of Mahomadans amongst whom there are still, by the grace of God, many ruling Princes, and Jagirdars and Taluqdars, and Zemindars and Merchants of

distinction, cannot they perform what only twenty lakhs of souls, of whom all but a few are merely ordinary cultivators, have done in so short a period? But ignorance of national wants, and perverse ideas about true charity are the cause of all this apathy and indifference. If only a few leaders of our community had the feeling heart of Meer Jafar Hussain who has undertaken such great pains in begging for his One Rupee Fund, now amounting to about Rs. 30,000 in aid of the Aligarh College, and if the attention of our ruling Princes and men of means were turned towards the sufferings and wants of our people, we would have the One Lakh's Fund instead of the One Rupee Fund. But a sense of national honour, a feeling heart and a liberal and intelligent idea of united efforts in the path of God, are conditions indispensable for this. The means then to regain our honour and prosperity, to achieve our advancement and rise, and the remedy of our present want and poverty, fall and helplessness, humiliation and ignorance are in our own hands. They consist in giving financial aid to the best of our power to our National College or on a larger scale to our National University, in equipping it with all the requisites of high education in every useful science and art, founding scholarships and endowing funds for various faculties and in making the path for students to reach the higher stages of life not only easy and clear, but an inviting and tempting one.

#### CLOSING COUNSELS.

The President then went on to offer some advice on the extension of education among women, which he pointed out was a delicate subject requiring discretion as well as zeal, and also upon physical education. Continuing, he said:—

Gentlemen, there is a strange malady spreading amongst the educated young men of this country, from wrong notions they have formed of patriotism and nationality. They seem to have taken it to be their duty to discover distinct and often conflicting aims and interests for every community, caste or creed, however small and insignificant, and to fall foul of other communities and sections of society in looking after the interest of their own, to spread malice and prejudice in the country, to censure Government most ungratefully, to spread distrust and disaffection towards it and to make premature, impracticable and indiscriminate demands on it. This deplorable condition is ascribed to Western education, and as ours is an Educational Conference, I want to deal with

this point here for a short while. I wish, that as Mahomadans have hitherto been safe from this venom by the influence of Sir Syed and others, they should remain so in the future and that the efforts to nullify its poisonous effects instantly whenever its symptoms are visible in the College or in the future University, should continue for ever. I wish that the leading and influential men of the community would, by their instructions and their guidance, keep the community aloof from anything which does not savour of peace and harmony, and loyalty and faithfulness to the Government, and should leave no stone unturned to remove the mutual misunderstandings of different communities and of the rulers and the ruled. Above all, what I would like the Mahomadans to always bear in mind is to let the differences of creed, country and colour have no influence on them. The injury which such differences have done to the cause of Islam has not been small. Not long ago a Mullah on the frontier of the Punjab set the simple Shias and Sunnis by the ears. They were as brothers to one another, and had long been living in peace and harmony, yet they killed one another by hundreds, and gave Government cause for anxiety for some time, and all for nothing. Some cities of India are also subject to a similar state of things, and though the outbreaks here occur very seldom, the evil effects of them live long. Some times, again, it is the Hindus and Mahomadans that are at logger-heads. Educated Mahomadans must consider that amongst other things, which they must always keep in view as their principles of life, they must never lose sight of peace and good-will towards all. They must never pick up any quarrels with their Hindu brethren, but must live peacefully with them and try to induce others to do the same. The Aligarh College under whose auspices the Conference is here assembled, has always by the grace of God been alive to the importance of practical lessons in the principles of peace and good-will. Mussalmans of every sect here receive religious education according to their different creed and say their prayers in the same mosque. Mahomadan students from the distant and differently-circumstanced countries, Madras, Bombay, Burma, Persia, Baluchistan and others live here together and join hands in every work, giving practical proof that they follow the same God, the same Prophet, the same Book and believe in the same Koran, and of that difference amongst them there is none. Similarly there are Hindu students here attending the

School and living in the Boarding House, learning a lesson from the harmony which prevails in the College, that the Indian communities form one nation and that their interests are common. I am Shia, and my forefathers have been so, yet my late brother and myself have been with the movement of founding the Aligarh College from the very beginning, and we have always wished that Mahomadans, in spite of their differences in creeds should have this general principle of peace and good-will for the ideal of all their moral and intellectual advancements. I am deeply grieved whenever I hear any discordant notes of dissensions and differences arising in our community anywhere and I earnestly pray the gentlemen here present, and there must be men of every sect and creed amongst them, to exert themselves for the sake of the one God, for the sake of the Prophet, the Koran, and the Kalma they all equally sincerely believe, to exercise their influence whenever they can in weakening and eradicating these pernicious and mistaken differences with a view to ameliorate our pitiable condition and to remove the many difficulties in the way of the Mahomadans. Gentleman, we have fought many battles in the name of religion. We have shed much blood and suffered much. But those days are now gone. The Almighty God has now mercifully committed us to the care of a wise, just, benevolent and merciful Government. Thank God for the peace and freedom which you now enjoy under it and make the best use of them. Time was when the nations of Europe were also enveloped in the darkness of superstition and ignorance like us and when men were burnt alive in the name of religion, and horrible deeds committed, the bare recital of which is shocking to humanity. Now, however, all is changed. The light of knowledge has dispelled the gloom. Different nations still inhabit the earth. Different tenets and beliefs are still the same. But there is no religious warfare, no religious animosities. All, all are absorbed in the same thought and are busy making advance by leaps and bounds in the fields of letters and sciences. Look at England. The Roman Catholic subjects of that country do not regard the King as the Defender of the Faith. Yet they are appointed to responsible posts like those of the Viceroy and Lieutenant-Governors and to big Commands in the Army, and they hold them and serve the King, the Empire and the Nation, loyally and faithfully, in peace and in war.

Gentlemen, it is the duty of all educated Mahomadians, whether they be the products of Aligarh College or any other institution, to display in their speeches and writings and deeds a sincere acknowledgment of the favours of the Government under whose benign shadow they have received the blessings of education in such peace and with such freedom, and with whose strength and stability and greatness and glory their interests are so indissolubly bound together. I need not give a detailed account of the favours, moral and material support extended to the communities of Islam by the rulers of India. I mean the Viceroys and Lieutenant-Governors and other high and distinguished officers of the Government—ever since the conception of the Aligarh College has come into being. To some of these the College walls themselves bear eloquent testimony. It is possible, gentlemen, that in the course of the many and multifarious duties of his post, any officer of Government may happen to pass an order or do a thing which might go against our interests or conflict with our views, like the Circular issued by Sir Antony MacDonnell, Lieutenant-Governor of these Provinces, in the matter of the Urdu language. On such occasions it behoves us to respectfully submit our views on the situation, as we did at that time; but it equally behoves us to behave so as not to forget ourselves and the bonds of respect in the heat of discussion. Ad-

ministrative mistakes, gentlemen, are not generally based on any hostility of intentions, for you know that Sir Antony MacDonnell, though he made the mistake, was yet a staunch supporter of the College.

“None of you, gentlemen, is unaware of the favour to which I have pointed above. And what greater proof can there be of the kindness and favour of our rulers than that the son and heir apparent of His Most Gracious Majesty, our King-Emperor, is coming to us in March next to honour the Aligarh College which the Mahomadians have established here for the education of their present and coming generations after years of toil and begging—not only to honour the College but through the College the whole of the Mahomadan subjects of India who are second to none in loyalty to the British Government and the British Crown? I hope and trust that Mahomadians residing both in and outside India will look on this honour more as a symbol of the kindness which the King-Emperor and His Government have always shown towards the Mahomadan subjects than anything else; and I request you all Members of the Conference, to join with me in praying sincerely and fervently for the long life, welfare and prosperity of His Most Gracious and Imperial Majesty the King-Emperor and the Heir-Apparent His Royal Highness, the Prince of Wales.

## THE BHARAT DHARMA MAHAMANDALA.

### Mr. BAL GANGHADAR TILAK'S SPEECH.

**T**HE Bharat Dharma Mahamandala has just completed its sittings. Upadeshiaks and Mahopadeshiaks have come from different parts of India to be present. At its meeting held on the 3rd January 1906, Mr. Tilak delivered the following speech:—I am sorry I cannot address you in any other language except Marathi and English. English should be boycotted for religious purposes. But I cannot help and hope you will excuse me. I shall speak a few words on the importance of Hindu religion, its present condition and the efforts that are being made to preserve it from decay. What is Hindu

religion? If you go to the different parts of India, you will find different views about Hindu religion entertained by different people. Here you are mostly Vaishnavas or followers of Sri Krishna. If you go to the south, you will meet followers of Ramanuja and such others. What is Hindu religion then? Bharat Dharma Mahamandala cannot be a Mahamandala unless it includes and co-ordinates these different sections and parts—its name can only be significant if different sections of Hindu religion are united under its banner. All these different sects are so many branches of the Vedic religion. The term Sanatana Dharma shows that our religion is very



old—old as the history of the human race itself. Vedic religion was the religion of the Aryans from a very early time. But you all know no branch can stand by itself. Hindu religion as a whole is made up of different parts co-related to each other as so many sons and daughters of one great religion. If this idea is kept in view and if we too unite the various sections, it will be consolidated into a mighty force. So long as you are divided amongst yourself, so long as one section does not recognise its affinity with another, you cannot hope to rise as Hindus. Religion is an element in nationality. The word Dharma means a tie.

What is there to hold together? To connect the soul with God and man with man. Dharma means our duties towards God as well as towards our fellow creatures. Religion is made up of both these elements—duty towards God and duty towards man. Hindu religion, as such, provides for a moral as well as a social tie. This being our definition we must go back to the past and see how it was worked out. During Vedic times India was a self-contained country. It was united as a great nation. That unity has disappeared bringing on us great degradation and it becomes the duty of the leaders to revive that union. A Hindu of this place is as much a Hindu as the one from Madras and Bombay. You might put on a different dress, speak a different language but you should remember that inner sentiments which move you all are the same. The study of the Gita, Ramayana and Mahabharata produce the same ideas throughout the country. Are not these common fells allegiance to the Vedas, the Gita and the teaching of Ramayana, our common heritage? And if we lay stress on it forgetting all the minor differences that exist between different sects; then, by the grace of Providence we shall be long able to consolidate all the different sects into a mighty Hindu nation. This ought to be the ambition of every Hindu. If you thus work to unite, you will find within a few years one feeling and one thought actuating and dominating all people throughout the country. This is the work we have to do. The present condition of our religion is not at all one that is desirable. We think ourselves separated and the feeling of that unity which was at the root of our advancement in the past is gone. It is certainly an unfortunate circumstance that we should have so many sections and sub-sections. It is the duty of an association like the Bharata Dharma Mahamandal to

work to restore the lost and forgotten union. In its absence India cannot claim its place among the nations of the world. For some 200 years India was in the same condition as it is to-day. Buddhism flourished and attacks were made on Hindu Religion by Buddhists and Jains. After 600 years of chaos rose one great leader, the first Sankaracharya, and he brought together all the common philosophical elements of one religion and proved and preached them in such a way that Buddhism was swept away from the land.

We have the grand and eternal promise, Sri Krishna has given in the Gita that whenever there is a decay of Dharma, He comes down to restore it. When there is a decay owing to disunion, when good men are persecuted, then, Sri Krishna comes down to save us. There is no other religion on the face of the earth except the Hindu religion wherein we find such a hopeful promise, a promise that God comes to us as many times as necessary. After Mohamed, no Prophet is promised, and Jesus Christ came once for ever. No religion holds such promise full of hope. It is because of this that the Hindu religion did not die. We are never without hope. Let heretics say what they may. A time will come when our religious thoughts and our rights will be vindicated. Each man is doing his best and as the association is doing its best, every Hindu is welcome to assist it and carry it to its goal. If we do not find men coming forward, let us hope they will do so, in the next generation. We are never without hope, no other religion is ancient and with the definite and sacred promise of Sri Krishna, it is based on truth and truth never dies. I say it and I am prepared to prove this statement. I believe that truth is not vouchsafed to one only. The great characteristic of truth is that it is universal and catholic. It is not confined to any particular race. Hindu religion tolerates all religions. Our religion says that all religions are based on truth "you follow yours, I mine."

Sri Krishna says that the followers of other religions worship God though not in proper form. Sri Krishna does not say that followers of other religions would be doomed to eternal hell. I challenge anybody to point out to me a similar text from the scriptures of other religions. It cannot be found in other religions because they are based on partial truth, while our Hindu religion is based on the whole, the Sanatana truth and therefore, it is bound to triumph in the end. Numerical strength also is a great strength.

Can the religion which counts its followers by crores die? Never. Unless the crores of our fellow followers are suddenly swept away, our religion will not die. All that is required for our glorious triumph and success is that we should unite all the different sects on a common platform and let the stream of Hindu religion flow through one channel with a mighty consolidated and concentrated force. That is the work which the Bharat Dharma Mandala has to do and accomplish. Let us be all united. Because a particular man wears a particular dress, speaks a different tongue, worships a particular *devata*, is that any reason for our withdrawing our hands of fellowship to our Hindu brothers? The character of Hindu religion is very comprehensive—as comprehensive as its literature itself. We have a wonderful literature. Wisdom as is concentrated in Gita, and epitomised in about 700 verses, that wisdom, I am confident, cannot be defeated or overcome by any philosophy, be it Western or any other. Now I turn to the forces that are arrayed against us. There are mainly two (1) Forces of science and (2) Christianity. If our religion is threatened with any hostile criticism, it comes from these two. As for the first, a great change is coming over the West and truths that are discovered by them were known to our Rishis. Modern science is gradually justifying and vindicating our ancient wisdom. With the establishment of Psychological Research Societies and the expansion of scientific knowledge they have come to understand that the fundamental principles of our religion are based on truth that can be proved. Take an instance. Chaitanya pervades everything. It is strictly a Hindu theory. Professor Bose has recently shown that this Vedantic doctrine is literally true according to modern science. Take the doctrine of the survival of soul independent of the body. Doctrines of Karma and Reincarnation go with it. Spencer never believed in these. But recently it has been our great privilege to see that Sir Oliver Lodge and Mayor and others have declared that the soul does not die with body, so much is now established. Modern science accepts the doctrine of Karma if not of reincarnation. But it is not the brief of Christianity. They hold that God gives a new soul each and every time. Thus it would be seen that a change is coming over the West. Our enemies are fast disappearing before the teachings of modern science. Take courage and work hard for the final triumph. If you make a little effort and aim at union, you have a bright future before you. Now-a-days Vedanta is not

only read but studied by Americans. No European doctor believes that the beating of the heart can be voluntarily stopped. But it has been proved on the contrary. Vedanta and Yoga have been fully vindicated by modern science and these aim at giving you spiritual union. It is our clear duty, therefore, to follow truth and recast our scriptures and place them before the world in the light of modern science that they may be acceptable to all. But I tell you again unity is necessary for such work. You would be wanting in duty to yourself and to your ancestors if you do not give up provincial prejudices and promote unity that underlies all sects. Swami Dyananand and others have been working but we have been very idle. We have grown so stupid owing to our ill-nature that we are required to be told by foreigners that our treasures conceal gold and not iron. Modern science and education are prepared to help you if you take advantage of them and time will come when instead of Christians preaching Christianity here we shall see our preachers preaching Sanatana Dharma all over the world. Concentrate all your forces. The idea of Hindu University where our old religion will be taught along with modern science is a very good one and should have the support of all. In conclusion, I would again draw your attention to bring about a harmonious union of all sects and rightly claim and obtain our rightful place among the nations of the world.

## INDUSTRIAL INDIA.

BY GLYN BARLOW, M. A.,

*Principal, Victoria College, Palghat,  
and formerly Editor of The "Madras Times."*

CONTENTS.—1. Patriotism in Trade. 2. Co-operation. 3. Industrial Exhibitions. 4. The Inquiring Mind. 5. Investigation. 6. Indian Art. 7. Indian Stores. 8. India's Customers. 9. Turning the Corner. 10. Conclusion. *Indian Daily News*.—Mr. Barlow writes with knowledge and care, and has pretty well exhausted the subject. His chapter on "Indian Stores" will repay perusal. *The Oriental Empire*.—To any one interested in Indian trade this little book might be both interesting and useful. *The Englishman*.—The book should be in the hands of every public-spirited man in this country.

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G. A. NATESAN & Co., Esplanade, Madras.

Report of an inquiry ~~POONA~~

INTO THE

**Agricultural Situation**

IN

**Matar Taluka**

OF THE

**DISTRICT OF KAN**

BY

**Messrs Devadhar, Thakkar & Joshi**

*Members, Servants of India Society,*

**BOMBAY.**

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**REPORT OF AN INQUIRY**  
INTO THE  
**AGRICULTURAL SITUATION IN MATAR TALUKA**  
**OF THE DISTRICT OF KAIRA.**

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**Nature of the Inquiry.**

At the instance of a few friends in Bombay interested in the well-being of the agriculturists in Gujarat, we undertook a somewhat detailed and an independent inquiry into the condition of the agriculturists in general and the poorer section thereof in particular, in the Kaira District as a result of the considerable failure of the last Kharif crop.

**Two sides to the Inquiry.**

2. For the purpose of this inquiry on which we started on the 24th of January 1918, it was felt very necessary to obtain as much useful and reliable information as possible in the matter of the alleged failure of the Kharif crop from the people and also from the officers of Government. We were, therefore, advised to secure as much co-operation from Government officials as may be necessary and even some sort of guidance at their hands, if available, in our work. So a kind friend in Bombay introduced us to the Hon'ble Mr. Pratt, the Commissioner, N. D. in order that we may explain to him the nature of our mission and request him to advise his subordinates to place at our disposal as much information pertinent to our inquiry, as we would require.

### **Interviews with Officials.**

3. We met Mr. Pratt in Ahmedabad on the 26th inst and after a general talk about our mission and the situation, he assured us of such help as we would need in our work, and also of sympathetic consideration of the proposals that would be framed by us at different stages of our inquiry. After securing this assurance from the Commissioner we proceeded at once to Mehemdabad to meet Mr. V. K. Namjoshi, the then Ag. Collector of the District, as advised by the Commissioner, before starting on our inquiry into the villages to gather as much useful and reliable information as was possible under the circumstances, from the cultivators themselves, as regards the yield of the major portion of the truly Kharif crop such as (1) Bajri, (3) Bavto, (3) Kodra, (4) Rice and (5) Kathols which it must be remembered, had already been cut from the fields. The other factors of this inquiry consisted of forming for ourselves from visits to fields and the inspection of the standing crops our own estimates of the so-called Rabi crops—such as (1) Tuver, (2) Divela, (Castor seed), (3) Tobacco (4) Cotton—still standing though sown in the monsoons—and the purely winter crops like (1) Wheat and (2) gram, (3) Variali which thrive on either well-water or the moisture in the soil.

### **Suspensions already granted.**

4. Before we left Bombay, Government had declared their intention of granting suspensions in 104 villages out of about 245 which constitute the three Talukas of Mehemdabad, Nadiad, and Kapadwanj out of the seven Talukas into which this district of Kaira has been subdivided. Thus there remained four Talukas of Matar, Thasra, Anand, and Borsad in which need for granting any measure of suspension, under the rules, was not recognized by the Government officials. We did not want to cover the ground already covered; moreover, we were few and the time we had at our disposal was rather very limited; so we naturally desired to confine our inquiry to one or two Talukas where it was required and where it may lead to some useful results.

### Need for inquiry in Matar and Thasra.

5. Our discussions with friends in Bombay on this subject led us to believe that we might leave out of account for the present the two Talukas of Anand and Borsad which were described to us as containing a comparatively large number of big land-lords. Thus there remained two Talukas Matar and Thasra. Friends described them as being as bad as, if not worse than, the above-mentioned three Talukas in certain villages of which suspension had been already granted by Government. We were, therefore, advised to begin our inquiry in Matar Taluka. Accordingly after meeting Mr. Pratt and Mr. Namjoshi, both of whom were good enough to make it possible for us to get the necessary facilities in our work, and after discussing with them the outline of our inquiry chalked out by us with a view to getting the benefit of their suggestion, if any, for its improvement, we began our work in the Taluka of Matar.

### Local Conditions.

6. This is certainly not the place to give a detailed description of the local conditions, pertinent to our inquiry, as seen to prevail in this tract at the present moment. A brief mention, however, of the (1) soils, (2) seasons, (3) crops, (4) the cultivators and (5) a few disquieting factors, will not be out of place for the purpose of this brief report. Broadly speaking, there are two kinds of soils in this district; one is called *Goradu* or "light soil which varies in quality from the loose grain yellow sand of the fields near the Sabarmati and the Mahi to a rich light brown mould....." It is sandy and may come nearer the alluvial soil of the U. P.; the other which is called *Kyari* or *Kali* (it may be so termed from its blackish colour) is hard like clay, and is nearly similar to the black soil of some of the Deccan districts, specially the southern districts. The land in this District is very fertile but it is heavily assessed. Then, there two main seasons for crops which are roughly divided into two, called the *Kharif* and *Rabi*.

### **Seasons.**

7. The history of the last monsoons was very painful. In the beginning the rains were delayed. Then there was a good rainfall and people were expecting a good normal crop. But the rains in the month of October proved a great blow. The showers in the first fortnight of October, were unnecessary and useless, and a good deal of damage was done on that account. Then there was a much desired break for a week and people had cut their crops and kept them drying in the fields. Then all of a sudden very heavy showers poured down for three or four successive days from the 22nd to the 25th of October doing considerable damage to the crops that were drying in the fields. This rendered the poor people quite helpless without an adequate supply of the staple food for four to five months. Again, this year rats much in excess of the last year's, have appeared in some fields and have done some damage and the recent crop report for this Taluka has recognized this fact. People say—but opinions differ—that this year's cold is in excess of the last year's, and that has produced a dread into their mind of impending frost. But it has only proved a dread. Thank God, the time is past and the grounds for this fear have totally disappeared. It seems that people have very little savings left with them because we have noticed people who gladly purchased Post Office Five-Year Cash Certificates thronging to post offices and trying to withdraw their small amounts. When asked they said that they did so because they had no money to pay the land revenue. Excessive rains of the last autumn, however, have produced indirectly one good result. It has enabled the land to keep plenty of moisture for such Rabi crops as need it for their growth.

### **The Kharif or Autumn Crop.**

8. The Kharif consists principally in this tract of (1) Bajri, (2) Cathol (pulses), (3) Bavto, (4) Rice, (5) Kodra, (6) Juwar, (7) Tur, (8) Divela (Castor seed), (9) Tobacco, (10) Cotton and a few minor crops. Some of these are mixture crops i. e. two of the above mentioned crops are



sown together; for instance Bavto and Tur or Divela; Kodra or Bajri and Tur. But Tur and Divela on a fairly large scale form Kharif crops by themselves sown in autumn and harvested before the pure Rabi crops are reaped. The Rabi crop consists of winter Tur, winter Divela, wheat, gram, and Barley which are sown during the winter. A great portion of the cultivable area in a village is generally under Kharif and a comparatively small portion is under the Rabi. Taking the Taluka as a whole the Kharif crop occupies sixty per cent of the area and the Rabi, forty per cent. The Goradu Land is mostly used for the inferior Kharif crops. It is the Kyari land that yields rice and valuable Rabi crops.

### Crops.

9. Rice is an important crop in this Taluka and is used generally by the agriculturists that produce it and by the better class people; Bajri and Juwar (to some extent) are used by people belonging to poor middle class; and Bavto and Kodra form the staple food of the poorest section of the rural population. Though owing to excessive rains fodder was spoiled a great deal during the last autumn these crops yield, in ordinary years, a good supply of fodder for the cattle; but the additional good supply comes from Juwar or *Sundh a*, which unlike in the Deccan, is raised here more as a fodder crop than as a cereal crop. Moreover, grass is grown separately by a prudent and large agriculturist for his cattle on a piece of land set apart for it. The land as a rule is very fertile and such lean years as the present one used to be rare before the great famine of 1900 A. D. There used to be an old saying in this part that there can be no famine in the tract lying between the two great rivers—the Mahi and the Sabarmati.

### The Cultivator.

10. The Patidar is a very clever, industrious, and enterprising cultivator, but the same cannot be said of the Dharala and other cultivating classes whose holdings are, in a majority of cases small, scattered, and, therefore,

uneconomic. The Dharala as a class is lazy and indifferent about his land and supplements his poor income from lands by wages earned. Even then he does not lead a moderately comfortable, or happy life though his condition is slightly improved of late. We have come to the conclusion that even in ordinary years the life of a poor agriculturist is almost a negation of sound economic factors such as industry, cheap and organized credit, thrift and use of knowledge of modern implements. Life in villages, moreover, is every day becoming costly; for instance, a poor man's piece of cloth costs him at the present moment Rs. 2-8-0 for which he used to pay only Re. 1; plague has so much disturbed the life of the villages in this district that village after village is affected and people have wholly deserted them in many cases. At the top of this has come the failure of the Kharif crop, which is largely admitted in regard to Bajri even by Government officials and to a lesser extent with regard to Bavto and Kodra; Kathols are recognized to have failed completely.

#### **Tour in Villages.**

11. We selected for our inquiry about half a dozen villages in each of the three circles into which the 81 or 82 villages that constitute the Matar Taluka are grouped for administrative purposes. We had to be content with the small number, because it was not possible for us to go over the whole area. A few typical villages, the conditions in which were believed to be almost similar to those in several others in that locality, were taken up and were observed as closely as we could manage to do in order to draw general conclusions therefrom, as applying to the whole area. In this we acted on the principle of going from the particular to the general. The first thing that was ascertained was the extent of the failure of the Kharif and secondly the anna valuation of the standing Rabi crop. 18 villages were thus visited in the course of ten days, during which period, information relating to about 20 more adjoining villages was gathered from the inhabitants of the latter.

### **The Method of Inquiry.**

12. The detailed method of investigation that was adopted by us after much discussion with friends and Government officials may be briefly described as follows:— We started with the anna valuation of all villages in the Taluka supplied to us by the Mamalatdar; we had talks with the village officials; we then went over in each village with as many friends as could be inspected in the course of three to four hours; after inquiring into the yield of Kharif, which had been cut already as mentioned above, and after the inspection of the standing crops in company with the Mukhi and a few land-holders of the village, we engaged ourselves into discussion with agriculturists that naturally came to us to tell the tale of their woes; we made inquiries about the valuation of the crops of the village as a whole as well as of a few typical holdings—large and small; we put questions to them as to what they would do if Government did not take into account their version of the very poor outturn of the Kharif. As our attention was drawn to the special difficulties under which the small land-holder laboured we made it a point to look specially into his condition and for that purpose localities inhabited by poorer section of the village population such as Dharalas, Dheds, Vagharis, Mohomedans and others were visited; we also went into the houses of a few members of these castes and tried to find out the stock of grain they had in their houses; we further endeavoured to ascertain the condition of their cattle and to know what quantity of fodder they had in store for it.

#### **Whole village as a unit of crop valuation.**

13. In our opinion, the task of valuing the crop of the whole village, and not of a few Khatedars or land-holders, is attended by a number of difficulties. In the first place it is, and cannot be better than, what is called an "*eye-estimate*" formed by village officials and made in a "*rough and ready method.*" There is neither arithmetic nor science nor even a few crop experiments to guide the valuation. Again there is no standard laid down to determine what is called a

"normal" crop "which is represented by 12 annas." It is possible to be accurate in calculation of about half a dozen fields; but this is not the mode of calculation required. It must be for the whole area comprising the village and not for a few individual or isolated fields in it. This is called the anna valuation for the crops of the whole village—the village being recognized as the admissible unit for valuation. When the crop is 12 annas it is said to be normal; when it is below 6 and above 4 annas in a village, Government, "as a matter of grace," suspend half the land revenue for the year to be collected in the following year; when it is below 4 annas *i. e.* less than one-third of the normal, the whole assessment is suspended.

#### **No Individual Relief.**

14. It may thus happen that the yield of the whole village may be "normal" and still there may be a dozen or more cultivators who may not have got any thing out of their fields in that year, but under the present rules no relief could be granted to the unfortunate people. In short, it is either the whole village or no one that could get relief under the rules for suspension. Again in estimating the anna valuation for any particular year, the estimates of the Kharif and the Rabi crops, the latter being in their infancy, are pooled together to determine the average yield of the crops of the whole village for the year for the purpose of the land revenue which is paid in two instalments.

#### **Anna Valuation a Guess Work.**

15. This valuation is prepared by village officers for the whole village. It will be thus seen, and that is admitted also, that it is more or less a result of guess work and a large factor of uncertainty enters into this calculation. It is not based, nor is it feasible to base it, upon the knowledge of the actual yield of crops, both Kharif and Rabi. If, therefore, it may be properly contended that the official estimates are somewhat put higher, it can be rightly pointed out that the estimates given by the people regarding the yield of their crops are generally under-rated. This is of course, not

peculiar to India ; it is believed to be common to all countries in the world. It is this position that makes the work of the investigator rather difficult. He has to wade, therefore, through a mass of oral evidence more or less of a conflicting nature and arrive at the truth as best as he could. In spite of these difficulties, we had to go on with our work trying our best to make as near an approach to truth as possible. A mention is made of this fact in this report because we know that it is very difficult to dogmatize about the situation under the peculiar circumstances of the case.

#### **Individual Inquiry Banned.**

16. It is freely recognized by Government officials that a number of cultivators may be found in villages in whose case it may be a very great hardship to pay the land revenue ; rules cannot take any cognizance of such cases as these come under the category of what is styled "*individual inquiry*" and which for very sound reasons has been abandoned long ago. There is some provision for a "local calamity" as distinguished from a "general calamity" and the rules leave out of account cases of small cultivators who may be considered to be really deserving of some kind of relief or sympathy.

#### **Small Cultivator and the Revenue Officer.**

17. Small cultivators are generally very poor, ignorant and bad agriculturists and consequently as a rule their holdings are uneconomic; the revenue officer is not disposed to sympathise with him in his miserable plight. The fault on the part of such a cultivator is, in his opinion, that he is too much attached to his land which he is unable to make paying so as to bear the burden of his whole family. The revenue officer will be glad, therefore, if such an uneconomic holder were to leave his land permanently and be a whole-time labourer and thus promote the industrialism of the country. Such a proposition may be economically sound in theory if the land be unduly burdened. But so long as economics, in India particularly, is not wholly divested of sentiment which is a great factor influencing the rural life, means will have to be found by Government to meet the

situation created by the existence of such a class in our rural economy. To teach him sound economic laws on such occasions as lean years, would be equal to first teaching a man lying on a sick bed the need for obeying laws for health, hygiene, and sanitation. It is sympathy which will please him and help him too. This point may be illustrated by a few facts relating to a village, with over 1200 people, which we visited. The number of land-holders or Khatedars in it is about 570 and the total assessment thereof comes to about Rs. 9,400. It was found that in that village there were about 310 Khatedars, including 135 residing in neighbouring villages, paying land revenue of less than 10 each. It need not be supposed that all the 310 khatedars out of 575 are in need of special consideration; but it is presumed that a majority of them are in such need. It is just possible that this number may include even a few good and rich cultivators having small patches. But we take this limit of Rs. 10 of land assessment as the dividing line between the better class cultivator and the poorer class cultivator. These 310 small khatedars pay an aggregate revenue of nearly Rs. 1140 out of the total of Rs. 9,740 for the whole village. This represents only 12 per cent of the total revenue. In a lean year like the present one this class, in our opinion, is bound to be hit hard and thus it stands in need of some relief or tangible sympathy. Revenue officers do not seem disposed to help such agriculturists in the belief that it would be going back to the abandoned theory of individual inquiry but it is difficult to see how this numerous *class of persons* and not individuals, could be easily brushed aside by being termed *individuals*. It is in the interest of agriculture that this class of persons should not be driven further into indebtedness and no price will be too great to prevent him from running into further debt. In such a case, Government should err more on the side of leniency rather than on the side of strict adherence to rules.

#### **The Lost Kharif and the Standing Rabi.**

18. The basis of our first and principal recommendation which is mentined hereafter may be briefly explained with

the help of a few figures given below. The whole of the cultivable area in the Taluka divides itself roughly into two groups, the Kharif and the Rabi. The first area is under the cereals and the fodder crop, and may be put down as Kharif area, the crops on which are harvested before the winter sets in. This comprises Bajri about 10%, Kodra about 9%, Bavto about 4%, Rice about 13%, Juwar about 9% and Grass about 15%. The above Kharif area makes 60% of the total cultivable area of the Taluka. It includes Juwar or Soondhia which is raised more for fodder than for its cereal; grass area may include some fallow land; these two latter together make up 24% of the Kharif area, which may be taken to show that it is mainly for fodder and this must have at the most enabled the agriculturist to feed his cattle and maintain it. The chief cereal Bajri has been admitted to have been very considerably damaged and the Bavto and Kodra to have been partially damaged by the excessive rains of October last along with Bajri. Kathols have been completely ruined by rats. Grass and Juwar, though a part of the latter may have been sold, could not have put into the pocket of the agriculturist much money after his having stored enough to feed his cattle, which he dearly loves and which is his great agricultural asset. It is feared that fodder supply will be short later on during the last summer days. It will be clearly seen as to why we took the above described damage of the Kharif crop as the basis of our first and foremost recommendation, for the postponement of collection till towards the end of March by which time the Rabi or the standing crops become ripe. These are as follows:—

(1) Cotton 16 per cent; (2) Castor seed 2 per cent; (3) Tobacco 1 per cent; (4) Tur 2 per cent, (5) Wheat and gram (purely Rabi crops) 10 per cent and (6) miscellaneous crops 9 per cent; these crops which are standing roughly give a total of 40 per cent of the cultivable area for the whole Taluka. Instead of taking 50 per cent of the Kharif area in a village as the basis of recommendation for the postponement of the collection, even if the basis of an area of 25 per cent or more of the (standing) Rabi crop in that village be

substituted it will not make much, difference in the result sought.

#### **The Kharif anna Valuation.**

19. We feel justified in making the above recommendation by taking our stand on another ground *viz.* the mean of the anna valuations arrived at with the help of official figures and the popular estimates. The official figures relating to the yield of Bajri, Kodra, Bavto, Rice, Juwar and Grass work out an average of  $6\frac{1}{2}$  annas; while the popular estimates of the same crops point out to an average of slightly more than annas three or say three and a half. The mean of these two valuations is 5 annas. If it be contended that it would be difficult to be absolutely certain about the accuracy of the above figure *viz.* 5 annas as showing the true position and if that be so, no suspensions could be granted under the rules, it may as well be contended that there is a great element of doubt even in the official calculation. We, therefore, plead that the benefit of doubt should, in our opinion, be given to the poor cultivator. That is how we have come to support strongly the recommendation which the people themselves have suggested as a measure of relief which they very much need and which we are sure will be much widely appreciated. When people gather their Rabi crop they will be in a better position to pay the whole year's assessment though it may be hard with some of them to pay both the instalments out of the proceeds of the Rabi which is less than normal.

#### **No Hasty Conclusions Drawn.**

20. During the time we were engaged in this work of investigation we had to exercise a deal of restraint in not publishing our information and impressions in bits; that would have led us to draw wrong or hasty conclusions. When we had finished our brief inquiry about Matar Taluka we met in Bombay on the 9th inst. to settle the outline of our recommendations or proposals. We had the privilege of placing our view of the situation and what we considered necessary under the circumstances before His Excellency Lord Willingdon the Governor of Bombay in the course of



an interview which His Excellency was pleased to grant us on the 9th inst. We had the further benefit of a discussion on the same subject with the Hon'ble Mr. Carmichael, the Revenue Member on the same day. His Excellency after giving us a very patient and sympathetic hearing desired us to place all our ideas on the subject of our inquiry before the Hon'ble Mr. Pratt, the Commissioner, N. D., in the form of a note putting down therein our proposals in a definite form. His Excellency assured us that Mr. Pratt would consider them not only with sympathy but with generosity too, and of his own accord kindly gave us a note to him accordingly. Mr. Carmichael who heard the details of our proposals patiently was good enough to advise us to meet Mr. Ghosal who had just then taken charge of the District and to discuss these with him also. He offered to write a letter to him on the subject.

#### **Our Note to the Commissioner**

21. This inquiry had led us to believe that though there is no famine or acute distress in this Taluka at present there are strong grounds for showing real and tangible sympathy with the condition of the people, whose anxiety and trouble caused by the failure of the last Kharif have been considerably aggravated as described above by additional disturbing and unfortunate factors such as (1) the high prices, (2) the prevalence of plague in villages, and (3) the dread that rats and frost might cause damage to the standing crop which is generally admitted to be fairly good even by the agriculturists themselves. They therefore, ask for a general postponement of the collection of Government dues, which they recognize it is their duty to pay, till the standing crops are harvested in good condition. We, therefore, came to the conclusion that the agriculturists in Matar Taluka deserve to be helped in a sympathetic way as indicated in our proposals. We, therefore, prepared a note which was more or less a summary of this report and in which were embodied the definite recommendations we ventured to make on the basis of the

information collected and the impressions formed in the course of our tour in the villages.

### Recommendations.

22. The following are the recommendations made by us:-

(a) *Postponement of the collection of Government dues.*

It is generally agreed that all Kharif crops, except rice which we do not consider to be unusually good, have substantially failed or yielded a very poor outturn and on that account the agriculturists are very eager to get some concession of the nature of postponement. We, therefore, propose the postponement of the collection of Government dues in such villages as contain more than 50 per cent. of the total cultivable area sown with Kharif crops viz. Juwar, Bajri, Bavto, Kodra, Rice and Grass, till the Rabi crop is harvested in good condition i. e. about the end of March next. The number of such villages lies between 50 and 60 in the Matar Taluka.

(b) *Half suspension of assessment.*

Our observation of the Rabi crops, coupled with the general impression formed about the failure of the Kharif, has led us to think that the anna valuation is put somewhat higher than we would feel inclined to do. We, therefore, recommend the villages mentioned in the following list, for half suspension of land revenue.

#### List of villages recommended for half suspension of Land Revenue.

- |               |                |
|---------------|----------------|
| 1. Damri.     | 12. Kunjra.    |
| 2. Vavdi.     | 13. Punaj.     |
| 3. Piparia.   | 14. Bamangam.  |
| 4. Kathoda.   | 15. Bhalada.   |
| 5. Sayala.    | 16. Mehelaj.   |
| 6. Shekhpur.  | 17. Shiholdi.  |
| 7. Chanor.    | 18. Asamli.    |
| 8. Shetra.    | 19. Chikhalia. |
| 9. Dharoda.   | 20. Radhvanaj. |
| 10. Sandhana. | 21. Moraj.     |
| 11. Hejrayad. | 22. Alindra.   |

(c) *Full suspension to small khatedars paying land revenue below Rs. 10.*

In order to stop further indebtedness of small agriculturists we strongly feel, that even though their holdings be uneconomic, they stand in need of special help at this time. Our recommendation, therefore, is that all Khatedars paying less than Rs. 10 as land assessment should be granted full suspension in the whole Taluka.

(d) *Remission for over-flooded areas.*

Under the "local calamities" section, a small area (less than 10 per cent) in seven out of the ten Kalambandhi villages have been granted remission on account of over-flooding of the Khari River. But in our opinion the actual area affected by over-flooding is much larger. We therefore, recommend that (1) the acreage for remission should be so revised as to include areas which have been considerably damaged, and (2) the *himayat* rate should be remitted in the case of all other over-flooded lands in the same tract.

(e) *Financial accommodation on easy terms.*

As it is particularly desired to stop further indebtedness of agriculturists, we recommend that efforts should be made by the public to start co-operative credit societies with the help of Government and the Co-operative Department to afford to indigent agriculturists facilities for securing necessary financial help to meet their requirements till the next year's crop is harvested. This is a matter in which the Government and the public can work hand in hand, we recommend, therefore, that Government should advance as initial capital as much money as would be deposited by the public, the limit for Government contribution being one lac of rupees.

#### Discussion on the Note.

23. This note was submitted to the Hon'ble Mr. Pratt on the 12th inst. and after a little discussion he called us for further discussion the next day when he expected the Collector Mr. Ghosal also to be present. When, therefore, our

recommendations were taken up for discussion by Mr. Pratt on the 13th inst. there were also present Mr. J. Ghosal, the Collector, Mr. Kerr who is to take charge of the District very soon, and Mr. M. K. Gandhi. The proposals were taken up one by one for discussion which may be briefly summarised in the following terms:—Our first proposal was accepted with a slight modification. It was accepted in the case of those villages in which the standing crops or Rabi was 25 per cent or more of the total cultivable area in the village, it being argued that in the case of villages in which there was a negligible proportion of Rabi, postponement was useless. After some searching examination of the second recommendation we were told that the Collector agreed to carefully go into the cases of all villages recommended for half suspension. The third recommendation for granting full suspension to that class of cultivators that paid land assessment of less than Rs. 10. was rejected as being contrary to the spirit of the rules and also as one of doubtful utility. As regards the fourth proposal Mr. Pratt desired us to make more specific mention of the areas affected quoting as he said "Chapter and Verse" of fields damaged by the floods. But Mr. Ghosal has undertaken to look into the matter himself and after ascertaining more fully the whole of the area that was affected by the overflowing of the canal, he would do all that would be necessary. He has in the meanwhile asked us to inform the people who have suffered to approach him and bring before him the full evidence of the damage that is complained of. We have accordingly informed the people of the seven Kalambandhi villages in the belief that the necessary help will be forthcoming from the officials concerned. Regarding the last recommendation about the establishment of Co-operative Credit Societies, it was thought that the matter may be taken up at a later date as it, in no way, concerned the present issue. It was a good proposal and no fault need be found with it.

#### **Assurance of Sympathy.**

24. This, in short, summarises the discussion that we had with the officials concerned in the matter regarding our

recommendations and it is difficult to say whether it was quite satisfactory. It was not, however, wholly disappointing. We have been assured that every sympathy will be shown to the poor cultivators in their difficulties and no coercive measures will be resorted to except under exceptional circumstances. And we hope and trust that everything under the circumstances will be done to justify His Excellency's assurance of sympathy and even generosity being shown to the cultivator who has suffered.

#### **Inquiry in Thasra.**

25. Thus after finishing our work in Matar Taluka and discussing our recommendations with the officials, as previously arranged we have now come down to Thasra where we have begun our inquiry on almost the same lines. We now understand that Mr. M. K. Gandhi, finding that the evidence collected so far was not quite adequate to meet the official test, has himself undertaken to collect evidence and, therefore, has come down to Nadiad with a number of friends from Ahmedabad representing the Gujarat Sabha. We are told that it may not be necessary, therefore, for us to go on with our inquiry at this stage now. In that case we may stop it in the belief that the officials will do all that is needful in the light of the evidence collected by us more or less with their kind help.

**THASRA, KAIRA.**

*18th February, 1918.*

**G. K. Devadhar.**

**N. M. Joshi.**

**A. Y. Thakkar.**

**Members, Servants of India  
Society, Bombay.**

## A BIRD'S-EYE VIEW OF INDIAN SERICULTURE.

BY BABU NITYA GOPAL MUKERJI, M.A., M.R.A.C., AND F.H.A.S.

### I—PRELIMINARY.

GREAT interest has been taken in the subject of sericulture by our Government, by Native States and by private individuals, within recent years, and considerable progress is to be seen in different local areas, which makes it incumbent on us to consider the question of a more general adoption of improved methods, and to get a clearer view of the situation as it stands at present. In Bengal, in parts of Maldah, Birbhum, Murshidabad and even in Midnapore (where the industry has almost died out), the silk-rearing peasants now recognise that their salvation lies in the following of scientific methods of sericulture. For the past fifteen years, for instance, more than a dozen cultivators have been using the microscope with success in obtaining seed-crops, and the silk rearers of a village in the Garhbeta thana of Midnapore, called Uparshol, where a nursery on a scientific basis has been started, have been trying to get a similar nursery started for them at Punishol in the district of Bankura. These two villages exchange seed with each other, and they have come to recognise that the establishment of a seed-rearing nursery in their own village alone is not sufficient to benefit them. For the sake of a parasitic fly, it is impossible in Bengal to rear silkworms successfully for two generations successively, and the people of one district must go to another district, or to a very distant, but recognised, place in the same district for seed. To benefit one part of a country, both parts must be taken in hand at once. This is one of the many examples which shows the importance of understanding the subject, if the cocoon-rearing industry is to be benefited. The starting of nurseries at a haphazard is not enough. We have defects to remedy not only in Bengal, but in Kashmir, in Mysore, in Baroda and in some other parts of India where the industry has been taken up of late years, and where more or less progress has been achieved, notwithstanding faulty application of the scientific system.

2. It is very necessary, therefore, that a succinct and clear account of sericulture should be at hand, which would obviate the necessity in the first instance, of reading up various books and reports that have necessarily sprung up with the 'recent' activities. While I call these activities 'recent,' they are at least 20 years old,

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and more progress might have been achieved if the improvements had been introduced with sufficient knowledge of the subject. A rude shock is sometimes received, when a party, which has been rearing the Eri silkworms, finds out he ought never to have attempted the task in the particular climate, or where a man who has been trying to introduce the Japanese mulberry, finds out that the tree he has been using is not mulberry at all, but a so-called "paper mulberry" which silkworms never eat, or where a man who has been using the microscope for years in eliminating Pebrine finds out that there is no Pebrine at all to eliminate, or when for years seed, which has been accepted as rigorously "cellular" and free from disease, is found out to be really full of Pebrine. The history of the application of scientific methods in various parts of India, is replete with such examples of mistakes.

3. I do not disparage by any means the literature that has grown up within recent years, and I may say, the bulk of it is from my own pen; but it is necessary to keep the main points in view with regard to the development of the mulberry, the *tusser* and the *eri* silk industries, and this is my plea for adding another 33 pages to the already existing literature on the subject. In the following pages matters to which special attention is called are printed in heavy type.

## II.—CLASSIFICATION.

4. Various classes of silkworms are reared, some indoors and some on trees in the open, which spin cocoons, out of which silk is obtained of various classes. Silkworms fall under two main groups—the Bombycidae and the Attacidae. The former make reelable cocoons and the latter unreelable ones, which have to be carded and combed and spun



FIG. 1.—ATTACUS ATLAS COCOON.

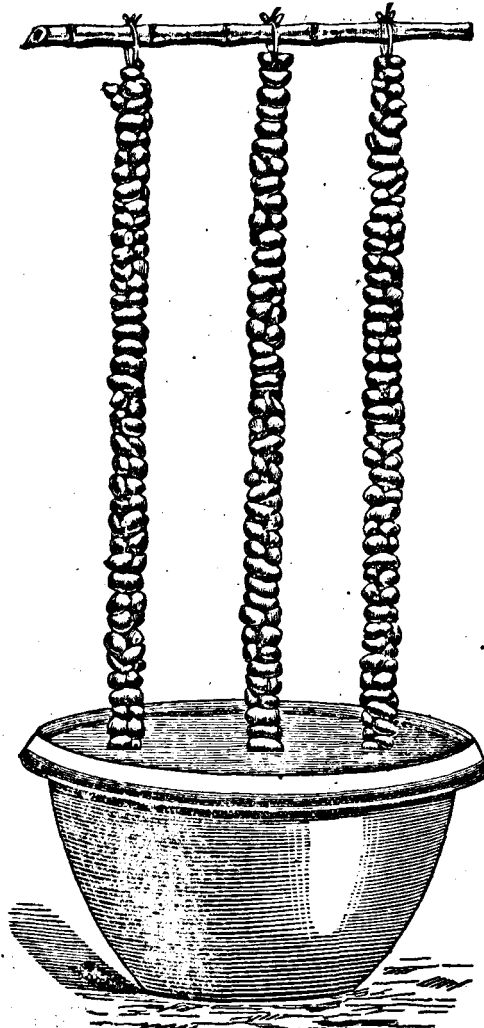


FIG. 2.—BOMBYX MORI COCOONS STRUNG UP FOR SEEDING;  
(The vessel underneath is for maggots of  
the parasitic fly to drop in and  
accumulate.)



into yarn, like cotton. The mulberry feeding silkworms and the tusser silkworms of commerce all come under the Bombycidae, while the Endi silkworms belong to the Attacidae. The *Attacus Atlas* (Fig. 1) which is the largest cocoon of all, out of which come the most magnificent moths, are unreelable and practically worthless wild cocoons.

### III.—THE MULBERRY SILKWORM.

5. The mulberry feeding silkworms, which are the most profitable of all to rear, are divided into the following groups:— (1) the *Bombyx mori* (Fig. 2), or the annual silkworms reared in Europe, China, Japan, Kashmir and some of the Western Asiatic countries; (2) the *Bombyx textor*, or the Barapalu, the annual silkworm of Bengal, the cocoons of which are flossy and not hard like the *Bombyx mori* cocoons, and the eggs of which do not require such intense cold as the eggs of *B. mori* for their hibernation; (3) the *B. Arracanensis* of Burmah and the *Barapát* of Assam which are closely allied to the *B. textor*; (4) the *B. Meridionalis* of Mysore and Kollegal, which yields 7 or 8 crops of cocoons in the year instead of one, the cocoons being greenish white and almost as good as Barapalu cocoons; (5) the *B. Cræsi* (*Madrasi* or *Nistari*), the golden yellow cocoons, which breed eight times in the year in Bengal and which produce very fine and soft silk; (6) the *B. fortunatus* (the *Deshi* or *Chhotopalu*), a brighter yellow cocoon of Bengal containing a larger proportion of stronger silk than the *B. Cræsi* silk; and (7) the *B. Sinensis* or the *China* cocoons, which are the smallest yellow cocoons of all, reared in Midnapore. There



FIG. 3.—WILD THEOPHILA HUTTONI SILKWORM.



FIG. 4.—MOTH OF THEOPHILA HUTTONI.

is a white variety of *B. Sinensis* also reared in Midnapore, which is called the *Bulu*; (8) the *Theophila* cocoons found on the mulberry trees in the Himalayas are wild (Figs. 3 and 4).

#### IV.—TUSSER SILKWORM.

6. The tusser cocoons are also divided into several groups, of which the *Antheria Yamamai* of Japan (Fig. 5), which yields a greenish white silk, somewhat rougher and coarser than white *B. mori* or *B. textor* silk, is the best. The *Antheria pernyi* (Fig. 6) or the China tusser, comes next. The *Antheria assama* or Muga of Assam is just as good as the China tusser. The *Antheria mylitta* or the Bengal tusser proper, comes last. The tusser of China and Japan is reared on oak-trees. The Muga of Assam is reared on the Sum (*Machilus odoritissima*), the Sualu (*Tetranthera monopetala*), the Mejankuri (*T. polyantha*), the Champaka (*Michelia champaka*) and other trees. The Bengal tusser is reared chiefly on the Asan or Sáj tree (*Terminalia tomentosa*), a tree which can be freely pollarded, also on *sal*, *arjuna*, *sidha*, *dhau*, *baer*, country-almond and other

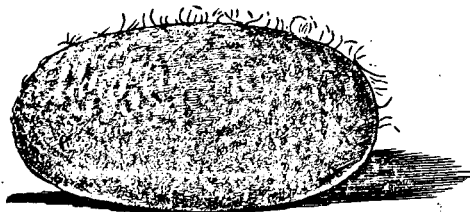


FIG. 5.—ANTHERIA YAMAMAI COCOON.

trees. The moths from tusser cocoons come out very irregularly, specially when the cocoons are large and strong, some coming out within three weeks of their formation, while others may not come out for two years. This accounts for tusser

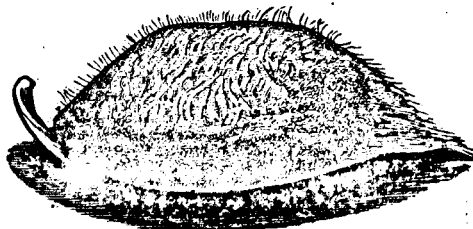


FIG. 6.—ANTHERIA PERNYI COCOON.

rearers choosing thin and small cocoons for seed, as eclosion of moths from such cocoons is more regular. An experiment conducted by the author, showed, that large and hard cocoons

can be used for seed, if the chrysalids are extracted from the cocoons and kept exposed or buried in saw-dust. This is one important step which can be taken in ameliorating the condition of the tusser silk-industry, which is going down on account of disease. The use of genuine wild cocoons for seed is another step.

#### V.—THE BENGAL TUSSER.

7. There are *three main classes of Bengal tusser*, the Narya, the Daba and the Bugui. (1) The Narya (Fig. 7) is obtained out of the small sized cocoons, generally wild, though domesticated cocoons are often fraudulently sold as wild cocoons. From the wild or domesticated Dhuria or summer cocoons of June

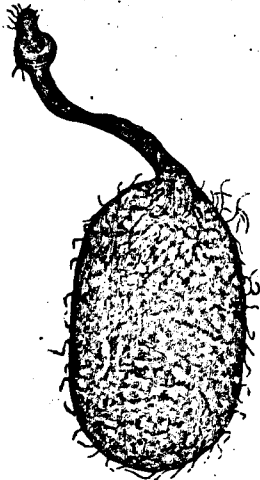


FIG. 7.—WILD LARYA  
OR NARYA COCOON  
(Dark, Small, Hard, Short  
and Thick Peduncled).

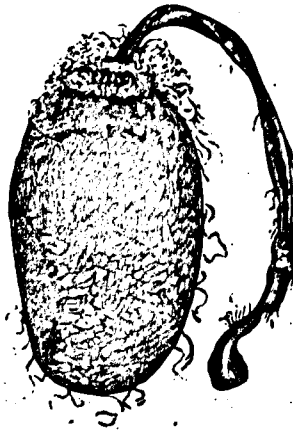


FIG. 8.—AMPATIA LARYA  
COCOON (FLIMSY COCOON).

are obtained an Ampatia or flimsy crop of cocoons (Fig. 8) in July and August, and from this Ampatia crop is obtained the regular crop of the year, the Barsati crop, in October (Fig. 9). A Jaddui or cold weather crop (Fig. 10) of Narya is also sometimes taken; but it takes nearly three months taking a Jaddui crop. (2) The Daba is now always taken from the domesticated stock and not from the wild stock, but it can be taken

and ought to be taken from the wild stock, though, being the strongest breed of all, the domesticated *Daba* does not give such hopelessly bad results as the domesticated *Narya*. The origin of the *Daba* cocoon is probably the *Muda Muga* cocoon (Fig. 11), *i.e.*, the large wild cocoon that does not cut in August or September of the year they are formed, but in the following



FIG. 9.—BARBATI LARYA COCOON  
(Small-sized, Hard Cocoon).



FIG. 10.—JADDUI LARYA COCOON  
(Light-coloured, Long Peduncled,  
Small-sized Cocoon).

June or July. In September or October such large and uncut cocoons can be picked out in *hâts* from among pierced seed-cocoons, and they ought to be looked for and reserved for seed till next June, when moths will come out of them, lay eggs as in the case of other tussler cocoons, and give an *Ampatia* (Fig. 12).

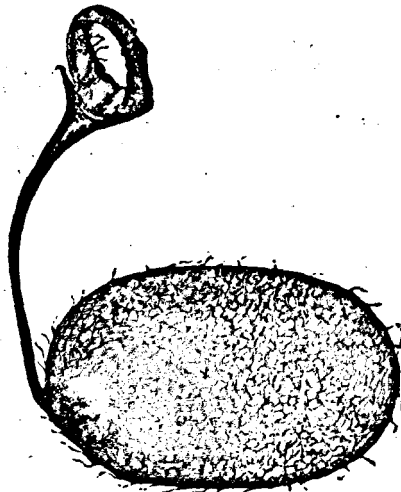


FIG. 11.—MUDA-MUGA COCOON.

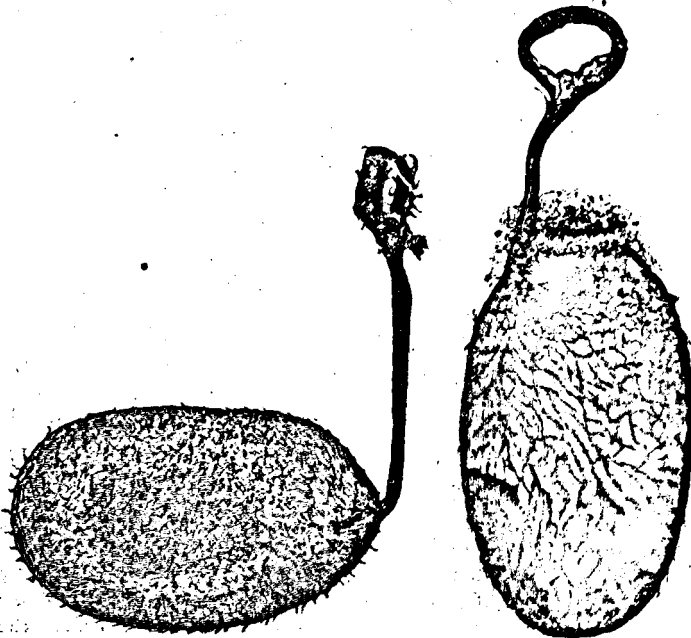


FIG. 12.—ANPATIA DABA COCOON.

FIG. 13.—BARBATI DABA COCOON.

and a Barsati (Fig. 13) crop of healthy *Dabas*. Some of the largest and hardest Barsati cocoons can be reserved for seed till next June, and the domesticated breed kept on until disease appears among the stock, when the wild stock must be resorted to again, in the manner already described. (3) The origin of the Bugui (Fig. 14) is the large-sized wild tusser cocoons (called Bar-ra, see Fig. 15), out of which moths cut out usually in September.

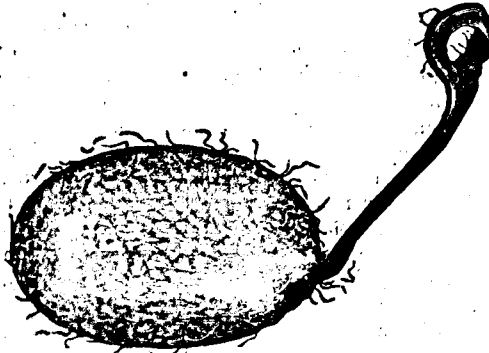


FIG. 14.—BUGUI COCOON.



FIG. 15.—BAR-RA COCOON.

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ber. It yields one crop of cocoons in November and December. Thus Bugui breeds once in the year, Daba twice, and Narya three times. The cocoons obtained from October to January, are the best, and those from July to September, are the worst. When the Barsati cocoons are selling from Rs. 8 or Rs. 10 a *kahan* (= 1,280 cocoons), the Ampatia *Naryas* or *Dabas* would sell for only Rs. 2 to Rs. 3 per *kahan*.

#### VI.—THE REARING OF THE TUSSER SILKWORM.

8. The method of rearing of all the three classes of tusser cocoons is the same. The moths begin cutting out of cocoons about 4 P.M. At 9 or 10 P.M. the male moths fly away. About 3 A.M. those or other male moths come to the female moths. To facilitate the visit of the male moths, the rearer must keep his females out of doors (usually they are kept perched up on bow-like sticks) and watch them against the attack of bats, birds, lizards, etc.

The moths remain paired till about 4 P.M., when they either separate themselves or are separated by the rearer, the females being kept pinned down in leaf receptacles, and the males given to domestic fowls. The eggs are collected after three days, and kept in smaller leaf receptacles, the eggs of two or three moths (about 500 eggs) being kept in each receptacle. On the ninth day the eggs hatch, and as soon as they hatch, they are put out on trees in which they are secured by pinning them on to leaves. The trunks of trees should be brushed clean of ants and other insects, and afterwards they are each given a circle of Bhela oil to protect the worms from the attack of ants, etc. To each tree about half a dozen to a dozen of seed-receptacles are pinned on at different places, that the whole of the tree may get covered with the worms and not any particular part of it only. The trees have to be kept low for facility of watching the insects against ants, wasps, birds, squirrels, a bug called *chányá*, a mantis, scorpions, centipedes, a large carabidæ beetle called *cha-bundia*, and other vermin. In this matter great care is necessary. The principal epidemic from which the tusser silkworm suffers, is Grasserie (Fig. 16), which is a disease which is produced readily, both among tusser and mulberry silkworms by feeding them with leaf, thinner, i.e., sap-  
 pier, than leaf that the worms have been eating hitherto. As sap rises from the ground, a heavy shower of rain makes the greatest difference of consistency in the leaf in the case of short trees, as by capillary action sap rises to a height of about 4 or 5 feet. No worms should be kept on branches within 4 or 5 feet from the ground, or such branches should be lopped off from the very first.

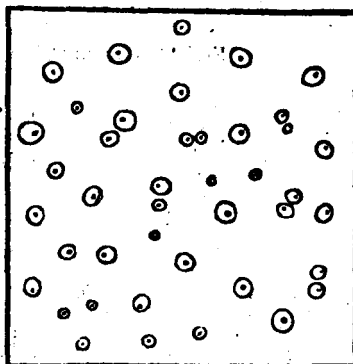


FIG. 16.—MICROSCOPIC APPEARANCE OF GRASSERIE CRYSTALS (X 600).

For tusser rearing the annual pollarding should be so done, that all the branches may be above 5 feet and below 10 feet from the ground, that Grasserie may be avoided, while the worms may be kept under close supervision. Another precaution which may be taken to prevent epidemic, is the daily removal and burial of droppings, and dead worms from under the trees. A stick with bird-lime (peepul tree gum mixed up

with warm mustard oil and kept covered with a bamboo tube when not in use) ought to be always in the hand of the rearer, that he may effectively scare away wasps and birds. A bow and pellets of mud are also of great help. In tusser-rearing localities, one scarcely sees a bird, the watch kept by the rearers being so strict. When the leaf of one tree is eaten away, the branches are lopped off with the worms on them and transferred to another tree, or several trees, and this continued until the cocoons are formed. When the cocoons are all formed, they are brought down with the adhering branches of trees, carefully separated from the branches and sold off in *hâts*. When they cannot be sold so readily, they must be killed. For killing the cocoons, they are put inside a *kulsi* (earthen pot), and inside the mouth of the pot a few sticks are inserted, so that when the pot is upset with its mouth downwards, none of the cocoons may fall out. The pot is then put in this reverse condition over another in which water is boiling over an oven. In about half an hour all the cocoons are killed with the steam rising from the one pot and going into the other. They are then dried in the sun and kept for reeling. The effect of domestication of tusser cocoons are:—(1) the cocoons tend to get smaller, (2) they get lighter and lighter in colour, (3) the silk gets finer, (4) the peduncle gets longer and slenderer, (5) the worms get more and more subject to disease. Domesticated cocoons are preferred by weavers, as they produce the whitest and finest cloths.

#### VI.—REELING OF TUSSER.

9. The reeling of tusser cocoons is done by patent processes in the European factories in Bengal, soda or potash being the chief solvent ingredient in use and glycerine the substance for keeping cocoons moist while they are reeled. A single person can reel off the silk from 250 tusser cocoons a day in European factories. The native process consists in boiling the cocoons in water to which ashes of Asan, Kenja, or other tree or plant (such as linseed plant ashes), are added, or *saji*. For 500 cocoons about half a seer of ashes are used, or half a chhitak of *saji*. A refined method would be the using of lye instead of the crude ashes. The lye may be obtained out of the ashes by repeatedly passing the water through the ashes kept over a piece of calico, until the water looks oily in appearance. The cocoons may be boiled in this lye for about half an hour. All cocoons are not softened equally by the boiling, and those that do not work off easily while they are being reeled, are kept separate and boiled the next day with a fresh lot of cocoons. Large and hard cocoons require stronger alkali and longer boiling. When the cocoons



have been boiled, they are kept in a pot between folds of a cloth over some ashes, and reeling commenced at once. One day's cocoons are boiled in the morning, one person being able to reel from 50 to 100 cocoons a day. The reeling is done with a *latai* on the right hand, and with the left hand fibres from 3 to 5 cocoons are twisted on the thigh, while the *latai* is being wound round with the right hand. As 50 to 100 cocoons are reeled and twisted by the same operation per day, this primitive method cannot be regarded as a very ineffective method of preparing the raw material for the loom. Usually the spinning of tassar cocoons is done in the weavers' families, and it is never done by the rearers as it should be. A *kahan* (= 1,280) of cocoons produces from  $\frac{1}{2}$  seer to 2 seers of silk according to quality of cocoons used.

#### VII.—THE MULBERRY.

10. The mulberry tree grows wild all along the Himalayas, from Kashmir to Assam, and the mulberry silkworm known as *Theophila*, is found abundantly on these trees. The variety of mulberry found in the Himalayas is very large. From the gigantic *Morus serrata* to the dwarf *Morus indica*, the gradation is slow. Some have soft succulent leaf, others rough, spiny leaf; some have large and abundant supply of fruits, others drop their blossoms and are hardly ever known to fruit. Varieties with large-sized leaves set close to one another on stems, smooth, and thick with gummy sap, and bearing little or no fruits, are the best to choose for silkworms. The *Morus alba*, variety *laevigata*, is one of the best varieties to choose. The mulberries in common use in Bengal and Mysore are the *Morus alba*, varieties *indica* and *sinensis*. The former known as *Photi* or *Sultani tunt* is the better variety of the two, the gum of the leaf being thicker. It has more palmate leaves, and it requires more manuring and cultivation to keep it in condition. The *Morus sinensis* (the *Kayli* or *Chini tunt*) has thinner and sappier leaves, but it is hardier. It is quite suitable for worms up to their fourth moult, but afterwards, *i.e.*, when the worms are well out of the moult and quite strong, they should be given the stronger *M. indica* leaf. These two varieties do not grow into very large trees, and one of the chief improvements that could be introduced into the Indian industry is the introduction of *M. laevigata* or some other similar superior variety of mulberry, suitable not only for rearing the poor Bengal cocoons, but also the superior *B. meri* cocoons. The tree system of propagation of the mulberry is also more natural and healthy. Trees when once grown up cost little keeping up, while the shrub-mulberry planted  $1\frac{1}{2}$  or 2 feet apart costs about Rs. 75 an acre keeping up.

## VIII.—PROPAGATION OF MULBERRY.

11. Propagation of mulberry may be either from seed, or from cuttings, or from grafts. Trees grown from seed produce leaf

which, like *M. indica*, is not quite suitable for rearing worms at the last stage. *Morus laevigata*, *M. Philipinensis*, the European *Morus alba* and other superior varieties of mulberry can be readily grown from cuttings, and propagation is done usually from cuttings only. The best Japanese mulberry, however, does not grow from cuttings, and it is grafted. Though the Japanese mulberry answers to all the requirements of a first-class mulberry, it is no better than some of the best Indian mulberries, and there is no occasion to introduce the Japanese varieties into India. For growing any mulberry from seed, one precaution is necessary. Before sowing the seed, it should be put in camphor water in a stoppered bottle for an hour, and then sown. Germination is otherwise very partial.

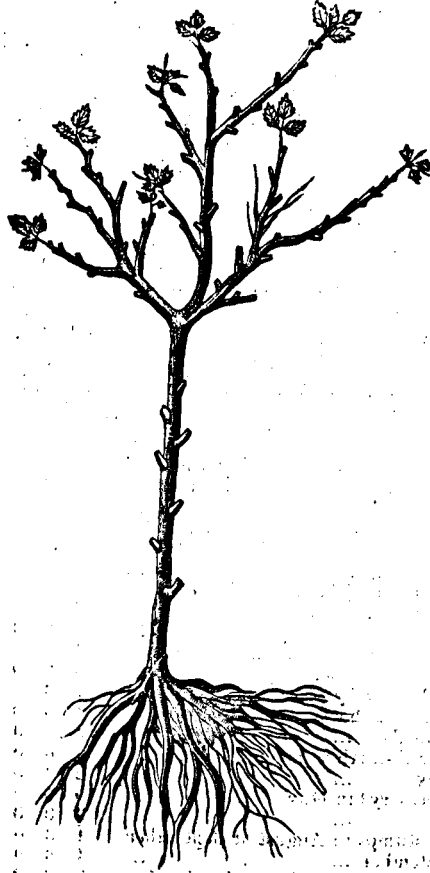


FIG. 17.—MULBERRY TREE PRUNED AND STRIPPED FOR TRANSPLANTING.

mustard, and seed for a large tract of land can be easily sent through post from one country to another. When the seedlings

are grown up, propagation may go on from cuttings, and thus the first cost of setting up a plantation saved very much. When cuttings are available, propagation should be from cuttings. When trees are sought to be propagated, there should be a nursery on high irrigable land, well dug up, manured and cultivated and protected with ditches and fences. The cuttings or seedlings should be planted in the nursery 9 inches apart, and transplanted on to fields, when 8 or 10 ft. high, at a distance of 20 ft. While transplanting, all the full-formed leaves should be nipped off and all branches within 5 ft. of the ground rejected (Fig. 17). Leaf from seedling trees should not be given to worms in their last stage, as it is more sappy.

#### IX.—COST OF PLANTING MULBERRY.

12. The cost of starting a mulberry plantation of the shrub kind is about the same as starting a mulberry nursery for trees. In the former case the cuttings are planted about 1½ ft. apart instead of 9 inches apart, and four or five cuttings planted at each spot instead of one. The cost of establishing a mulberry nursery, one acre in area, for the first two years, is given below :—

	Rs.	A.	P.
(1) Wages of 90 men employed in digging the field with spades in the cold weather, at 3 as. ...	16	14	0
(2) Ditching and fencing (by piece-work) ...	30	0	0
(3) Cost of 12 ploughings, the plough-man with bullocks and ploughs being hired, at 4 as. a day ...	9	0	0
(4) Cost of getting 30 loads (about 30 mds.) of mulberry stalks in September, at 4 as. ...	7	8	0
(5) Wages of 15 men making cuttings, at 3 as. ...	2	13	0
(6) Wages of 15 men making hollows in regular lines ...	2	13	0
(7) Wages of 45 men planting cuttings ...	8	7	0
(8) Hand-hoeing in October by piece-work ...	1	8	0
(9) Cutting away the first shoots in December ...	1	8	0
(10) Ploughing afterwards ...	2	0	0
(11) Cost of putting tank-earth as manure in April ...	15	0	0
(12) Ploughing in May ...	2	4	0
(13) Irrigation (if necessary) in May ...	15	0	0
(14) Weeding in July ...	3	0	0
(15) Cutting away of stumps in August or September ...	1	8	0
(16) Ploughing in September ...	1	8	0
(17) Digging with spades after the November bund ...	7	8	0
(18) Two years' rent ...	12	0	0
	141	3	0

Expenditure in connection with items Nos. (10) to (18) has to be incurred annually, i.e., about Rs. 75.

## X.—OUTTURN.

13. The first crop of leaf, which is ready in November or December when planting is done in September, or in April when planting is done in February, is cut away, as the leaf is very thin and sappy and not very suitable for silk-rearing. The crops *bund by bund* that are obtained afterwards are :—

		Value.
24 maunds of leaf (with stalks) in	January ...	Rs. 24
26 "	March ...	" 36
48 "	June ...	" 24
60 "	August ...	" 30
45 "	November ...	" 90
45 "	December ...	" 45
<b>Total</b>	<b>258 maunds</b>	<b>Total value Rs. 249</b>

## XI.—PROFITABLENESS OF THE SILK INDUSTRY.

14. An acre of mulberry from the third year, when it is well established, usually yields 300 maunds of leaf with stalks, which is sold as a standing crop, cocoon-rearers buying it up and cutting it away from day to day. The purchase at the above prices is usually on credit, and often the buyers, when they lose their crop of silkworms from diseases, are unable to pay the price of mulberry. The mulberry grower and the silk rearer are therefore both interested in the eradication of diseases. From 300 maunds of leaf 600 seers (1,200lbs.) of fresh cocoons are obtainable as the maximum result per acre. The value of this quantity of cocoons may be as much as Rs. 600. The profitable-ness of sericulture, when loss from disease, etc., may be kept down, can thus be easily imagined.

## XII.—THE TREE MULBERRY.

15. When rearing is done with leaf from large mulberry trees, the seedling or cuttings planted should not be touched for the first five years as the leaves go to nourish the trees. They should be protected for the first three years at least with gabions, or with a rough envelope of coarse grasses and thorns, that injury from cattle may be avoided. If a couple of seers of whole bones are put underneath each tree once in twenty years, and the soil underneath the trees annually dug up in November, the trees will always remain in condition. Two pluckings are possible annually,

the first in February or March, and the second in October or November, as some leaves must be left to nourish the trees. In the fifth year, when the first picking of leaves takes place, each tree will yield about 10 seers of leaf at each picking, or half a maund in the year. By the tenth year, the yield will gradually increase to a maund per tree. The maximum average yield per tree, may be put down at 2 maunds, which result will be attained after about 20 years. But the divergence in the yield of leaf is great according to the variety grown. The quantities mentioned will be readily yielded by *Morus laevigata*, *Philippinensis* and the ordinary European *Morus alba*, but not by *M. indica* or *sinensis*. Every other year the branches of the trees should be pruned off, so that the new shoots coming on with a more vigorous growth of leaves, can be readily bent, and the leaves picked with the help of a crook without climbing.

### XIII.—REARING OF SILKWORMS.

16. The rearing of mulberry silkworms (Fig. 18), and of Endi or Eri silkworms indoors on bamboo *dalas*, proceeds on much



FIG. 18.—MULBERRY SILKWORMS IN VARIOUS STAGES. (ONE SILKWORM BEING SHOWN WITH A PARASITIC FLY DEPOSITING EGGS ON IT).

the same method. Leaves (castor leaves in the case of the Eri silk-worm) are put on the newly-hatched worms, cut up very fine, the worms with the leaves separated from the eggs after three or four hours, and put separately at the lowest shelf of a *machan* (called *ghara* in the silk districts). The eggs hatching the next day are put higher up in the *machan*, and the third day's worms still higher

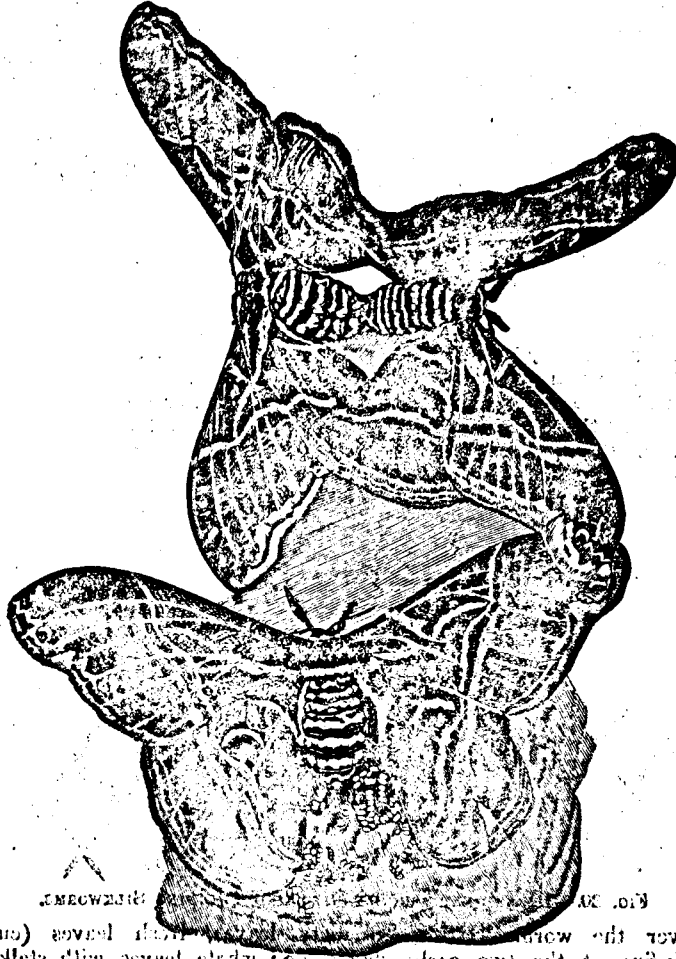


FIG. 19.—FECUNDATION AND OVIPOSITION OF ENDI MOTHS.

up, after which usually no more notice is taken of the eggs, except in the case of the Barapalu eggs, in which the hatching is much more tardy. The worms up to the last moult are usually fed five times a day at regular intervals. At the last stage, the worms are fed three or four times a day. The worms moult or change their skin four times during this interval, *i.e.*, from hatching to spinning of cocoons. Inside the cocoons the worm moults twice, once in changing into chrysalis and the second time in changing into a moth. Inside the cocoons and as moths they eat nothing. As moths they pair and lay eggs (Fig. 19), and after a few days die off. Strong and healthy moths may live for a fortnight after laying eggs; but a moth dying within a day or two after laying eggs *may be* healthy and their eggs fit for rearing. As leaves are heaped up on *dalas* by repeated feeding, cleaning becomes necessary. Native rearers neglect cleaning at least in the early stages. But neglect in this matter and in the matter of keeping the worms thin, and the room well ventilated (though the worms themselves must always be kept away from a current of air), result in worms dying in large numbers specially at the last stage, though at the last stage one may be very careful. Keeping the worms thin and clean and the room well ventilated (though in even temperature) and free from dust, is necessary from the first. Cleaning and thinning of the worms are facilitated by thread-nets (Fig. 20) of meshes of about half an inch. A net is spread

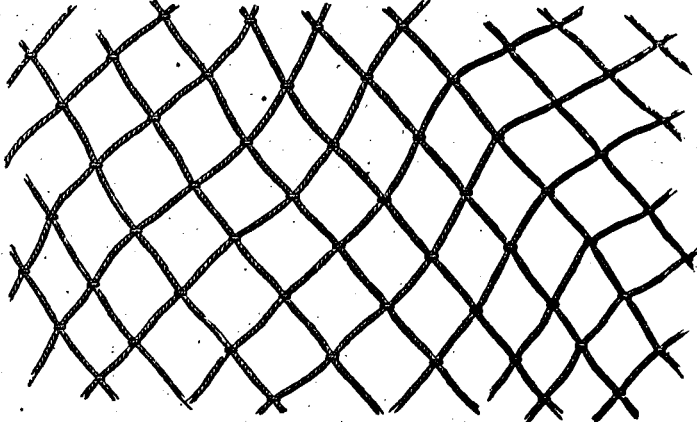


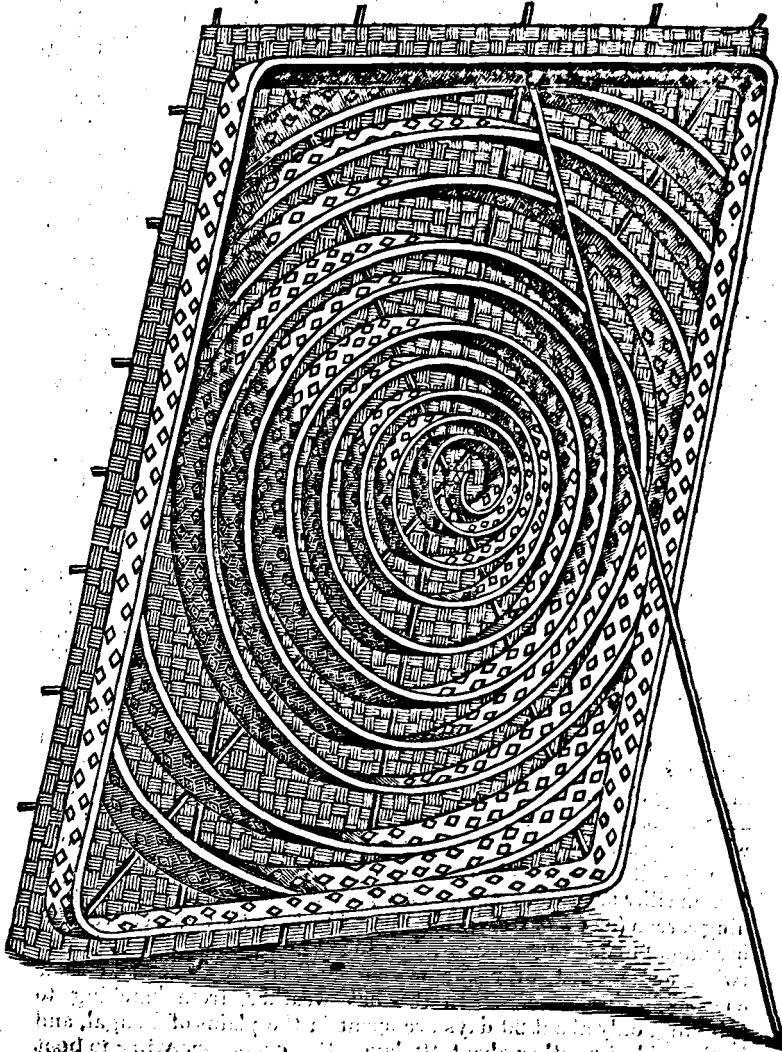
FIG. 20.—THREAD-NET FOR CLEANING AND THINNING SILKWORMS.

over the worms resting on dirty leaves, fresh leaves (cut up fine at the two early stages and whole leaves with stalks

being put from the third stage) scattered over the net, and after half a minute the net may be removed to another *dala*. This has the effect of separating the worms evenly into two lots. Nets are to be used daily for cleaning whether the worms need thinning or not. A *dala* of newly-hatched worms has to be divided up into three *dalas* after the first moult, into nine *dalas* after the second moult, into 27 *dalas* after the third moult, into 81 *dalas* after the fourth moult, and at the last stage the worms occupy twice as much space (*i.e.*, 162 *dalas*) before they make cocoons. Daily the net from a *dala* with the worms and litter are to be lifted at the mid-day feed, removed on to a fresh *dala*, and the older *dala* removed outside and thoroughly cleaned. If, however, worms are found underneath the net, they must be assumed to be moulting. They should not then be disturbed, but kept on a lower shelf on a separate *machan* where no feeding should be done for about 24 hours. The worms on the net removed to a fresh *dala* are to be given a feed and then left without food for about 24 hours. Great care is necessary at moulting periods. The point to remember is, it does more harm giving food to moulting worms than fasting them for a few hours until the worms are well out of moult which is known by their agility and hungry look. If on blowing over the worms they move very fast, one knows they are properly out of moult. If, on the contrary, the movement they exhibit is of a dull and listless kind, they are not quite out of their sickness, and they should be still left without food. An extra feed at the time when the worms are going off to moult does not do them much harm; but feeding too early does harm. Experience is needed in this matter.

17. Worms in the same room should be all of the same age, as much as possible. That is why tardy worms are kept high upon *machans*, and early ones lower down, both at hatching and at moulting times. If worms of different ages are kept in the same room, the late worms suffer more from disease. Worms when they are ready for spinning become translucent and they constantly spit out silk from their mouth. At this time, in the case of Indian silkworms, they are quickly picked and transferred to a spinning screen (or *Chandraki*, vide Fig. 21) where they get convenient bearings for making cocoons. In the case of the *B. mori*, dry twigs are arched over the worms and ripe worms make their cocoons in these arches. In the hot weather, from hatching to spinning, only about 20 days are spent in the plains of Bengal, and in the coldest weather about 40 days. But cocoon-rearing is best done when the temperature is about 75° and fairly uniform. That is why the November bund or crop is the best crop, and the





of the...  
 has...  
 and...  
 another... **Fig. 21.**—**Cassids on Striped Carpet**...  
 cut... to... of... of...

only these two crops would be taken. But when the shrub mulberry is used, rearing must be done at other seasons also, when, on account of too great heat, or cold, or damp, rearings are more or less unsuccessful. Two good crops of cocoons are better than eight indifferent ones (even the two good crops being subject to infection when four or eight crops are attempted). Indeed, on account of the parasitic fly-pest (Figs. 27 & 18) it is not feasible to take all the eight crops in the year, and this is why rearers take a crop and omit the next and then go for seed to some distant place, and the actual number of crops taken in a village is three or four. When the cocoons are formed, they are gathered from chandrakis on the third day and sold off at once, or killed in a *kulsi* as described in connection with tussar cocoons, or in a basket put over a boiling pan of water, the basket being covered over with a blanket. When there is hot sun, the rays of the sun are sufficient to kill the cocoons in two or three days.

#### XIV.—REELING OF MULBERRY COCOONS.

18. Except in the rainy season, cocoons, however killed, must be steamed in an oven immediately before reeling. Ovened cocoons should be reeled off within 3 or 4 days. Ovened cocoons should not be spread out in the sun to get dry, but should be kept spread out indoors in *machans* and reeled off as fast as possible. For small quantities of cocoons the ovening can be done in a basket over a pan of fire as in the case of killing, a blank space being left in the middle of the basket, so that cocoons about 6" thick may rest on all sides and the top, and the steam work its way from the bottom through the cocoons and out of the blanket. When for 10 minutes the steam is coming out of the blanket, the cocoons may be considered to be properly ovened. When dealing with large quantities of cocoons, special erections are necessary for ovening. In the rainy season the air is naturally steamy and it exercises the same beneficial effect on the cocoons as an artificially produced atmosphere of steam. But cocoons *spun* in rainy weather do not unravel properly in basins and they are a source of great loss to European factories where even silk is required to be made. Ovened cocoons are reeled off in a basin of water (Fig. 22) which is kept boiled with fire or steam, and passed in two lots to a reel, which as it is wound round and round, the cocoons get worked off. As each cocoon gets worked off, its place is supplied by another, the end of which is kept ready for the purpose by the reeler, and an expert reeler can reel off as many

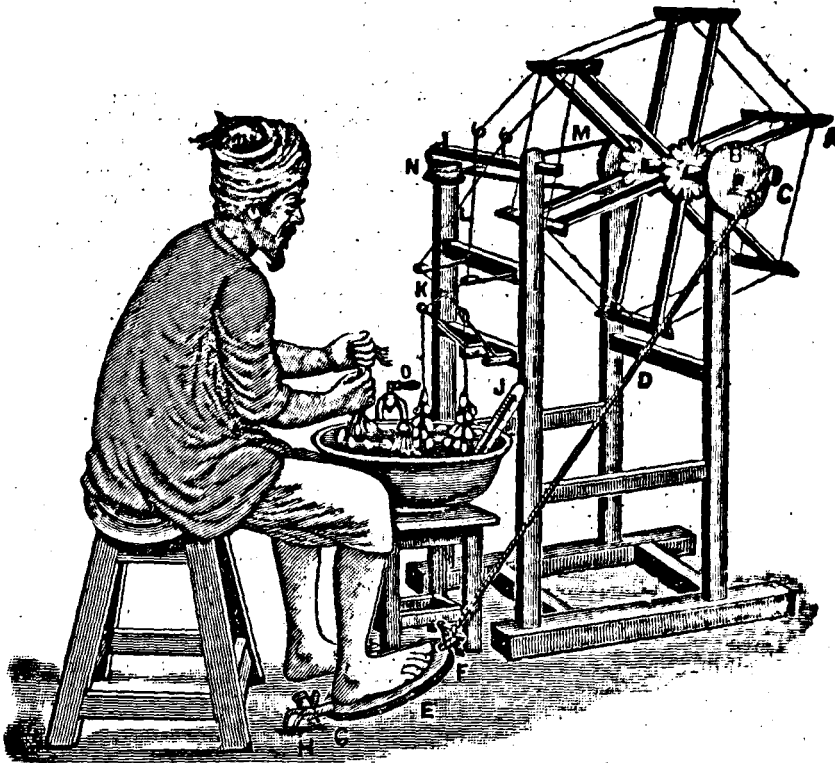


FIG. 22.—A NEW REELING MACHINE WITH PEDAL ARRANGEMENT,  
WORKED BY ONLY ONE MAN.

- A—Reel (2½ feet diameter).
- B—Pulley at right-hand end of the reel (weighted).
- C—Pin or screw on B.
- D—String or wire.
- E—Plank (pedal).
- F—Hole at one end of E for tying string or wire.
- G—Hole at the other end of E for tying the pedal to a pin fixed into the ground with wire rope.
- H—Pin fixed to the ground for keeping the pedal in position.
- J—Thermometer for testing the temperature of water in the basin for boiling and reeling the cocoons.
- K & L—Two croisures.
- M—String giving motion to the eccentric.
- N—Pulley on which the eccentric rests.
- O—Steam-cock.

as four *kahans* of cocoons per day when he has to make the best kind of silk, and ten *kahans* a day when he has to make native *Khangru* silk.

#### XV.—THE SILK-FIBRE.

19. There is no fibre so long, so strong, so fine, so soft, and so smooth, as the silk-fibre. When we talk about the staple of cotton-fibre being long, we only mean that it is  $1\frac{1}{2}$  or  $1\frac{3}{4}$  inches in length; when we talk of jute-fibre being long, we only mean that it is 12 or 13 ft. long, but the tasser cocoon has an uninterrupted fibre 800 yards long and some varieties of mulberry cocoons, one uninterrupted fibre of 900 yards, and yet the fibre is so fine that in the case of the tasser this single fibre from a cocoon is 700 milligrammes and in the case of the mulberry silk it is 250 milligrammes in weight. So fine is the thread, that although there is no difficulty, on account of its strength, to draw the thread out of single cocoons, in practice never fewer than three cocoons in the case of the tasser and never fewer than four or five in the case of the mulberry cocoons, are used simultaneously for drawing out the thread from. It is for the finest silk muslins or silk gauze that thread is made by drawing out the fibre of four or five mulberry cocoons together. So strong is the fibre of mulberry cocoons that it is quite easy to draw out the fibre on to a reel without a single break, though this fibre is so fine that for practical purposes it is never used for making fabrics in these days, though perhaps in older times the "Koan vests" of the Roman empire were woven out of such single silk-fibre. And yet each single fibre of silk is made of two ultimate fibres agglutinated together with a natural gum which gives the fibre its brilliancy. These two ultimate fibres or *bases* come out of the spinarette at the mouth of the silkworm, and ultimately derived from two glands situated on two sides of the interior of the worm. These two glands are sometimes taken out of the body of the silkworm, put in vinegar and afterwards drawn out in the form of silkworm gut which is used for tying fishing hooks to the line. For its weight and pliancy there is no such strong substance as the silkworm gut.

20. But though the fibre is the strongest, finest and softest fibre of all, one silk-fibre differs from another so much that one is valued at Rs. 10 a seer, while another at Rs. 30 a seer, and a country which habitually deals with a Rs. 10-per-seer fibre can ill compete with a country which habitually produces a Rs. 30-per-seer fibre. The native-made silk of India called *Khangru* or *Ghangru* silk sometimes sell at only Rs. 10 per seer, and Rs. 12

per seer may be taken as the average price of *Khangru* silk. The European filature reeled silk is much better. It sometimes sells for only Rs. 16 or Rs. 17 per seer, but its average price is about Rs. 20. Italian, French, and Japanese silks are still better and they sell for about Rs. 30 a seer.

21. Why is there this difference in price? Let us first see the cause of difference between European filature reeled silk and *Khangru* silk. As much as one seer a day may be reeled by a couple of men on the *Khangru* system, though the average quantity is 9 chhitaks. As much as 4½ chhitaks per day is sometimes turned out by a pair of operatives in European filatures, but the average may be taken at 3½ chhitaks. This difference comes of the Europeans looking to quality and the Indians chiefly to quantity. There are three causes which combine to make the European filature reeled silk being so much superior to the country *Khangru* silk :—(1) The European factories of Bengal regulate the number of cocoons reeled more exactly and usually use a smaller number, five or six cocoons, instead of 20 cocoons. (2) The European factories insist on a knot being put whenever there is a break. (3) The European factories cross two adjacent lots of fibre twice on themselves to effect an agglutination of fibres, while the country reelers not giving any croisure and putting no knots, can reel away very fast and get a larger absolute and relative produce.

22. Is it worth while for our country reelers to follow the European system, and produce a smaller quantity of superior fibre? Not at present, when the demand for silk at Rs. 12 a seer in India is very large and very keen. There is practically no demand for the Rs. 20 silk in the Indian market. Ask the large silk-mill-owners of Bombay what silk they want. They will tell you, silk of the value of Rs. 5 or Rs. 6 per pound; and as for hand-loom use, they prefer, as a rule, the cheaper silk. A few *skeins* of what is called by our country weavers "Latin silk," that is, European filature reeled silk, are always used by exceptionally good weavers to meet some special demand, but it is the *Khangru* silk that they are accustomed to handle. The demand from Benares, Lahore, Amritsar, Karachi, Nagpur and other centres of silk-weaving is for the Bengal *Khangru* silk, and this demand is very great. Nearly a crore of Rupees worth of silk is exported to other Provinces of India from Bengal against 50 lakhs of Rupees worth of superior filature reeled silk exported to Europe and America. The demand for the *Khangru* silk shows an upward tendency and the demand for the superior European silk shows a downward tendency. There is therefore no hesitation in what I have recommended. Go in for quantity for the present, and turn out *Khangru* silk for the country.

23. The next question we should turn our attention to, is, why is not the European filature reeled silk of Bengal as good as Italian, French or Japanese silk? In Europe there is demand mainly for high-class silks, as in India there is demand chiefly for low grade and cheap silks; and in India also, as time goes on, the demand for high class silks will increase. If the millers and weavers of India can buy high class silks for Rs. 8 per lb., they will not buy low grade silks for Rs. 5 or Rs. 6 per lb. High class silks are more easily unravelled, and there is less waste in unravelling it, and though labour in India is cheap, the manufacturer finds it pays him to buy high class silk for Rs. 8 a lb. If in Europe also European filature reeled silk can be sold for Rs. 8 a lb., it will sell better, but European manufacturers do not care about using silk which gives so much trouble in unravelling. It is therefore worth while to be prepared for the European market and for the future demand of the Indian market. At present the European silk factors should rewind their raw silk before export.

24. What is the cause of the inferiority of the European filature reeled silk of Bengal as compared to the European and Japanese silks? This is a question which we have not answered yet. From recent experiments I have come to the conclusion that the inferiority comes neither from the inferiority of the workmen nor of the machine, but it is to be attributed mainly to the inferiority of the Bengal cocoon. The Bengal cocoons are the worst in the world, and with no machine is it possible to produce out of these cocoons silk of such quality as can be produced out of the *Bombyx mori* cocoons. The reason is not far to seek. The length of the fibre on a Bengal cocoon is about 200 to 250 yards, while that on a *Bombyx mori* cocoon about 800 yards. The silk made out of *Bombyx mori* cocoons (which are the staple of Europe and Japan) must therefore contain about four times as fewer joinings as the silk made out of *Bombyx Cræsi* or *B. fortunatus* cocoons of Bengal. The average length of fibre on a Mysore cocoon is about 300 yards, and the *Bombyx meridionalis* cocoons of Madras therefore produce a little better silk than the silk produced by the same machine in Bengal filatures out of Bengal cocoons.

#### XVI.—INTRODUCTION OF THE *BOMBYX MORI* COCOONS.

25. How to introduce the *Bombyx mori* cocoons into India is therefore the problem before us. I have worked the *Bombyx*

*mori* cocoons successfully for a number of years in Bengal, and it has been worked in Kashmir and Assam with success also. The difficulty with regard to the rearing of this class of cocoons is in the matter of conservation of seed or eggs. The eggs require a period of intense dry cold, and they must be protected from hot winds at other times. In every part of India the *B. mori* worms can be reared (and in many parts they have been reared), successfully at some time or other from February to June. But the conservation of the eggs from April to next January is possible only in a few places like Kashmir, Dalhousie, &c., where in winter the cold is severe but dry. There is another difficulty with regard to the *B. mori*. The epidemic called Pebrine must be kept suppressed by annual examination of the seed with a microscope. If railway communication is established between Kashmir and the rest of India, and if Kashmir establishes the "system of grainage" as devised by M. Pasteur, she can supply the rest of India with seed. This will give one good crop in the year which will make a Rs. 30-per-seer silk. But a separate organization of having a grainage and hibernating station at Dalhousie may be also tried and this was the subject of my paper in last year's Conference at Benares.

#### XVII.—DISEASES OF SILKWORMS.

26. The greatest obstacle to sericulture is the prevalence of certain diseases among silkworms. In Bengal, Pebrine (Fig. 23),

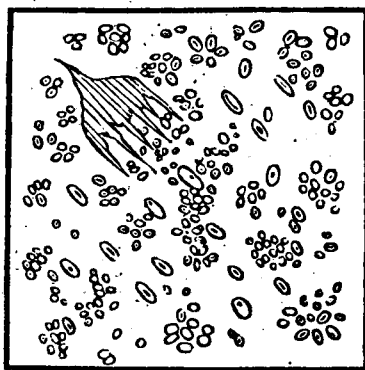


FIG. 23.—MICROSCOPIC APPEARANCE OF PEBRINE (X600).

Muscardine (Fig. 24), Grasserie, and the fly-pest (*Tricolyga bombycis*) do the greatest amount of damage; while other diseases, such as Flacherie, Court, Gatine and the *Dermestes vulpinus* also do some amount of harm. In Mysore Flacherie (Fig. 25) does the most harm, while other diseases are scarcely known.

27. Pebrine (Bengali *kata*) is caused by a microscopic organism which, when magnified 600 diameters, looks like grains of mung seed. It is a slow-acting disease, taking 30 days for complete development, so that

when the seed is badly pebrinized, the worms die off at the last stage, all of a sudden. If rearing is completed in less than 30 days, pebrinized worms spin cocoons, though these are poor. When the seed is not very badly pebrinized, some worms, i.e., those produced from pebrinized eggs, die off on the 30th day, while others which catch the infection from the pebrinized worms, die later on, or make cocoons and come out as moths, which show pebrine corpuscles, and then die. Some worms from eggs free from pebrine happen to escape infection. These spin cocoons, come out as moths, and show no pebrine corpuscles. The eggs from these moths are safe to rear from. Each moth is made to lay eggs under a separate cover, on

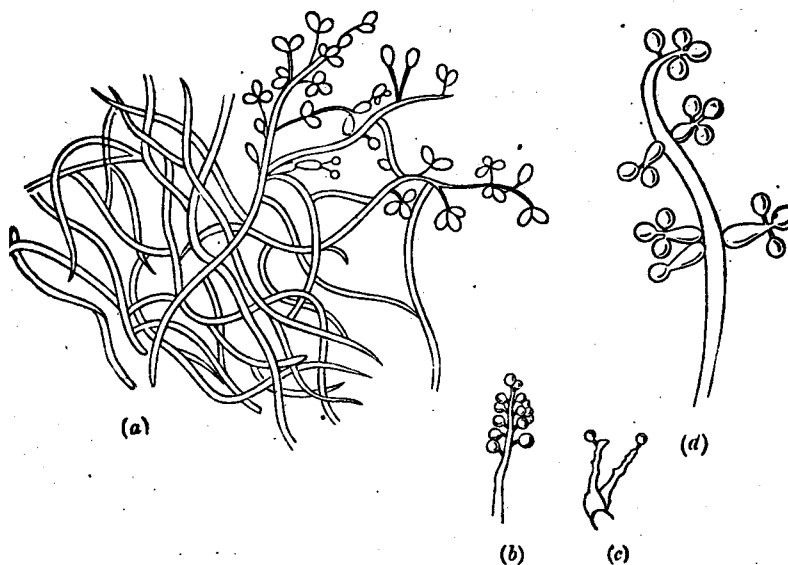


FIG. 24.—MICROSCOPIC APPEARANCE OF MUSCARDINE.

(a) Hyphae with spores ; (b) End of an old branch which is producing spores by abjunction and is thickly covered with spores, the youngest of which are terminal ; (c) two sporogenous branches from which all the spores have fallen except the youngest and uppermost (enlarged 500 diameters) ; (d) young sporiferous hypha (enlarged 700 diameters).

sheets of paper, and after at least five days, each is examined under a microscope. The eggs of those moths, the blood of which show no pebrine corpuscles, are retained, the rest being burnt. The eggs selected out are then superficially



purified from diseases, by a dip in a sulphate of copper bath (1% solution), hung up in a cool but airy place to get dry, and then taken inside a rearing room, which with its rearing appliances has been already disinfected (Fig. 26) with sulphate of copper wash and sulphur fumes. The rearing from eggs thus selected and in room thus disinfected cannot fall from pebrine.

Where rearing takes place once a year, disinfection of appliances is not necessary for protecting the worms against pebrine alone, provided the seed itself is selected. The germ of pebrine loses its vitality in seven months, and local infection thus dies out before the next annual crop is taken. Natural freedom



FIG. 25.—MICROBES OF FLACHERIE.

from pebrine is more desirable than freedom secured by microscopic selection. Thus, the *Bombyx meridionalis* silkworm of Mysore is naturally free from pebrine, and microscopic selection is not necessary in rearing, and this variety is giving good result in Bengal. A lot of seed selected out free from pebrine always tends again to get more and more pebrinized from 1 to 5%, from 5 to 20%, and from 20 to 50%, and so on, until in a few generations every moth again is found to be pebrinized. In this case, therefore, microscopic selection is needed at every generation to secure exemption from pebrine. Five per cent. of pebrine in the seed does not affect the result, but 20, 30

or 50% of pebrine left without selection, spoils the result more or less, though even with 80 or 90% of pebrine in the seed, a sort of a crop is obtained in the hot weather, the pebrine not getting time to develop so fully as to kill the worms. It only weakens the worms, so that they either make poor cocoons, or succumb to other diseases. A pebrinized lot of worms thus falls an easier victim to *Flacherie*, *Muscardino*, *Grasserie* and *Court*, than a lot of worms which is free from pebrine. It is essential to have a number of nurseries in each silk-district in Bengal, where the system of microscopic selection will be rigorously followed and the cocoons obtained from selected eggs sold for seed-purpose, or where a stock naturally free from pebrine is reared. The few nurseries that have been established by cocoon-rearers in Bengal are doing very good work.

28. *Muscardino* is another epidemic of the silkworm which is due to a higher fungus, quite visible to the naked eye in its fully developed form when it partakes of the nature of a white mould on the bodies of dead worms. The worms which have this mould get like sticks of lime, hence the Bengali name *Chunakati*. This epidemic is also readily controlled by disinfection of eggs and all the appliances used, and rearing the worms in a clean manner. If through neglect of disinfection of the rearing house and the appliances, of the eggs at the commencement, or by the neglect of delitage, *Muscardino* does break out, it can be stopped, by cleaning the worms with nets, keeping the worms fasting for a few hours and by burning sulphur afterwards in the room thoroughly shutting it up. The cleaning will have to be done daily after this and a little sulphur burnt after the room has been smeared with sulphate of copper solution. Many a rearing was saved from *Muscardino* in connection with the experiments with which I was entrusted for ten years.



FIG. 26.—USE OF ECLAIR VAPORISER FOR DISINFECTION.

29. *Flacherie* is an epidemic caused by the fermentation of mulberry leaf inside the stomach of silkworms. Such fermentation may be caused by various microbes, but the microbe which is mainly instrumental in setting up the gastric fermentation is the *Bacillus Megaterium bombycis*. The disease is known in Bengal as *Kalsira* because the dorsal vessel of the worm gets

black. Putrefaction, however, sets in very rapidly and the whole worm gets black and putrid soon after death. This disease is so common in Mysore, because there the custom prevails of feeding the worms 7 to 9 times a day instead of 3 or 4 times. The organism may be either in the spoilt, dusty or heated mulberry leaf, or in the intestine of the silkworm. Weak worms have greater proclivity to take the epidemic, so that a feed of the same lot of mulberry may give Flacherie to one rearing and none to another. The state of the rearing room also has considerable effect on the disease. A stuffy, close room would give Flacherie to silkworms, while a well-ventilated room gives comparative immunity. Dust, specially dust raised at delitage, aggravates the epidemic. The remedies are: (1) disinfection of eggs, rearing house and appliances with sulphate of copper solution. (2) Feeding of the worms not more than five times during the early stages and not more than four times a day during the last stage. (3) Using of fresh unfermented leaf, without dust, without dew or other moisture, and of leaf that has not been submerged under water or otherwise got under the control of microbes in the field while growing. (4) Keeping the rearing room well ventilated. (5) Cleaning the worms daily and yet raising no dust, by taking the trays out for dusting, and keeping the floor instead of sweeping it.

30. *Gatine* (Bengali *Salpha*) is a form of indigestion which is caused by excess of heat or excess of cold, which takes away the appetite of the worms, and though they are given leaf, they do not eat, or eat only occasionally. The worms look elongated and white. In pebrine also the worms look pale, but they look short and not elongated. The ultimate form which *Gatine* takes is the same as in the case of Flacherie. They become black and putrid. *Gatine*, however, is not so fatal, and it does not spread so rapidly as Flacherie; and if the worms are removed from the cold place, or if by *punkha* or other means heat can be lessened, the worms recommence eating and the epidemic is arrested. It is best to avoid rearing in April or May, and in December and January, when the temperature cannot be controlled, and rearing in open places, where the temperature varies very much.

31. *Grasserie* (Bengali *Rasá*) is a disease which is not associated with any microbe. It is caused by a sudden change in the character of food from a less sappy to a more sappy condition. Worms ought to be given stronger and stronger leaf as they get older and older; but if owing to a heavy shower of rain following protracted drought, or change of field, the consistency of leaf changes into a more sappy condition, *Grasserie* at once breaks out.

The remedy is to use leaf gathered from trees and eschew the use of shrub leaf as much as possible. The recommendation to grow large mulberry trees is very important for this among other reasons. In Europe and in Kashmir where leaf from trees is used, Grasserie is never known in the epidemic form, while in Bengal more loss takes place from Grasserie than from Flacherie. In fact, Grasserie is looked upon by the French peasant as an auspicious sign, as an indication of a full harvest.

32. *Court*, called in Bengali *Láli*, *Ráangi* or *Kurkutte*, is more an abnormality than a disease. A worm affected with *Court*, turns into chrysalis without making a cocoon or making a very flimsy one. The chrysalis turns into a moth which may lay eggs, and examined under the microscope, it may not show any disease. But the reproduction from such seed gives *Court* in a more exaggerated form in the next generation, and it is, therefore, an abnormality that must be avoided. If worms are fed on *naicha* leaf, that is, on leaf from a new plantation, or from shady places, or given an insufficient supply of leaf at the last stage, this abnormality is noticed, and it is further hereditary.

33. Double-cocoon (Beng. *Genthe-koa*) or two worms jointly forming one cocoon, is an abnormality which is not very common in Bengal, but it is very common in Japan and China, and fairly common in Europe. The tendency is hereditary, and as double cocoons cannot be reeled, they are often fraudulently used for obtaining seed for sale. The use of such seed has resulted in breeds that show the abnormal tendency to an exaggerated degree. In Bengal, cocoons being always bought for seed, there is no fear of this abnormality assuming alarming proportions.

34. The fly-pest does very great harm to the silk crop in Bengal. The *Tricolyya bombycis* which is a tachinid fly, lays its eggs only on silkworms. The eggs hatch into maggots which penetrate into the body of silkworms, and in time kill the silkworms either before or after they have made cocoons. If a silkworm dies after making its cocoon, instead of a moth, a number of maggots of the fly come out of the cocoon. These infest the rearing room, and it becomes impossible to rear silkworms at the next generation. That is why Bengal rearers give up rearing every other generation, and every time go to some distant place for seed. With the seed-cocoons, however, a few maggots of the parasite always come into the village, and some damage is always done. The remedies are: (1) For all the villagers to seed their cocoons in the distant village where they go to buy them, and bring home only eggs. (2) Never to allow any villager to take two crops in succession, but to make all to stick to the three or four regular crops. (3) If these precautions are impossible to

adopt and if the fly must be dealt with, the rearing room must be built in a special manner, the windows away from the entrance being fitted up with wire gauze, and outside the windows vessels of water with a few drops of kerosine oil to each being kept at a height of 5 or 6 feet from the ground, while before the entrance, which should be kept shut in daytime as much as possible, cow-dung fire should be always kept, which should evolve smoke. This has the result of the parasitic fly avoiding the entrance, congregating outside the windows and rushing every now and again into the troughs of water and drowning themselves, believing them to be entrances to the rearing room. In Fig. 27 a parasitic fly is shown ready to drown itself in a trough of water outside a ventilator or fly-trap.

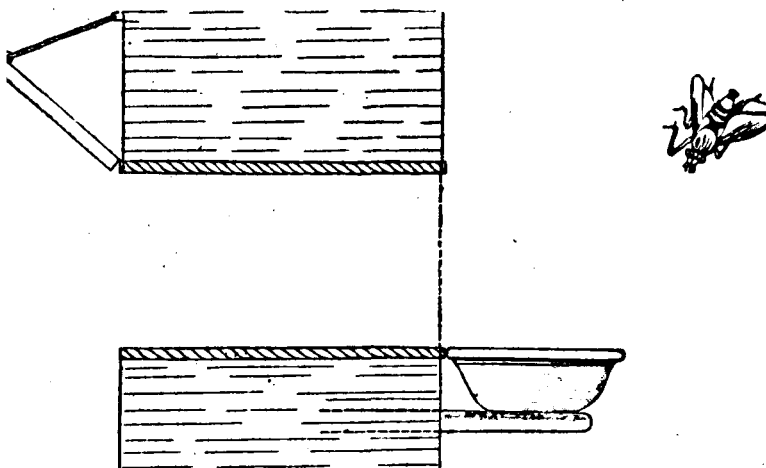


FIG. 27.—FLY-TRAP.

35. The *Dermestes vulpinus* is a beetle which eats up silkworms, chrysalids and moths, both in the larval and imago stages. These also come with the seed-cocoons. They also harbour in cocoon godowns. If seeding is done outside rearing rooms, and if the rearing rooms and appliances are kept scrupulously clean, there is no fear of loss in an epidemic form from this pest. Once only has the author seen the *Dermestes* ruining the rearings in a few villages near Berhampore.

## XVIII.—REARING AND SPINNING ERI SILKWORM.

36. The Eri silkworm is reared in the same way as other Polyvoltine silkworms of Bengal. The cocoons, however, cannot be reeled, and the method of dealing with the cocoons should therefore be described. The moths should be allowed to escape from the cocoons, and as in reeling mulberry or tussar cocoons, the insects should not be allowed to remain in the cocoons. The rearing and spinning, therefore, of the Eri silkworm involves no killing of animals, and for this reason alone Eri silk-rearing is popular among amateurs in this country. The fibre also is strong, and *Endi* cloth is on this account very popular, and the rearing of the Eri silkworm, though less profitable than that of mulberry or tussar silkworm, is not altogether without advantages. The cocoons, after the moths have escaped from them, are boiled with ashes or better still with lye, as in the case of tussar cocoons, and when cool, well kneaded in the warm lye, and then washed by constant kneading in clean water, wrung out and dried in the sun and spun with a spindle (Fig. 28) or a wheel at leisure. Eri rearing and spinning must remain for years to come a cottage industry. But Eri cocoons are carded and combed and spun like cotton or

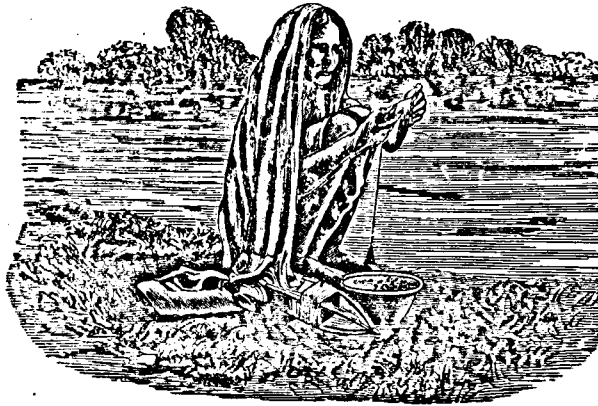


FIG. 28.—SPINNING OF PIERCED COCOONS.

wool in European mills, and when the industry is established on a large scale anywhere, a *carderie* on European principles may be established.

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## Sugar Industry in India.

BY H. VENCOPA RAO, Esq.,

*Sea Customs Office, Madras.*

IN a paper read by me before the South Indian Association, Madras, in August last on the "Problems of Sugar Industry", the full text of which appeared in the September of the *Indian Review*, I discussed at some length the chief problems that engaged the attention of the cane-growers and cane-sugar manufacturers all over the world, with special reference to the condition of sugar industry in this country. I do not think it necessary to repeat here what has been said by me there but would mention in this paper only the chief points of my previous paper. The most prominent defects noticed by me in the Indian sugar industry are (1) the sporadic cultivation of canes in small plots of land, (2) the waste that occurs in consequence of defective crushing in primitive mills, (3) the manufacture of raw sugar in the form of jaggery or *gur*, (4) the difficulty of transport of canes to the factory and sugar to the market, and (5) the absence of demand from foreign countries for Indian raw sugar. I drew the attention of all those interested in the sugar industry in India to the increasing demand for refined sugar and the inability of the manufacturers in India to meet that demand. It was pointed out by me that cheapness was the sole recommendation in favour of foreign beet sugar. The remedies suggested were (1) the application to cane of the very same methods as are adopted for the manufacture of sugar from beet on the Continent of Europe, (2) the establishment of central factories on the coast with a view to develop the export trade in sugar, (3) the extension of cane cultivation in the deltaic tracts of such rivers as the Cauveri, the

Tambraparni, the Kistna, the Godavari and even the Ganges in close proximity to these central factories, (4) the institution of a sliding scale of prices in regard to canes delivered on sale into the factories, (5) the arrangement with the Railway companies for a reduction of fare in respect of canes brought to the factories for sale and of sugar transported to the market for consumption, (6) the utilization of the labour of returned emigrants in cane cultivation. Not being immediately connected with the sugar industry in any way, I had doubts as to whether I had rightly diagnosed the causes of the depression of the Indian sugar industry and had suggested appropriate remedies. I expected that those actually engaged in the industry in India would seize the opportunity to come forward and mention their troubles and difficulties. My object in choosing this subject for my paper, although I am not qualified to express an opinion, was to invite expert opinion and to draw public attention to the rapid ruin which is overtaking an industry which has existed in this country from time immemorial and which is the mainstay of the people and of the state. Another industry which had its birth in India ages ago and flourished as an important item in the export trade of the country has almost ceased to exist owing to German competition. I refer to indigo. The large patches of blue which represented indigo cultivation in the Statistical Atlas of India are left blank now. The huge foreign capital thrown into the industry in Bengal has become a waste and returns no profit now. The foreign capitalists are now thinking whether they cannot grow some other crop in its place. German *savants* appear to me to be the Viswamithras of the Kali age well versed in the art of duplicating nature. Their ire seems to be particularly directed against us just as Viswamithra's was directed against Vasishtha. They invented artificial indigo to suppress the natural indigo of our land. They invented aniline and alizarine colours to suppress our lac dye and other natural colours. The inventor of the artificial sugar *saccharine* from



coal tar naphtha is an Americo-German chemist named Fahlberg. The sugar is said to be 230 times as sweet as cane sugar. Although this sugar is employed in sweetening jellies, puddings and beverages in other lands and patronized by diabetics in this land of whom the number is increasing, it is an antiseptic but no food which the natural product is. But all the same the German scientific skill has been able to put upon the world's market at very cheap prices a natural sugar which has become a formidable rival to cane sugar. The shining white beet sugar crystals have ingratiated themselves into the favour of our *Halvais* and confectioners. The northern provinces of India are patronizing German and Austro-Hungarian granulated sugar in increasing quantities. The absence of response to my appeal in this country looks ominous. I once suspected whether the soul has flickered away from the heart of Indian industry. But the much needed galvanic current comes from a distance to revive and inspirit the Indian industry. *Tropical Life*, a journal published in England and devoted to the interests of tropical products such as sugarcane, cocoa, cotton, coffee, &c, in reviewing my paper on sugar industry heads its leading article with the significant title "Sugar Industry in India—Improved Machinery Badly Needed." Probably that is the impression which my paper created in the minds of people abroad competent to express an opinion in the matter. But I would wish very much to get an expression of Indian opinion as to whether I represented the case of the Indian sugar manufacturer correctly. But it is very distressing to find that it is very difficult to make him articulate, and this will be the primary function of the Industrial Conference. The drawbacks of the industry can be learnt only from those engaged in it. Will the Indian Industrial Conference bring about a special conference of sugar-cane growers and sugar manufacturers in India at some centre where sugar manufacture is carried on on a large scale? I would prefer Allahabad. Without the co-operation of those engaged in the industry no attempt at their improvement will succeed. The foreigners who have

thrown some capital in the sugar industry in this land are not very well off and labour under very great difficulties in making both ends meet but they are extremely reticent in disclosing their difficulties.

The future of cane sugar industry in this country does not, however, look so hopeless. On my presentment of the case of Indian sugar industry the writer in the *Tropical Life* observes as follows:—"This tends to show that if properly exploited by capitalists and sugar-machinery engineers, a great deal more money could be derived from this industry than is the case at present. Out of the world's total production of 8.34 million tons of cane sugar, India, even by means of her primitive methods, produces 3 million tons or 39 per cent. Given modern machinery, she could easily produce half as much again, if not more, without extending the area under cultivation, whilst cost per pound for manufacturing should be greatly reduced." The same paper quotes in this connection from Mr. Nursey's lecture before the Society of Engineers to show that with maceration and triple crushing, from 81 to 85 per cent. of juice can be obtained from the canes. Another quotation is made from the *Louisiana Planter* to show that with the 12 roller mill 96 per cent. of juice could be obtained whilst if very heavy maceration or saturation of the last bagasse with water is used even a greater percentage than 96 can be secured. "It can therefore be seen", says the writer in the *Tropical Life*, "what a tremendous margin of profit is thrown away every year, when 3 million tons of jaggery are turned out on a 50 to 60 per cent. of juice. If 75 per cent. or 85 per cent. is obtainable, at least another one million tons of sugar could be made" This is the strongest argument ever adduced in favour of employing heavy crushing machinery in the Indian sugar industry. Mr. George Osborne, writing in the *Louisiana Planter*, states that in Hawaii the demand for a high percentage extraction tends to require the 12-roller mill and the vacuum centralizator system in all the large mills of the islands and

that there seems to be no question of the advantage of the 12 roller mill where a large amount of work has to be done." What huge efforts are made in procuring labour and securing facilities for the export of sugar in other lands can be gathered from the fact that Hawaii planters subscribed among themselves 300,000 dollars to cover the expenses of transporting 1,000 or more Portuguese agricultural families from the Azores to work on the sugar estates. Each family will be given an acre of land with a suitable house for abode. The Hawaiian Commercial and Sugar Company which owns the largest cane sugar plantation in the world is credited with the intention of making the village of Kahulni in Mani into a large sea port town. A large harbour is to be constructed and the entire sugar crop of Mani will eventually pass through it. Railway facilities from all parts of the island will be provided. An opinion is gaining ground in some quarters in this country that sugar industry can be put upon a profitable basis with the help of simple and cheap machinery although experience in other countries points to a different conclusion. It has been seen what efforts the small island of Hawaii is putting forth in order to place its sugar industry on a better footing. In Antigua where a central factory was established only recently, the Central Factory Company appears to have realized a net surplus of £3,956-9s. 8d. for the year 1905. During the past few years, the establishment of central factories has gone apace and every imaginable quarter of the globe where sugar cane is grown is ambitious of establishing a central factory. India alone believes in the efficacy of the old methods of crushing canes in small wooden mills, in the profitableness of manufacturing white sugar from jaggery and in the adequacy of home trade for the improvement of its sugar industry. It is wrong to suppose that India is differently circumstanced from other countries. Agricultural conditions in India may differ from those of the colonies and probably some of the colonial methods of obtaining canes for the factory may not be suitable for

India. But the method of manufacture of sugar in central factories is the same all over the world, and we in India have simply to copy those methods and manufacture such sugars, both raw and refined, as are marketable in any part of the world. The Government is experimenting with the several varieties of canes with a view to find out the most suitable variety for Indian conditions. It is for the Indian capitalists and others interested in the promotion of Indian industries to investigate where to establish factories, how to secure lands for planting canes and how to mass labour thereon. The probable market for Indian sugar should be likewise investigated. We are better off than the Colonial manufacturers in two respects. We have got at our very doors very cheap labour for which the Colonials are paying heavily. We have an extensive home market which is expanding but which is being exploited not by us but by Germans and Austrians. The whole country should first be mapped out showing the Zones of activity of foreign and native sugar, the prices of the respective sugars at several stations in these Zones. The present areas of cane cultivation and other areas which possess facilities for cane cultivation should be similarly mapped out. So also the most convenient places for the establishment of big factories by virtue of their having canal, railway, river or sea communications with the other parts of the country or the outside world. It will be a wonder to many why capital and enterprise in India should fight so shy of sugar industry when it has so quickly and unreservedly taken up cotton and jute industries on a large scale, employing the most modern machinery in manufacture and exploits the distant markets. The reason is not that raw material for the cotton and jute industries can be had in more plentiful abundance in the country than for the sugar industry. The average annual estimated production of cotton and jute in India is about 480,000, and 950,000 tons respectively in round figures while that of raw cane sugar is three million tons. This last estimate is only on a 50 to 60 per cent. basis, but if 96 per

cent. could be extracted by means of modern appliances the figure would mount up to 5 million tons at least, without increasing the present acreage of cultivation even by a single acre. If larger markets outside for Indian sugar could be secured, in view of the Government providing for more irrigational facilities another million acres will come under the plough producing in all about 7 or 8 million tons of cane sugar or nearly one and a half times of the quantity which the whole world except India now produces. The only reason that occurs to me is the difficulty of concentration at the factories of a large quantity of canes representing 3 million tons of raw sugar and passing the whole quantity through the mills within a short cane season of 3 or 4 months. Cane has to pass through the mills within 24 hours of cutting and cannot be stored up and worked leisurely like cotton and jute. It is a fact well known that sugar factories, however big they may be, have to be idle for a greater part of the year. Another reason is that according to one great authority who speaks from recorded results, sugar production runs in a four-yearly cycle. In one year, the crop will be very large, and the demand of the country considerably over-supplied; there is consequently a very heavy fall in prices. In the second year there will be a fair crop, as, although no new cane will have been planted there will be a large return from re-growth of last year's ratoons. Internal prices may somewhat improve, but on the whole, they will not prove remunerative. In the third year there will be a small crop, perhaps barely sufficient for internal consumption. Prices will then improve greatly, and in consequence, the planter will again begin to plant on a large scale, so that, in the fourth year, there will be a return once more to a large crop and low prices. This was written of Brazil but the conditions of sugar industry in that country are so similar to those in India that those remarks may equally apply to the latter country. The sugar industry in that country is said to be heavily handicapped by excessive taxation, deficient means of transport, lack of capi-

tal, high rates of interest and heavy railway freights. Some at least of these features may be found in India. As regards railway freights, the *Tropical Life* commenting upon my paper observes as follows :—

At present the cost of railway carriage either to convey the sugar to the consuming centres, or to transport the coal and machinery to the sugar factory, is a serious drawback in the development of the industry, and handicaps the sale of the sugar in competition with the imported article. With a little organisation in the bulking of freightage, this difficulty could easily be overcome, as it is in Europe with vegetables, poultry, etc., produced in very small lots, but brought to a common centre, and despatched in train loads at a time. Even in England, which is not always up-to-date in these matters, when the fruit trains are being despatched, we are told the produce is brought to the station in vehicles of every description, "from a heavy dray to a sugar-box on wheels." If this can be done in Europe with such crops, it should surely be possible to do it in India with an article like sugar, produced in fairly large quantities.

This is a big subject requiring patient investigation with reference to the special conditions of this country and I do not like to dogmatise from a knowledge of the conditions of manufacture in other countries. But one thing I can say. If we wish to improve our sugar industry, we must have an eye to the export trade in raw sugar at least. If that is granted then the raw sugar that we produce must be of the same form and of the same standard as those produced in the colonies, otherwise it is impossible to secure markets for them in Europe and America. Such sugar can be produced in big factories alone. To run big factories, there should be plentiful supply of canes near at hand. To secure it, for the present at least, the plantations should be owned by the factories or they should be under the effective control and direction of factory owners. The plantations should be financed by the factory owners. These methods should be adopted until the agricultural classes learn the advantages of some of the Colonial tenures. It goes without saying that to run the industry on these lines huge capital is required. I do by no means despise cheaper methods which are constantly being advocated for the acceptance of the sugar-cane growing ryots.

They deserve a trial also but nothing should be accepted on authority. When the crash comes the country's progress will be thrown back by several years. At present people are embarking upon enterprises having for their object the improvement of industries in India. Of course, next to cotton, sugar industry merits our immediate attention and we also see some activity in this direction. The promoters require advice and support which no body is in a better position to give than the Indian Industrial Conference whose duty it will be to procure the best advice from unexceptionable sources.

## Development of Indian Sugar Industry Coupled with Agriculture.

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IN some Districts of the Central Provinces and in the dominions of most of the Native States in Central India, there are extensive date forests of wild and luxuriant growth. Speaking generally, the date trees in those parts are taller and stouter than those of Bengal; as they are more numerous in the villages. It is a very remarkable fact, that while the labourers and the cultivating classes in Bengal, particularly those of Jessore, Nadia, Khulna, Faridpur, &c., derive a handsome income by the manufacture of date sugar, crude as well as pure,—by tapping date trees every winter, the Central Provinces and Central India get nothing from their richer possessions of date forests; though with the exception of one very serious matter, the facilities for the production of date sugar in the Central Provinces and in Central India are great. These facilities consist of cheap fuel and cheap labour; besides, the climate of the provinces is exceptionally good. The difficulty mentioned above is the entire ignorance of the people in the date growing tracts of the provinces, how to tap the date trees and to produce sugar from the extracted juice. In some of the Districts in those tracts, there are some classes of people in the date growing villages who follow the Bombay method of tapping the date trees to make *toddy* for the purposes of intoxication under the Excise Rules in force. Like the Pasis of Behar, the date-tree tappers in the Deccan, Central Provinces, and Central India,—known by various names,—Bankaris, Bhandarias, Talvadias &c., have no other occupation than to sell *toddy* and to supply the liquor



to the Abkari contractors of the Excise Department. These tappers are extremely unclean in their habits; and are, speaking generally, inveterate *toddy* drinkers. The tapping processes they know are widely different from and are very much less artistic than those that prevail in Bengal. It has been found by repeated experiments continued for nearly three years, in certain villages in the District of Khandwa in the Central Provinces, that by working side by side, the Bengal tappers, called *gachis* and *sheolies*, produced much better results than their brethren of the Bombay Presidency. It is therefore indispensable that to introduce and to develop the industry of date sugar manufacture in the Central Provinces and in Central India, the first essential condition is to impart the knowledge of the Bengal system of tapping the date trees. The said system has the acknowledged merit of being the least injurious to the date trees, and the most effective mode of extracting the largest quantity of soccharine juice from the trees.

2. It is said that the early Bengali settlers in the Central Provinces and in Central India used to wonder why the poor villagers in those parts did not utilize the date forests and manufacture crude date sugar. The resources of the owners of the *Sindbans*, as the date forests are called, were great for procuring any amount of the Bengal skill over a considerable area of the Province. And yet what it was to prevent the spread of the industry till now? The reason was not far to seek. It was the impression of the people that there was no other use of the date trees than that they yield intoxicating drink only. To the conservative and orthodox minds of the Deccanis of the upper and middle classes, the date trees and their juice have a sort of traditional repugnance which it has been my endeavours within the last eight years to dispel. In 1898, I imported five *gachis* from Jessore to see for myself what quantity and quality of sweet juice could be derived from the date trees in the Central Provinces, what the outturn of *gur* therefrom, and what the people would say as regards the produce. A village near Khandwa was the place of my first experiment in 1898. I found,—

(1) The yield of juice was a little less than the ordinary yield in Bengal. Only the trees standing in the cultivated fields yielded nearly the same quantity as an average Bengal tree does.

(2) The sugar percentage in the juice was much higher than the same in Bengal. That is to say, while 10 to 11 *seers* of *Jeeren Ras* in Bengal produce after boiling one *seer* of *khejoor gur*, seven to eight *seers* of my juice produced the same quantity of *gur*.

Respectable people of the District, both official and unofficial, used at times to visit my little factory in the village. The villagers from all sides used to flock in numbers to see the processes of tapping the trees and boiling the juice. All those classes of people expressed their surprise to me that though they had considered I was engaged in manufacturing a sort of condensed *toddy* or an intoxicating drug, they found that my produce was an exceedingly fine and flavoury *gur*. The taste they said, was somewhat different from that of the ordinary cane *gur* they were accustomed to use. But in points of appearance and formation of crystals, the *gur* produced was declared to be better than the sticky mass of the inspissated cane-*gur* so largely imported in the province. The superior results of the date *gur* I made just noticed above, are due to one fact; namely, the trees growing in the moist soil of Bengal yield more watery juice than those on the dry land of the Central Provinces and Central India.

3. I continued my experiments in another village of the same District (Khandwa) next year, when I sent a quantity of date *gur* for analysis to the Rosa Sugar Refinery of Messrs. Carew and Co in Shajahanpur in the United Provinces. I was glad to read in their report that though my date *gur* was badly made, the sugar percentage therein was very high, being nearly 55 p.c. Contrast with this the ordinary Bengal percentage. Sometime ago I read some official statistics of the date sugar industry in the District of Jessore. It is stated there that the quantity of pure sugar was about 37½ p.c.; while the rest was

treacle. Following the custom of Bengal, I have made Khejoor *gur* cakes, called *patali*, and by pouring the *rab* to cool in earthen pots, produced semi solid mass of sugar crystals mixed with treacle. I have worked the latter in the Centrifugal with success which I can hardly conceive to be possible in Bengal. I sold the separated brown sugar crystals in the local Bazars from Rs 6 and Rs 7 a *maund* (80 lbs). The treacle driven off from the Centrifugal basket is readily saleable for the use of the *gooracco* makers at the rate of Rs 2-8 to Rs 3 per *maund*. I exhibited my date *gur* and date *gur* cake at the Madras Exhibition held in December 1903 and at the previous Calcutta Exhibition. I received from the jurors at both the Exhibitions certificates of merit to say that my article was in no way inferior to what is manufactured in Bengal. I think my article deserved a larger measure of praise with reference to the ordinary sticky *Khejoor gur* of Bengal.

4. While engaged in my works of experiments of manufacturing date *gur* every winter in the villages of the District at Khandwa in Central Provinces, I had an opportunity of being called by the Durbar of the Indore State to begin my operations in a date forest village in the Malwa. The word Malwa means the Territories of His Highness the Maharaja of Indore, a large part of the Gwalior State, the whole of the Jaora State, and the territories of Dewas, Dhar and many other Minor States in Central India. The whole Malwa, for the purposes of sugar industry, may be called a huge forest land of natural, wild, and spontaneous growth of date trees. It comprises also an area of numerous scattered *Adan* fields of good irrigation facilities where sugarcane is now being grown, and where it can be more widely and successfully grown with better methods and in more improved style. A very limited proportion of the irrigated and irrigable fields is now being utilized for sugar cane by the poor and extremely backward village cultivators of the Malwa country. The reasons for this sad state of things I will not stop to enquire and to discuss. But I have not the slightest hesitation to state that there is considerable

room for the expansion of the sugar cane cultivation in the villages of Malwa. Years of scanty rainfall and of famines having depopulated and thinned the villages of the Indore and Gwalior states, the Durbars at Indore and Gwalior have announced their intention to grant concessions and advantages to induce new settlements of tenants from outside. I availed myself of the opportunity afforded; and selected the culturable wastes and the date forest lines in the villages of Morad and Goknia in the Indore District which are at distances of five and 10 miles respectively from Indore. This was in the year 1902. Before starting business, I represented to the Minister of the Indore State, Rai Bahadur Nānak chand, C.I.E., the supreme necessity of importing a set of Bengal tappers to introduce their improved methods in the villages, and applied for the grant of the promised concessions as regards the date trees and the agricultural fields in their vicinity. The Durbar of the Indore State permitted me to take 10 tappers from Bengal at the State expense, and to purchase the requisite tools and plant for the manufacture of date *gur* and sugar. This I did in the winter of 1902-03; and I am glad to say, the results of my operations were declared to be very satisfactory and hopeful for the further expansion of the industry in the State. In order to enable me to continue my business of sugar manufacture in conjunction with agriculture, the Council of Regency of the Indore State granted me the privileges of free use of the date trees for five years from 1904, and reduced rates of the rental of all the available fields in the villages, rising by slow degrees, to the standard assessment rates in the course of the said five years. There are about 8,000 date trees in the two villages named above, besides numberless date plants all along the lines. The trees stand in thick clusters and in well defined rows on the borders of agricultural lands of dry and wet cultivation. But they preponderate chiefly along the banks of the numerous *Nallas* and water courses that exist all over the Malwa country. Roughly speaking, we may fairly assume

that there are about 3,000 to 4,000 date trees within the limits of a single village in the majority of villages in Central India and in the date growing Districts in the Central Provinces: and in every date forest village there are fertile lands to raise all varieties of valuable crops for which Central India and the Central Provinces are famous. Thus there exist unique opportunities for agriculture, and coupled with it, the cognate industry of manufacturing sugar from date as well as cane throughout the length and breadth of Central India. It is, I am sure, hard to find a similar combination of facilities and advantages in any other part of India. It may be here pointed out that the industry of manufacture of sugar only, from date or cane or both, cannot possibly stand alone. It must be coupled with and be made a subsidiary adjunct to agriculture. The sugar-making industry is of the winter season only. The men engaged therein must find employment for the rest of the year and agriculture is undoubtedly the most profitable employment. This is the prevailing and normal condition of things in all the date and cane sugar producing Districts in Bengal. No departure therefrom is possible or advisable.

5. Here it is necessary to draw a tentative scheme of a project for agriculture with the industry of manufacture of sugar from date as well as cane, taking one village in Central India as a unit for consideration, and setting forth, *inter alia*, the following important particulars:—

I—Description of the date jungles of Malwa and of the Central Provinces, their extent, and the number of trees; how the trees are grouped, the nature of the soil on which they grow; rent of the land for agriculture and of the date forest land; and the climatic conditions of the provinces.

II—What are the initial difficulties for tapping the date trees and how they can be met.

III—To show that the only sound way to undertake the business is to start general agricultural farms, where—

- (a) the local crops, such as wheat, grain, opium, cotton, &c., will be grown;
- (b) sugarcane will be largely cultivated; and,
- (c) a large sugar industry, both date and cane, will be undertaken in the winter.

IV—Nature of the date juice of the Central Provinces and Central India as compared with that of Bengal both as to quality and quantity.

V—Available local markets and labour. And,

VI—The resultant profits that can reasonably be expected from the whole business.

To consider the above points serially and in a concrete manner, I will take Morad, the seat of my own farm, as the model, which in many respects it is, to represent the condition of things that exists in thousands of villages in the Central Provinces and Central India. I have there about a dozen plots of land of black sticky *cotton soil*, as the soil of Malwa is ordinarily called, each measuring from about six to 10 *bighas*. I do not speak of similar fields that belong to the other tenants of the village. On all sides of most of these fields there are clusters of grown-up and growing date trees, in straight lines, and at convenient workable distances of from six to nine feet apart from one another. It would appear as if they have been planted with a design to enable the cultivators to follow agriculture for the whole year, and to avail of the slack agricultural season of winter to make date sugar. To facilitate irrigation there are about a dozen good wells of which four are mine. The level of water in the wells ranges from eight to 20 feet below the surface of land; so that lifting water by the country *Mote* or pump is a tolerably easy and inexpensive work. Over the area of about one acre of land on all sides of the well you can, as I have been doing, raise wheat, opium, potatoes, onions, brinjals, cane, &c.,—reserving the remainder of your farm for the rain crops, *i.e.* jowari, bajri, cotton and pulses. Around each of my fields of wet and dry cultivation, there are, on an average, about

400 date trees sufficient to engage two *tappers* and two *khedis* to assist them. These *khedis* acquire the skill in about two or three seasons. The nature of the land of the date tree lines is the same as that of the adjoining fields, that is, culturable and fertile. But the clustering date trees, young and old, render ploughing hard. It needs hoeing-up by hand, and weeding in the rainy season to foster the growth of the date trees, and to increase their yield of juice. Besides the date trees guarding, as it were, the borders of tenant holdings, wide and thick date forest lines run along the natural water courses, which traversing village after village, present the sight of interminable avenues of date trees which are yet untouched by human hand. I have got all my date trees in Morad rent free for five years, as said above. They are about 6,000 in number. But the average rent charge of all kinds of forest land in the villages of the Native States in Central India is very low. It ranges from four annas to eight annas per *bigha*. In the date-forests, that means an insignificant trifle for about 200 or 250 date trees that certainly stand over one *bigha* of land. Public health in the whole Malwa country and of the Central Provinces is almost uniformly good.

6. Regarding the initial difficulty of lack of trained men locally the farmer must for the first two years import about five Bengal tappers and associate with them his local labourers to work as *khedis* or their assistants. My own experience is that the cost of one skilled Jessore tapper for one season, including his railway fare for the forward and backward journeys, and his wages at the rate of Rs. 15 per month, is about Rs. 100. Thus for five men for two consecutive seasons, an outlay of Rs. 1,000 for importing the Bengali's knowledge of tapping is a part of the necessary sinking capital. One *khedi* for each Bengal *gachi* will not cost more than Rs. 25 for the five months of the tapping season. Rupees 25 per month for the five local *khedis* or Rs. 125 for the season, being added to the cost of five Bengal tappers, the total cost of labour would be about Rs. 625. To this would be added the expenses for pots.

ropes, pans, and fuel which would not be less than Rs. 75 in all. I will provide Rs. 100 more to meet all possible contingencies and unforeseen charges. Against this initial cost or debit of Rs. 800 for the first starting year, no one should expect that his produce of *gur* would bring to him an equal credit amount. As a certain amount of labour would be wasted in clearing the date trees, the five *sheolies* and their *khedis* would not be able to operate on the prescribed number of date trees which is at the rate of about 200 trees for one tapper and *khedi*. In the first year only about half the number of the trees would be tapped: and even those trees would not, on their first tapping, yield the proper quantity of juice. Like milch cows, date trees are in need of being annually tapped to bring them, so to speak, to their sap-bearing condition. So, as I have personally seen, the aforesaid batch of workers would not turn out at the rate of more than eight annas worth of *gur* from each tree. That is to say, the first year's income from date *gur* would be only about Rs. 250 for an expenditure of Rs. 800, as said above. In the second year, while the expenditure would nearly be the same, the income would slightly increase, because about 200 or 300 more trees would be reclaimed from the wilderness and utilized for the purpose of the industry. But from the third year, the costly item of Bengal labour would be, as it certainly should be, dispensed with and then the farmer scores out the sum of Rs. 500 from the debit side of his budget of date sugar expenses. But by this time, his local *khedis* will have become skilled workmen; and for this additional accomplishment they would charge Rs. 10 a month for the five months of the tapping season. Thus in successive years, the nestling *khedis* grow to become full-fledged *gachis*, batch after batch, till it becomes possible to sieze all the circles of the date trees that stand within the limits of the farm. Later on, I will set out the prospects of gain, taking agriculture and sugar manufacture from date and cane within the compass of the village industries under consideration, *manned solely by the local agencies.*



7. Reverting again to our model village, Morad, we have to arrange for the cultivation of our fields, grow all the usual crops thereon, reserving every year certain areas near the wells for the cultivation of sugar cane. But in Morad or elsewhere, in any village of any district in Central India or in the Central Provinces it is neither possible nor desirable to secure all the irrigation wells and all the available agricultural lands for the exclusive use or home farm of a single person or of a group of men working jointly. It should be the constant aim of the enterprising farmer to foster and to improve the agriculture of the village, retaining for himself a certain number of demonstration plots to raise sugar cane and other crops in improved style, making advances to the poor tenants to grow sugar cane as largely as possible, and training his own other labourers of the village how to tap the date trees and extract the sweet juice. At the rate, say, of 200 trees for a tapper, it will never be possible to entertain 30 or 40 labourers for working in the fields of a single village-farmer. You cannot possibly expect to supplant the old resident cultivators in the villages and appropriate all their fields. The wisest and best course for you to follow would be to purchase heaps of cane which you helped others to grow, and to purchase potfuls of date juice drawn from the trees growing on or near others' fields. Give me any amount of sweet juice, of cane or of date, and I shall not delay one moment to set up some kind of improved machinery to produce *gur* or to manufacture sugar in the country. It is not in the power of any single cultivator or of any group of cultivators,—for they hardly know to combine to work for common advantage, to purchase mechanical contrivances of any sort for *gur* or sugar making in improved style. Whether you take the apparatus contrived by Mr. S. M. Hadi, Assistant Director of Agriculture in the United Provinces, which is set down as one of the important items for demonstration at the present Exhibition, as it was last year at Benares; or whether you adopt the "central factory system" which the leading engineering firm

at Calcutta, Messrs Martin & Co., have now taken to introduce in this country to give an impetus to the Indian sugar industry, you must make the poor and illiterate ryots of the country the means to an end; and you must so manage your farm as to make it handy and easily accessible to the neighbouring agriculturists. Mr. A. E. Jordan, the well-known sugar expert and mechanic, has recently joined Messrs. Martin & Co., expressly for the purpose of designing sugar machinery to refine sugar and make sugar in crystals from juice under the "central factory system." Mr. Jordan is said to have designed an apparatus for a more successful crushing of the cane than what obtains in India, and for a better and more scientific process of boiling and treating the juice to secure as much economy and profit, as in the West Indies, Egypt and Mauritius. Mr. Jordan has personal knowledge and experience of the factories of those places which have enabled the people over there to land in this country pure crystal sugar at a cheaper rate than the cost of our country *gur*. The cost of Mr. Jordan's apparatus, made by Messrs. Martin & Co., is likely to be about Rs. 18,000 which will turn out pure white sugar at the rate of nearly two tons a day. That means the daily supply of over two tons of raw cane, or nearly 12 tons of cane juice, or nearly 20 tons of Bengal date juice, or nearly 15½ tons of date juice of the Central Provinces and Central India. How to obtain such a large supply of juice every day throughout the winter season is the most important question connected with the subject of sugar industry in India. The answer is, we must follow the method adopted in other sugar producing countries in the world, as explained elsewhere in this paper. I come before you with full knowledge of the local conditions of the Central Provinces and Central India where I have lived almost the whole of my life, and I know no other Province in India where you have so many facilities to develop and to expand sugar industry with agriculture as in Central India. Therefore, my advice to my countrymen is this:—

1. Go and settle in a date forest village in the Indore, Bagli,

Dewas, Gwalior, or Jaora State. Apply for land for agriculture and you will have as much as you would require or be able to manage. You will, I am sure, be granted free use of date trees for a number of years till you well settle in business.

2. You will find local labourers at the rate of Rs. 60 a year, and bullocks of the excellent Malwa breed at the rate of Rs. 100 a pair. Go on at the same time purchasing Malwa cows and calves at the rates of Rs. 30, Rs. 40, or Rs. 50 per pair. Look after them and tend them properly; and you will have a large stock of cattle for your own use and for the use of other tenants.

3. Retain as much land and cattle, date trees, &c., as you require for the full year's crops including suger-cane, and date juice from your own date trees.

4. Within the limits of your means and resources, advance money, cattle, seed, and improved agricultural implements to the neighbouring cultivators on easy terms of interest, in cash or in kind; and then you will not run the risk of loss. Offer inducements and facilities to the tenants, their labourers, and their children to learn the art of tapping the date trees that appertain to their holdings, and offer to purchase the date juice they would extract, every winter, which, while bringing you profit after being treated in your central sugar factory, will bring to your neighbours a new source of income. Lend money or your well grown sugarcane to extend the cultivation of cane far and wide under the usual conditions of purchase at the current local rate for the time being.

5. All the above you can not do in a day or in the first year of your operations. You will have to make an honest and sincere beginning, at the start, relying on your own means. If you are earnest and steady, and make some progress, you will obtain on easy terms loans from the State concerned, and then you will be able to advance loans yourself in cash or in kind, to other cultivators.

6. Having arrived at this stage of your business, you will

find that, while your own agriculture is in full swing, you have paved the way for the supply of date juice and of sugar-cane suited to the requirements of your central factory. Here you must remember that the ordinary country crusher of the best type or the Behia iron mills extract only about 60 per cent. of the cane juice. So that loss or wastage of 40 per cent. is ruinous for the business of sugar-making. I have heard that the triple crushing system of Mr. Jordan's design secures 90 per cent. extraction of juice, and the crushed cane is readily available as fuel for boiling.

7. For all varieties of your crops, for your manufactured *gur* and sugar, the head-quarters of every Native State,—Indore, Mhow, Neemuch, Gwalior, Bhopal, Jaorah, Rutlam, &c., afford most convenient and ready markets, as grain of every sort sells at rates which are almost uniform all over India. Locally made *gur* sells at the rate of Rs. 5 to Rs. 7 per *maund*, and sugar from Rs. 9 to Rs. 12 per *maund*.

8. I will not enlarge on the subject by stating in detail the prospects in gain of the whole concern of agriculture coupled with the industry of manufacture of sugar from cane and *dâte*. Confining my attention to the business of making *gur* and sugar alone, I will briefly state my own experiences of the last eight years thus:—

(i) One trained tapper with the aid of an assistant can turn out not less than 20 *maunds* of date *gur* in one season from his circle of about 200 date trees. A locally trained tapper in the Central Provinces and Central India is glad to get Rs. 10 a month. His assistant would be happy if he is paid Rs. 6 per month during the winter season. Date *gur* sells in those Provinces at the rate of Rs. 5 per *maund*. The total expense comes to about Rs. 80 for *gur* worth Rs. 100 : leaving a profit of 25 per cent.

(ii) I have raised one *bigha* of sugar cane at an expense of nearly Rs. 100 ; *i.e.*, Rs. 45 for cane cuttings, Rs. 5 for rent, and about Rs. 50 for all other items. For *gur* making or chewing purposes, the cane produced is well worth Rs. 150, bringing 50p.c. profit on the outlay. Well cultivated, one *bigha* would grow

about 12,000 stalks of more than human height of sugar cane. At the rate of one pice for one piece, the whole crop is worth Rs 150 *on the field*. I have seen by detailed calculations and observation that one date tree yields every winter as much juice as can be extracted from about 90 well grown canes. But the difference is that the date trees in the wild forests of Central India are Nature's plantations; whereas the cane fields are the growth of one year's hard labour and expense. In point of saccharine properties, the date juice of the Central Provinces and Central India makes the nearest possible approach to the ordinary cane juice. Hence both kinds of juice can be treated together. The Bengal date juice is nearly half as sweet as the cane juice.

9. In the above paragraph, I have taken a group of 200 date trees and one *bigha* of cane field as the units to indicate the prospects of gain from sugar industry alone in one agricultural farm in the Central Provinces and Central India, of which hundreds can be established if our countrymen wake up and work.

## Indian Sugar Development.

BY A. E. JORDAN, Esq., A. M. I. M. E., F. S. A.

*Messrs. Martin & Co., Calcutta.*

ALTHOUGH the development of the Indian Sugar Industry is a matter of the utmost importance to the country, I have no desire to burden you with a very lengthy paper on the subject. As a matter of fact, I have written so much on the Sugar Industry, during the last two years especially without any appreciable results beyond arousing some interest where before there was none, that I fear, a very lengthy paper would at this time be a burden to myself even, keenly interested as I am in the subject, because it could only be a repetition of what I have written so often.

I will therefore be content, as you no doubt will be also, if I simply state a few facts regarding the backward state of the Sugar Industry in this country and make one or two suggestions for improving it. The Sugar manufactured in this country is derived from two sources, viz: The Sugar Cane and The Palm Tree. The area under Sugar Cane Cultivation is anything from 3 to 5 million acres, and it is most difficult to form an estimate of the outturn of raw sugar, but if we take the cultivation at 3 million acres only, and reckon on an average of 20 tons of cane per acre the output of raw sugar should be something like 6 million tons.

The method of manufacturing this raw sugar as carried out by the cultivators must be known, I am sure, to everyone, and is simply this.

The canes are crushed by country cattle mills, which extract only about 50 per cent. of the juice which is in the cane, and this juice is boiled into "Gur" or "Jaggery" which frequently yields less than 50 per cent. sugar.

You can see some of this raw sugar in the Agricultural Section of the Exhibition. It looks innocent enough in all conscience but it is the manufacture of this very article which is at the bottom of the deplorable backward state of the sugar industry of this country for the following reasons :—

In the first place, through inefficient crushing of the canes, the cultivator does not obtain the profit from his crop which he ought to obtain, and the quality of the raw sugar which turns out by his crude methods of boiling, is in most cases, so poor that is to say, it yields such a low percentage of sugar when refined, that it can only fetch a low price, so the cultivator has absolutely no encouragement to extend his sugar cane cultivation.

In order to make white sugar, this raw sugar must be made into a liquor for filtering, and as the liquor must be decolorised being of a dirty brown colour caused by the method of boiling it, it is absolutely necessary that it be passed through some medium which will decolorise it to make white sugar, and the only medium that will effect this is Animal Char. Burnt bones possess the necessary chemical or mechanical, whichever you like to call it, properties of effecting this decolorisation of the liquid as nothing else does, but I may here state for the benefit of those who imagine that bones and blood are used in the manufacture of sugar, that when refining the raw sugar the liquor simply filters through the animal char, and is not mixed in any way with it, and neither is there any blood used in the manufacture of sugar in this country or in any country exporting sugar to India. The use of animal char too, as regards the white sugar consumed in this country is confined to Indian Refineries only, and simply on account of the manufacture of raw sugar by the people themselves, notwithstanding the fact that they object to the use of animal char although there is no other means of making the raw sugar, white.

The countries exporting sugar to India do not make raw sugar at all, but manufacture the white sugar straight from the

cane juice and the Beet juice by the sulphurous acid gas process, and without the use of animal char.

The losses incurred in the refining of raw sugar are enormous as in order to keep the refinery working throughout the year the raw material has to be stored, deterioration takes place, and on refining, frequently considerably over 50 per cent comes out as uncrystallisable or grape sugar, what is commonly known as Molasses.

It is this Molasses, which when converted into spirit, brings to the Government such a large annual revenue, and I believe it to be the case that the Madras Government, on the one hand does everything in its power to extend the cultivation of the sugarcane by establishing experimental farms and pumping plants for irrigation, while on the other hand, unknowingly, it encourages the conversion of the sugar into spirit by paying higher rates for the spirit made from raw sugar only, than for the spirit which is made from molasses only.

The Member of Council who asked the question "Will the Government state what steps are being taken to check the alarming increase in the consumption of intoxicants in Bengal as shewn in the Report of the Commissioner of Excise for 1905-06" at the meeting of the Bengal Legislative Council on the 15th instant, might now know of a way to check the consumption of intoxicants viz., by encouraging sugar manufacture instead.

In the Madras Presidency there are proprietors of sugar Refineries who make the manufacture of spirit to fulfil the Government contracts their chief business and purchase Jaggery for the sole purpose of converting it into spirit, notwithstanding the fact that sugar is much more valuable in its proper form than when converted into material for the fermenting house (I do not refer to the East India Distilleries which use for the refuse Molasses). One of those proprietors has a refinery which has been closed for the past three years and he was quite unaware of the fact that sugar could be made



straight for the cause which grow in abundance round his concern until I told him so.

He nevertheless still lacks confidence through past failures and instead of purchasing the necessary cane crushing and juice evaporating plant himself, he is looking out for some one else to do so.

There are thousands of people, both Europeans and Indians of the same wrong opinion, that before white sugar can be made, raw sugar has first to be made, and unfortunately the Agricultural Departments have been of the same wrong opinion. The Agricultural Department of the United Provinces however have recently been making some experiments in making sugar direct from the juice, but while the apparatus used by Mr. Hadi, which consists simply of several pans placed over a fire, the most important feature being the treatment of the juice with "dhaula" stalks and "kita" or soapnut for clarifying and bleaching, is useful enough for demonstration purposes, this method will have to be considerably improved to make sugar manufacture commercially successful which of course is necessary before any development can take place and this can only be done as has already been found in other countries by employing steam plant.

The United Provinces Agricultural Department have evidently recognised this also as it demonstrates the driving of the Centrifugal Machines by a steam engine, and it would have been to great advantage as Mr. Hadi himself sees, if a steam driven mill had also been obtained to do the work of the numerous cattle mills which are demonstrating in the best way possible how the juice can be left unexpressed from the canes. It follows therefore that if steam is necessary for the Centrifugals and Mills, it is also necessary for economising in fuel consumption and for boiling the juice whereby a higher output and a better quality of sugar is obtained.

It will no doubt be very many years before there are sufficient factories in the country to deal with the cane cultivation, and

raw sugar will continue to be made by many cultivators, but as this raw sugar cannot be made into white sugar without the employment of animal char then it should be converted into a high class yellow sugar instead, which does not require the use of animal char, by using the most up-to-date machinery whereby the maximum amount of sugar and the minimum of molasses will be obtained from it. We must remember also that in dealing with the raw sugar, fuel has to be purchased to work the refinery.

We have been told by the agricultural Chemist to the Mysore Government, in this fifth annual report that it should be the object of the cultivators to turn out a better quality of raw sugar for the refinery by using the centrifugal machine and extracting the molasses, but in making this statement he could not have given the consideration to the subject which it requires.

When the cultivator has once made the raw sugar the enormous losses have occurred, and no subsequent treatment will recover the quantity of sugar left unexpressed from the canes, or the quantity which has been converted into molasses in boiling. Even if put through the Centrifugal Machine, the high quality of raw sugar left in the basket would fetch such a high price, it would find a most profitable market in that state and the Refineries which attempted to purchase and work it, would be obliged to do exactly as they did in the United Kingdom and that is, close, as they could not possibly compete with the imported sugar.

If the refinery, refining the "Gur" has a Distillery attached then it is manufacture of spirit from the molasses which enables it to keep open, and that is exactly what takes place in this country.

In Mysore there is such a concern, while canes of the best variety in the world containing, according to analysis made, as high as 21 per cent. "sucrose" and only a half per cent. "glucose," are grown. The same thing happens in every part of India, the canes are grown, half the sugar is burnt, and a considerable portion is turned into spirit.

Let us see what is done in the countries which dump the sugar into India.

The canes are crushed by powerful triple crushing plants, not one three roller mill, but three roller mills in succession—90 per cent., and even more, of the juice in the cane is expressed, but instead of this juice being boiled into a raw sugar it is made into sugar straight away, over 90 per cent. of the crystallised sugar being obtained by employing the following methods.

The juice as it leaves the Mills is immediately bleached by mixing with sulphurous acid gas, obtained by burning sulphur in a small furnace, and after bleaching, any acidity of the juice is immediately neutralised by the application of lime in the form of milk of lime, in order to prevent as far as possible the formation of "glucose," *i. e.*, molasses, which is caused only by the acidity of the juice.

After liming, the filtering of the juice through cloth bags, the evaporation to a thick liquor, the boiling to grain in the Vacuum Pan, and the spinning of the wet sugar in the Centrifugals, are all carried out by the most up-to-date and economical machinery, and in this way the maximum amount of sugar and the minimum of molasses is turned out by employing the crushed cane only, which goes straight from the Mills to the furnaces, as fuel.

This is white sugar made without animal char filtration which is unnecessary as the cane juice is of a clear opaque colour, quite different to the dirty brown goor liquor.

That is how the cane sugar and Beet sugar imported into this country is made and is the method that must be adopted in India also.

It is useless for the poor cultivator to attempt manufacturing sugar, as he has neither the knowledge nor the money required. What is wanted is co-operation on the joint stock system in order to obtain the necessary capital to purchase the plant. In numerous villages throughout the country where the canes are crushed independently by the cultivators, small steam

plants should be established to deal with from 50 to 100 acres per season at a cost of about Rs. 16,500 without a Vacuum Pan which would cost another Rs. 5,500 say, to which the cultivators would send their canes. They would thus be freed from the cares and anxieties incidental to the manufacture and sale of the product, and they would be able to give more attention to improving the cultivation which would undoubtedly rapidly extend.

The small steam plants to run out from 1 to 2 tons of sugar per day instead of making raw sugar, would make pure white cane sugar, thus avoiding the losses, and the sugar would be of a better quality than the Benares sugar now sold in Calcutta at Rs. 11 per maund of 80 lbs.

These steam plants would be extended also to suit the extension of cultivation and in time there would be large cane sugar Factories where these small ones existed, and probably not a pound of sugar would be imported. From the enquiries which I have received from all parts of the country where the sugar-cane is grown I am as certain that that is what will take place, as I am that this paper is being read to-day.

It may be said that these factories would only work during the cane seasons, well! such is the case in other countries which have to import Indian labour, rice, cattle etc., and have disadvantages such as cyclones and cattle disease to contend against and yet profits are made by sending their product to India. But the cane sugar factory in this country might also be a combination of factory and refinery, making white sugar from the canes grown in its vicinity and yellow crystals from the "Gur" made by the cultivators in outlying districts, and so would be able to work all the year round. The Baroda State Factory which I inspected some time ago was intended to work on these lines, with animal char plant however, but owing to not having the necessary machinery to obtain a high extraction of juice when the price of the canes was high, owing to incompetent management, and the fact that the Jaggery was brought up from the south of India in boats and converted itself into molasses

on the way, although thousands of tons of Palm Tree Jaggery was available at comparatively easy distance, it was a failure, as it could only be. So much for the sugar cane.

The other source of sugar manufacture is the Date or Palmyra Tree already mentioned. There is such a large business done around Calcutta in the former, and in the Tinnevely district of the Madras Presidency in the latter.

Exactly the same thing is done with the juice from these trees when it is collected, as is done with the sugarcane juice. It is boiled to "Gur."

The same remedy as I have suggested with regard to the raw cane sugar should be adopted here also, that is, for the Date Tree good to be made into a high class yellow sugar which does not require the use of animal char in its manufacture. I would mention here however that the sugar turned out by the Calcutta and Madras Refineries, and which is made by employing animal char, finds a ready market in the country and I wonder after all if the objection to animal char is not only an imaginary one.

To manufacture the white sugar direct from the juice as it is collected from the trees a difficulty is met with which does not apply to sugar cane. I mean the difficulty of getting the juice in large quantities to the plant, for while the canes can easily be conveyed by carts, the juice from the trees collected in small pots is not so easily handled. There is one way out of this difficulty however, for in Queensland and elsewhere the juice is sometimes conveyed long distances from the cane crushing mills to the sugar making plant, and an attempt should certainly be made to avoid the enormous losses in sugar by manufacturing from the juice direct.

I would therefore suggest that small steam plants similar to those I have recommended for the sugar cane centres, but without the cane crushing mill where there is no cane cultivation, be established in the centres of the Date Tree Cultivation.

The pots of juice when taken from the trees could be emptied into a tank, and treated immediately with milk of lime

in order to neutralise the acidity thus preventing the fermentation and the consequent formation of molasses.

These tanks of juice containing say 300 gallons each could easily collect the juice from a circle of several thousands of trees, and be conveyed to the plant for manufacturing into white sugar straight away.

The cost of such a plant to turn out  $\frac{1}{4}$  to 1 ton of sugar per day would be about Rs. 6,000, and the sugar would have a value of Rs 6 per maund at any rate.

The question is, who is to do this, for like the cane cultivators, the men who collect the juice have not the knowledge or capital, so it must be done on the Joint Stock System.

We are told in another paper on the subject that there are millions of Date Trees growing wild in Central India, and there are millions of such trees growing wild in the forests of the Nizam's Dominions and other parts of India also of which no use is made, and I am confident that if such small plants were established to manufacture sugar direct from the Sugar Cane and Palm Tree Juice, the Indian Sugar Industry would be revolutionised.

I have often been told that my writings and figures in the various Indian Journals have aroused some interest in the matter and I have been inundated with letters of enquiry from all parts regarding sugar machinery for making white sugar from "Gur" but when I informed my correspondents that animal char was necessary, I heard no more from them.

I understand that in some quarters the Government is blamed for the large annual imports of sugar which have a value of seven crores of rupees but the only blame that can be attached to Government is in not obtaining experts in the manufacture of sugar as well as experts in cultivation, for to my mind, showing how the enormous wastage of sugar in the country could be avoided, and how greater profits could be obtained from the present crops, is of much more importance than showing the cultivators how to grow the cane and convert the sugar into a material only fit for the distillery, for that is

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exactly what the demonstrations of "Gur" manufacture amount to, and what the cultivators know only too well how to do, without being taught.

In the Punjab, and even in Calcutta, the boycotting of imported sugar has taken place, but the boycotting of sugar is only an expression of the people's impotency regarding sugar manufacture, and no amount of boycotting will help the development of Indian Sugar.

If there is any desire to develop what should be the foremost agricultural industry of the country, and to have the indigenous product take the place of the imported one, then sugar must be made as elsewhere, in the most economical manner possible, and without employing any material that will make its consumption obnoxious to the people.

To facilitate the formation of Companies for the purpose of erecting Sugar Factories, I attach to this paper some figures showing what profits may be expected and in view of the profits made by the Cawnpur Sugar Works Limited, I think my figures are extremely moderate.

In conclusion, I would anticipate the question "How are we to work such plants when we have no knowledge of the work?" by saying, that my firm Messrs. Martin & Co., Calcutta, who have now taken up Sugar work in earnest, will be only too glad to give all the necessary expert advice and assistance to any who wish to take up Sugar Manufacture.

*Balance Sheet of a Sugar Factory to turn out 6 tons of Sugar per 24 hours from sugar cane during the cane season, and from raw sugar in the off season, without animal char.*

Factory to deal with 50 tons of Cane (2 acres) in 24 hours=5,000 tons of cane per season of 100 days (200 acres)  
 18" X 30" Two Roller Mill extracts 400 galls. juice per hour=9,600 galls. per day=@1,650 galls. juice per ton  
 of sugar=6 tons of all sugar=600 tons per 100 days.

<i>Cane Season of 100 days:—</i>		Rs.			Rs.
360 tons (60 <sup>o</sup> / <sub>100</sub> ) 1st sugar @ Rs. 6-8 per md.		65,520	5,000 tons cane @ 5 annas per maund	...	43,750
120 " (20 <sup>o</sup> / <sub>100</sub> ) 2nd " @ Rs. 5 "		16,800	1,200 tons Gur @ Rs. 3/8 " "	...	1,17,600
120 " (20 <sup>o</sup> / <sub>100</sub> ) Molasses Gur @ Rs. 2 per md.	...	6,720	Cost of manufacture @ Rs. 20 per ton of produce	...	36,000
600 tons			Fuel for Gur Season	...	12,000
			Depreciation of Buildings and Machinery @ Rs. 10	...	8,000
			Nett Profit	...	26,250
<i>Gur Season of 200 days:—</i>					
600 tons (50 <sup>o</sup> / <sub>100</sub> ) yellow sugar @ Rs. 6 per md.	100,800				
240 " (20 <sup>o</sup> / <sub>100</sub> ) 2nd sugars @ Rs. 5 "	33,600				
360 " (30 <sup>o</sup> / <sub>100</sub> ) Molasses Gur @ Rs. 2 per md.	20,160				
1,200	2,43,600				

Declares 26 <sup>o</sup> / <sub>100</sub> dividend on 1 lakh		Rs.
CAPITAL.—Machinery on spot	...	60,000
Erection of Buildings and Machinery	...	20,000
Working Capital	...	2,0000
		<u>1,00,000</u>



## Indian Essential Oils.

BY DAVID HOOPER, Esq., F. I. C., F. C. S., F. L. S.,

*Industrial Section, Indian Museum.*

IN introducing to the Indian Industrial Conference the subject of perfumes one is struck by the fact that so little has been previously written on the subject. India as an Eastern and tropical country is renowned all the world over for its odoriferous species and perfumed blossoms, the essences of which have been extracted by recondite methods for ages past. The sources, uses and preparation of these ancient drugs is a highly interesting historic study and would be out of place to discuss here. I referred to this aspect of the subject about two years ago in an article on 'The Perfumes of the Moghuls' (*Calcutta Review*, Oct., 1904). On the present occasion it will be my aim to indicate the geographical and botanical sources of the chief commercial essential oils, review the present condition of the trade, and make a few practical suggestions in passing on the future possibilities of the industry.

Essential oils are distinguished by their strong and characteristic odours, and by being evaporated without decomposition and with little or no residue. The composition of essential oils is variable; many like turpentine oil consist of carbon and hydrogen only, others contain oxygen in addition. Their chemical constitution also differs in different cases, the majority being ethereal salts or compound ethers, aldehydes or phenols. Many essential oils consist of hydrocarbons or fluid bodies, mixed with solid oxidised compounds. When the latter are present in considerable amount a portion usually

separates out in a crystalline form. In such cases the solid is often referred to as the *stearoptene* and the liquid is called the *elæoptene*. The essential oils are almost all of vegetable origin and exist in the flowers (as the rose), in the leaves (as the basil), in the rind of fruit (as the orange), and the fruits of the umbelliferæ (as the anise and ajwain).

The extraction of the oils is performed by the following methods, but in India the first only is that in general use.

1. Distillation of plants or parts of plants by boiling with water and condensing the steam. Notwithstanding that nearly all essential oils boil at a higher temperature than water their vapours escape with the vapour of water and collect in the distillate where they separate. Another modification of this method is to employ steam instead of a naked fire, this prevents the caking and burning of the solid matter at the bottom of the still.

2. The process of the sponge and the ecuelle. In the case of fruits of the orange tribe, in which the oil glands are large and numerous, a portion of the essence can be extracted without distillation. For this purpose either a sponge, or a vessel like a cup with sharp points inside, is used for separating the oil from the peel.

3. Expression. In a few cases (orange, lemon, &c.) a part of the essential oil may be obtained by submitting the material to pressure.

4. Maceration in fat. This is to avoid as much as possible the application of heat. The flowers are macerated in vegetable tallow or paraffin, previously melted on a water-bath. The fat, charged with the essence, is afterwards shaken up with alcohol which removes the perfume.

5. Enflourage or absorption is another process having the same object. Here layers of fat on glass frames are covered with flowers, and the flowers changed each day until the fat is sufficiently impregnated with the perfume.

For the purpose of illustrating the trade in Indian essential oils I have prepared a diagram showing the value of

the exports for the past twenty-seven years. In 1879 the exports were valued at Rs. 1,20,439, they rose in 1902-3 to Rs. 7,70,872, and have remained at a high figure since then. On consulting the table it will be seen that there are two serious depressions, one occurring in 1896-97 and the other in 1900-01. It will be remembered that these periods coincided with two disastrous famines which were particularly felt in the Central Provinces, the region of the grass oil industry. The famine of 1896-97 affected the Khandesh district and naturally resulted in short supplies of the oil. In 1899-1900 the famine of the Central Provinces was worse in the Western provinces of Nimar and Betul. In Nimar the death rate reached the melancholy height of 105 per mille. The exceptional drought decimated the plants just at the season of distillation and for some months that year the Bombay dealers received no stocks. This scarcity not only affected the trade in India but also caused great inconvenience in the European markets, the price had to be raised, and the door was opened to smaller dealers to resort to adulteration. The monsoon that burst in July, immediately after the famine, was very heavy, and the young grass suffered in consequence, but in 1901 and 1902 the industry recovered itself as will be shown in the table. In studying the essential oil industry in India where the occupation is chiefly in the open air one has thus to reckon with drought, floods, frost and other adverse climatic conditions which in certain seasons give the trade a 'set-back.'

After these general remarks on the Indian trade as a whole, I propose to refer to the various perfume plants which afford commercial oils and specify a few others which might be rendered to some account as trade articles in the future.

One of the most important essential oils in this country is East Indian geranium or palma rosa oil. It is known in the vernacular as *rusa-ka-tel*, and is referred to in ancient works on perfumes and medicines. The oil is obtained from a grass—*Andropogon Schoenanthus*—or rusa grass, which is widely distributed in India. This grass is abundant in the North-

east of the Bombay presidency, in Malwa, Merwara and Rajputana in Central India, and in the Central Provinces and Berar. The art of distilling the essential oil from the grass was probably commenced in Khandesh in the 18th century when this district was in a flourishing condition under its Muhammadan rulers. The original seat of the industry appears to have been at Pimpalnur, but as the oil became in greater request the manufacture spread to Nandubar, Shahada and Taloda. The Nimar district in the Central Provinces has always been an important centre, so much so that the oil was for many years known commercially as 'Nimar Oil.' It was first brought to the notice of Europeans by Dr. Maxwell in 1825, and Mr. J. Forsyth, in 1827, was the first to make an inquiry into the industry. He found the grass in patches in the jungles throughout Nimar and the Nerbudda Valley, but in greater abundance along the foot of the Vindhyan range in the vicinity of Jaun ghat, and 30 miles further west on the table land near Nalcha. The plant commences to flower at the end of August and continues to flower vigorously to October and November and during this time it gives sufficient oil to cover the expenses of its preparation. The distillation was conducted eighty years ago according to the same methods in use at the present day. The grass is boiled with water in wrought iron stills fitted over an earthen fireplace. From the still-head two straight tubes, from 5 to 6 feet long, conduct the vapours into two copper receivers immersed in cold water. The process occupies about six hours, and as four boilings are made in the 24 hours, a seer of oil can be obtained in that time. One of these stills will produce one and a half maunds or 80 quarts of oil during the season. We have no computation of the number of stills employed at the present time, but in 1879-80 there were 197 stills producing 71 cwts. of oil in West Khandesh and 100 of these were in Nandurbar alone.

Within the last few years there has been a considerable expansion of the industry in the Central Provinces and Berar. In the Forest Administration Report for 1896-97 the distillation was observed to be extending in Nimar district, and was carried on

also in Hoshangabad, Betul, Mandla and Seoni. The forest revenue from the grass became an important consideration ; in 1901-02 in the Betul district the receipts from leasing rusa grass *birs* went up from Rs. 1,325 to Rs. 7,332. Lately other districts have shown a revenue of over Rs. 10,000 per annum for leasing rusa grass lands.

In Berar the distillation is carried on in Ellichpur, Amraoti, Buldana, Basim and Wun. Jamod in Akola has been said to be celebrated for the industry. The oil prepared in various localities in Berar is brought to the chief market at Ellichpur town where it is brought up by dealers and exported to Bombay at Rs. 2 to Rs. 4 per pound according to quality. The grass is everywhere very abundant, and the distillation requires only a moderate amount of skill and a small initial capital. The manufacturer is therefore well recompensed for his labour which is shown by the late increase in outturn and proved by experiments made by the Forest department in 1902-03.

There are two kinds of rusa grass oil obtained in the Central Provinces, one of a fine delicate odour and yellow colour called "Motia," and the other darker and more pungent called "Sophia." Ordinary rusa oil has for its principal constituent an alcohol boiling at 232°, named geraniol. The amount of this constituent varies from 76 to 93 per cent. Rusa oil is soluble in 3 or more parts of 70 per cent. alcohol. It was formerly adulterated with ground-nut oil, but as this is readily detected it was afterwards adulterated with kerosine and turpentine oil. The dealers have lately given up the suicidal policy of sophistication, and export the oil as it comes from the distillers. A very simple test for this and all other essential oils is to place a drop or two on a piece of white blotting paper and heat it. If volatile oils are present no stain will be left, but in the case of fixed oils, like ground nut or castor, there will be a greasy stain. The only satisfactory method of testing an essential oil is to ascertain the boiling point, and to separate the constituents by fractional distillation, and separation of its alcohol by potassium sulphite, and other chemical methods.

Rosa grass oil was formerly designated Turkish geranium oil in the time when the oil entered the European market by way of Constantinople where it was used on a large scale for mixing with otto of roses. It is used by the Arabs and Turks in making hair oil, but it is most extensively employed in soap manufacture and perfumery.

*Exports of Essential Oils (chiefly Rosa-grass oil)  
from Bombay.*

	gallons.	Rs.
1896-97	8,199	1,49,553
1897-98	10,776	2,09,691
1898-99	16,000	4,04,140
1899-1900	10,400	2,78,005
1900-01	12,834	3,44,670
1901-02	19,641	6,10,783
1902-03	18,872	5,23,630
1903-04	20,680	5,38,774
1904-05	18,742	4,65,209
1905-06	23,436	5,51,425

These figures reveal a five-fold increase during the past forty years, for in 1866-67 we find that 41,643 lbs. (4,627 gals.) were shipped from Bombay to England and ports of the Red Sea. About ten years ago Egypt, the United Kingdom and Turkey in Europe were the principal consumers; at the present time, while Egypt is still absorbing one-third of the exports, Germany and France have become important buyers.

In former years, as we have shown, East Indian geranium oil always varied in composition and properties, it appeared to be made from a mixture of grasses and it was often adulterated with other oily products. Within recent years the situation has changed and an excellent oil at moderate prices is in the market. It has acquired a distinct reputation in the perfumery industry and is considered a good material for scenting soaps.

• From a commercial point of view a critical stage has been reached. The production of the oil has grown in an unprecedented manner and large parcels of good and medium oil are being regularly thrown on the market. The price last year had never before reached such a low quotation and large supplies this year are threatening still further to depress its value. In consequence of these favourable conditions to purchasers on the Continent, the manufacture of geraniol on a large scale has been taken up and this added to its cheapness will cause other outlets to be invented for its use as a natural or artificial perfume.

Besides India Europe receives fair quantities of geranium oil from Algeria and Reunion, and the Spanish oil in point of quality is not approached by any other kind. The production in Algeria is estimated at 270 cwt., and at least 1,250 acres of grass are under cultivation. From Reunion the average exports of oil have been 250 cwts. Notwithstanding this competition India in the matter of quantity is far in advance of any other country in the production of this perfume.

Lemon-grass oil is another grass oil derived from a species of *Andropogon* usually referred to as *A. citratus*. Although allied to rusa grass oil in its botanical origin, it is totally distinct in its chemical composition. Lemon grass oil, as its name signifies, has a lemon-like odour and taste. It is a yellowish or reddish liquid of sp. gr. 0.899 and 0.903. It is readily soluble in 2 pts. of alcohol of 70 per cent. The chief constituent is an aldehyde, citral boiling at 228°, which occurs in the oil to the extent of 70 to 75 per cent. Citral is also found in lemon peel, the leaves of the true verbena of Spain, and in other lemon-smelling plants.

Lemon grass oil is prepared in Southern India, and the industry is more modern than that of rusa oil. I can find no earlier record than its importation into England in 1832. For many years it has been prepared on the western slopes of Travancore north of Anjengo as far as Cochin, where the grass can be obtained sufficiently green and fresh for about six months in the year. In this region the Malays distil the

grass in copper stills with an earthen dome and the condenser consists of a copper tube passing through a tall wooden bucket. Each boiling yields a quart of oil worth about Rs. 3 in the bazar. In the eastern part of the Travancore State the Tamils use a round copper boiler contracted into a neck at the top and about four feet high. The top is covered with a specially prepared earthen vessel which communicates with a copper tube about three inches in diameter which passes through a condenser filled with cold water to a receiving vessel. When the still is charged with grass, all the joints are made air tight by luting with rags and clay. Distillation is continued for twenty-four hours when about a pint of oil is obtained. The stills are moved about from place to place according to the abundance of the grass, and in the cold weather may be seen dotted over the landscape. In February the grass becomes coarse and is burnt. The industry and the profits were formerly in the hands of natives and operations were carried on with grass growing wild in the jungles. Gradually the wild grass of the two States of Travancore and Cochin was insufficient to supply the increasing demand for the oil from Europe. The distillers of Cochin then began to exploit Malabar where the grass was not known to have any economic value. The owners of the land on account of the new use of the grass enjoyed the benefit of seeing it rise to fourteen times its former value. Planters have commenced distillation in the Ernad and Walluvanad taluqs, in the Wynaad, and Venieri in Pudukoti. These hilly regions are covered entirely with lemon grass which is sold at a nominal sum, but the question of specially cultivating the grass for oil in suitable lands is now being considered. It has been said that the new industry will provide an outlet for the energies of the Moplahs whose fanaticism is so well known and perhaps may be traced to the straitened circumstances of their existence. In 1903 there were eleven stills at work at Waluvanad, most of them being controlled by Moplahs. The stills used here are more modern in construction than those used in the south, and are made locally at a cost of between Rs. 200



and Rs. 300 each. The copper boiler is six feet high and twelve feet in circumference. From the head of the still a pipe conducts the steam through a condensing tub filled with cold water and the oil is collected into the vessels used as receivers. An ordinary grass-cutter is paid two annas a head-load for the lemon grass, and sixteen of these bundles are sufficient to fill a boiler, which after distillation yield one bottle of oil. The best oil before it is bottled is always filtered through paper. When Travancore held the monopoly of the industry, the oil was exported from Cochin, but now that the industry has extended northwards into Malabar, Calicut is becoming a centre of distribution.

Lemon grass oil is exported in reputed quart bottles each of which is guaranteed to contain 23 ounces. One dozen of these bottles make a case. The exports from Cochin have risen from 228 cases in 1884 to 2,387 cases in 1889 and 1,917 cases in 1890. At the present time from 2,000 to 3,000 cases are exported annually from Cochin to Bombay and to various foreign ports, chiefly New York, Hamburg and London.

The following are the exports of essential oils, chiefly lemon grass oil, from Madras during the past ten years :—

	gallons.	Rs.
1896-97	5,324	79,081
1897-98	6,292	1,33,775
1898-99	4,278	89,745
1899-1900	6,280	1,29,701
1901-02	5,89	27,376
1902-03	6,258	2,42,319
1903-04	3,889	1,60,505
1904-05	2,721	1,41,489
1905-06	2,675	1,54,141

A large proportion of the oil is absorbed for the manufacture of citral, and ionone—an artificial violet perfume. On this account within the last three years the price has quadrupled.

These prices must have proved very favourable to the distillers and traders of the Western Coast, but on the other hand fresh sources of supply have appeared which may compete with the present monopoly. An export trade in the oil has recently developed in Java. It is also brought in small quantities from Singapore and Ceylon, and experimental batches have been sent from Tonkin, San Thome in Portuguese West Africa, Brazil, and Monserrat in the West Indies. Messrs. Schimmel & Co., certify that the Brazilian and West Indian oils are unable to compete with the East Indian oil on account of their insolubility in alcohol. The demand for lemon grass oil is steadily on the increase in England and the Continent, and all things being considered there is a very successful future for its manufacture in India.

Citronella oil, although prepared chiefly in Ceylon, should be referred to in dealing with grass oils. This oil is distilled from *Andropogon Nardus*, a grass cultivated on the slopes of the hills in the Southern Province of Ceylon, and according to statistics as much as 40,000 to 50,000 acres are under cultivation. The first and principal harvesting period is in July and August, and the second lasts from December until February. The average yield is from 16 to 20 bottles of oil per acre for the summer and from 5 to 10 bottles for the winter season. The stills, of which there are 600, are modern, and the success of the natives who constitute the majority of the producers is remarkable. There has been an enormous increase in production and consumption of citronella oil in Ceylon, which is shown by the exports reaching in 1899 one and a half million pounds in weight. Since this date exports have declined.

The oil contains citronellal and geraniol; it is occasionally adulterated with fatty oils, petroleum, resin spirit, acetone, and alcohol. It is much cheaper than lemon grass oil and it is sometimes used for the purpose of adulterating the latter.

Leaving the grass oils which are the chief Indian essential oils that are exported in large quantities we will consider some

of the essences and perfumes which are made and used to a considerable extent in the country. Sandal wood is one of the most important perfumes in the East, as it is one of the most fashionable in the West and is mainly derived from the province of Mysore where the trees are protected by the state. The annual auction sales of the wood from the roots and stems brings in an annual revenue of five or six lakhs of rupees. The wood is sold in grades varying from Rs. 500 per ton for selected logs to Rs. 85 per ton for fixed chips. The wood is purchased by Muhammadans in Bombay, whose agents attend the Mysore auctions, and is shipped to Europe *via* Tellicherry or Bombay.

The Mysore Government has long had establishments for extracting the oil which is sent to China and Arabia. The oil is procured from the wood by distillation, the roots yielding the largest quantity and finest quality. The yield of the oil is at the rate of 10 ozs. per maund or 2.5 per cent, and the process lasts several days. The average price of the oil in India is Rs. 8 per pound. Two or three private firms have also established stills, but the oil is said not to compare in properties with that made by European distillers. While it appears desirable from a commercial aspect to prepare the oil in the country that produces the raw material the indigenous stills are not at present capable of dealing with large quantities. At the factory of Messrs. Schimmel & Co., Leipzig, special appliances are used for comminuting the wood, and their stills are constructed for producing daily four cwts. of oil, with an average yield of 3.3 per cent.

In 1902 it was reported from Mysore that the spike disease has appeared in the sandalwood plantations which was threatening the trees with destruction. The disease had first been observed in Coorg in 1900. There has naturally been an upward movement in the price of the oil in spite of the large quantity of wood sold at the auctions owing to the numbers of trees cut down at Hunsur, Chickmagalur, Seringapatam and Coorg which showed traces of the disease. Unfortunately no

successful remedy has at present been found for the disease ; and the future does not look hopeful. A decline in supplies of sandal wood is predicted, as the young trees are particularly subject to the disease, and the growth of new plantations is not at present calculated to keep pace with the consumption.

These remarks on the ancient and favourite perfume of sandal wood oil will appropriately introduce the subject of attars or ottos, of which rose otto is the most important. In former Moghul times sandal oil was generally used as the basis in preparing all ottos. Col. Phillott, an authority in Persian and Urdu literature, has drawn my attention to an old work published in Lahore, describing the preparation of otto of roses. The copper alembic and condensing appliances are carefully detailed, the former is charged with rose petals and water, but before heat is applied a small quantity of sandal oil is to be placed in the receiver with the object of "drawing over" 'the rose essence.' "Each time the otto is prepared sandal wood oil must be placed in the receiving vessel." The resulting essence was no doubt an agreeable perfume, but in modern times it is more satisfactory to obtain the pure essential oils first, and then blend them in known proportions afterwards.

Rose water is manufactured in Bengal and the Panjab, but a large quantity is imported from Persia. For over two centuries rose water and otto have been made in Ghazipur on the banks of the Ganges from the damask rose (*Rosa damascena*). The oil distilled there, however, is never pure, being adulterated with other oils. One hundred lbs. of rose leaves or one hundred thousand roses are estimated to produce three drachms or 180 grains of otto and 100 bottles of rose water. Rosewater to the extent of 20,000 to 30,000 gallons annually is imported into Bombay from Persian Gulf. Two qualities are met with—Yak-atishi (once distilled) and Du-atishi (twice distilled). Its value is Rs. 4 to Rs. 4½ for a carboy of 20 lbs.

Turpentine oil—the essential oil distilled from the turpentine or oleo-resin of the Chil Pine (*Pinus longifolia*) is prepared by the Forest Department in Northern India. Factories are

established at Dehra Dun, Naini Tal, and Nurpur in Kangra. These centres are capable of producing about 20,000 gallons of turpentine oil a year. The whole of this output is consumed in the country being used in the Medical Stores, Military Department, by several railway companies, and by paint and varnish manufacturers. Samples of the oil have been sent to England, and have been favourably reported upon by such eminent authorities as Professor Armstrong and Sir Boverton Redwood.

Eucalyptus or Blue gum oil is now an established industry on the Nilgiri Hills. The blue gum plantations were commenced about sixty years ago, and the wood has been used principally as fuel. About twenty years ago the oil was first distilled from the leaves in the Botanical Gardens, Ootacamund. At the time of the influenza epidemic in 1891, the manufacture was taken up by Mr. Wallace, and the oil was readily bought locally and by the Medical Stores depot in Madras. Lately other stills have been erected at Lovedale and Coonoor and the produce finds an appreciative market.

Camphor is a concrete essential oil largely used in India, and in recent years a great deal has been written regarding the cultivation of the tree in India and Ceylon. It is well known that the camphor of commerce is largely manufactured in Central China, Formosa and Japan, and is one of those articles subject to monopoly and consequently to advancing values. It has been considered a suitable tree for cultivation in this country, but the prospect of waiting fifty to a hundred years for trees to reach a mature enough condition to yield camphor has deterred many from speculating in the enterprise. It has also been suggested that camphor might be made from the leaves of comparatively young trees, but as I pointed out ten years ago there is a small yield of oil in the leaves and the amount of camphor is very variable. Experiments must be made in this direction on a larger scale before definite opinions can be expressed.

Ajwain or ajowan (the seeds of *Carum copticum*) is largely used in medicine, and the oil and water are prepared nearly all over India. The *aik* or distilled water, called *omum* water in South India, is a favourite domestic remedy replacing the well-known dill water of Europe. The oil by spontaneous evaporation at a low temperature yields a crystalline substance or steareptene known under the name of *Ajowan ke phul*. This substance is identical with thymol, contained in the Western herb, *Thymus vulgaris*. Crude thymol manufactured in Central India has an average value of Rs. 8 per lb. There are other plants of the umbelliferous order the fruits of which might be conveniently distilled and the oil exported.

Winter-green oil is largely consumed in America on account of its aromatic and medicinal properties. Its special value resides in the fact that it consists chemically of a compound of salicylic acid, and is a strong antiseptic. One or two drops placed in a bottle of ink or gum used on the office table will prevent the formation of mould. An Indian Winter-green (*Gaulthera fragrantissima*) grows on the Nilgiris and other mountains in Southern India and its essential oil is easily prepared by using an ordinary copper still.

Dipterocarpus oil (Gurjan balsam or wood oil) is obtained from various species of *Dipterocarpus* growing in Assam and Burma. The balsam or oleo resin consists of a resin acid, gurgunic acid, and an essential oil. The oil is becoming more and more important for the trade owing to its industrial and medicinal applications.

I would now enumerate a few indigenous perfumes which are often asked for by English and Continental dealers. These relate specially to delicate scents which of necessity must be made from fresh flowers and plants since the raw articles rapidly deteriorate. The preparation of these oils is thrown out as a suggestion to those who have a small capital and who would be sufficiently enterprising to make experiments.

The essence of Champaca or Champa from the flowers of *Michelia Champaca* is always wanted in perfumery. The small

supplies in Europe of this oil are continually being exhausted. The blossoms must be gathered singly just as they expand and must be distilled at once or submitted to the process of enfleurage. No way has yet been devised of otherwise preserving them from rapid decay. Where these trees occur in any abundance a profitable harvest of the aromatic principle could be easily obtained.

Keora essence is another perfume much sought after by European distillers. The flowers have a most delicate scent, but samples of oil placed on the market are usually obtained by steeping the blossoms in sesame oil which destroys all the honeylike characters of the true odour. The keora known by the English name of Screw pine and by botanists as *Pandanus odoratissimus* is a native of India, Persia, and Arabia, and occurs frequently along the Western Coast.

Cassie flowers obtained from *Acacia Farnesiana* yield an excellent perfume for which there is always a demand. The oil consists of a methyl ester of salicylic acid. The tree is wild in most parts of Bengal and the Panjab, and the yellow flower heads perfume the atmosphere very pleasantly. When the plants are cultivated a tree yields 2 lbs. of flowers valued at three to four pence a pound; an acre thus realising £30 to £40.

At Cannes in the South of France cassie pomade is made by the process of infusion. This consists in infusing the substance in a mixture of lard and beef fat in a water-bath. Two pounds of the flowers are immersed entire in one pound of fat; after immersion in the fatty menstruum for the requisite period the mixture is strained off and the residue pressed. The pomade is preserved in large metal vessels. In India the animal fat may be substituted by petroleum wax or the concrete oil of *Vateria indica*, the Piney tallow of Malabar, or kokam butter—the natural fat of the seeds of *Garcinia indica*.

About fifteen years ago a large consignment of Indian made cassie pomade was shipped to London and was found to be superior to that grown at Grasse in France. This

opinion was confirmed by the eminent firm of Messrs. Schimmel & Co. It is to be regretted that this promising trade was abandoned owing to the death of the gentleman who made this perfume in Naini Tal but it is hoped that this reference to the excellence of Indian cassie pomade will resuscitate its manufacture.

Patchouli oil is an absolute necessity for perfumery. The true patchouli is prepared from a labiate plant, the *Pogostemon Patchouli*, a native of Malaya and Indo-China. But there are various species of *Pogostemon* in Western India which are marked by their strong perfume and would doubtless yield essential oils if submitted to distillation.

The following list of raw materials for the manufacture of perfumes in India might be added to the more important ones I have been considering :—

*Mesua fenea*, flowers. Nagkesur.

*Ochrocarpus longifolius*, flowers. Lal-nagkesur.

*Ruta graveolens*, herb. Rue, Sudáb.

*Zanthoscyllum* sp., fruits. Pepper flower.

*Toddalia aculeata*, leaves. Milakaranai.

*Munaya Kœnigi*, leaves. Curry leaf tree.

*Citrus* sp. Fruits and leaves. Oranges and lemons.

*Oegle Marmelos*, leaves. Bél.

*Feronia elephantum*, leaves. Wood apple.

*Hardwickea pimata*, oleo-resin. Yenne.

*Prunus armeniaea*, seeds. Rubani.

*Prunus insititia* seeds. Alu-bokhara.

*Altingia excelsa*, balsam. Nantayok.

*Myrtus communis*, leaves and fruit. Myrtle.

*Carum carvi*, fruits. Sujah-jira, caraway.

*Fœniculum veelgaw*, fruits. Fennel.

*Pencedanum graveolens* fruits. Dill.

*Aralia Pseudo-ginseng* root. Indian Ginseng.

*Nardostachys Jatamansi*, root. Spikenard.

*Bhumea balsamijera*, plant. Ngai.



*Sphæranthus indicus*, flowers. Mundi.  
*Achillea Millefolium*, plant. Biranjasit.  
*Spilunthes Acmele*, flower heads. Pipulka.  
*Artemisia vulgaris*, herb. Wormwood.  
*Sanssurea Lappa*, root. Kut. Paehak.  
*Mimusops Elengi*, flowers. Maulsiri.  
*Nyctanthes arbor-tristis*, flowers. Night Jasmine.  
*Jasminum grandiflorum*, flowers. Jasmine.  
*Plumeria acutifolia* flowers. Khair-champa.  
*Ipomœa sinuata*, leaves. Noyeau plant.  
*Vitex Negundo*, leaves. Nisinda.  
*Vitex triplolia*, leaves.  
*Ocimum basilieum*, herb. Sweet basil.  
*Ocimum sanctum*, herb. Holy basil.  
*Ocimum gratissimum*, herb. Ram-tulsi.  
*Lavandula stœchas*, herb. Arabian lavender.  
*Mentha sylvestris*, herb. Wild mint  
*Origanum marjorana*, herb. Marwa, marjoram.  
*Thymus serpyllum*, herb. Wild Thyme, masho.  
*Piper Betle*, leaves. Pan.  
*Cinnamomum* sp. bark and leaves. Indian cinnamon.  
*Litsæa polyalthia*, leaves.  
*Aquilaria Agallocha*, wood. Agar, eagle wood.  
*Salix Caprea*, flowers. Bedmishk.  
*Juniperus communis*, fruit. Juniper berries.  
*Cedrus libam*, wood, oleo-resin. Deodar.  
*Kæmpfelia Galanga*, tubers. Chandra mula.  
*Hedychium spicatum*, tubers. Kapur-Kachri.  
*Alpinia Galanga*, root. Greater galangal.  
*Homalomena aromatica*, root. Gondo matri.  
*Calamus*, Sweet flag.  
*Nigella Saliva*, Seeds. Black cummin.  
*Abelmoschus moschiferus*, Seeds. Ambrette.  
*Cassias Tetrantteras*, of the laurel tribe.

## Indian Essential Oils.

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IN introducing to the Indian Industrial Conference the subject of perfumes one is struck by the fact that so little has been previously written on the subject. India as an Eastern and tropical country is renowned all the world over for its odoriferous species and perfumed blossoms, the essences of which have been extracted by recondite methods for ages past. The sources, uses and preparation of these ancient drugs is a highly interesting historic study and would be out of place to discuss here. I referred to this aspect of the subject about two years ago in an article on 'The Perfumes of the Moghuls' (*Calcutta Review*, Oct., 1904). On the present occasion it will be my aim to indicate the geographical and botanical sources of the chief commercial essential oils, review the present condition of the trade, and make a few practical suggestions in passing on the future possibilities of the industry.

Essential oils are distinguished by their strong and characteristic odours, and by being evaporated without decomposition and with little or no residue. The composition of essential oils is variable; many like turpentine oil consist of carbon and hydrogen only, others contain oxygen in addition. Their chemical constitution also differs in different cases, the majority being ethereal salts or compound ethers, aldehydes or phenols. Many essential oils consist of hydrocarbons or fluid bodies, mixed with solid oxidised compounds. When the latter are present in considerable amount a portion usually

separates out in a crystalline form. In such cases the solid is often referred to as the *stearoptene* and the liquid is called the *elxoptene*. The essential oils are almost all of vegetable origin and exist in the flowers (as the rose), in the leaves (as the basil), in the rind of fruit (as the orange), and the fruits of the umbelliferæ (as the anise and ajwain).

The extraction of the oils is performed by the following methods, but in India the first only is that in general use.

1. Distillation of plants or parts of plants by boiling with water and condensing the steam. Notwithstanding that nearly all essential oils boil at a higher temperature than water their vapours escape with the vapour of water and collect in the distillate where they separate. Another modification of this method is to employ steam instead of a naked fire, this prevents the caking and burning of the solid matter at the bottom of the still.

2. The process of the sponge and the ecuelle. In the case of fruits of the orange tribe, in which the oil glands are large and numerous, a portion of the essence can be extracted without distillation. For this purpose either a sponge, or a vessel like a cup with sharp points inside, is used for separating the oil from the peel.

3. Expression. In a few cases (orange, lemon, &c.) a part of the essential oil may be obtained by submitting the material to pressure.

4. Maceration in fat. This is to avoid as much as possible the application of heat. The flowers are macerated in vegetable tallow or paraffin, previously melted on a water-bath. The fat, charged with the essence, is afterwards shaken up with alcohol which removes the perfume.

5. Enfleurage or absorption is another process having the same object. Here layers of fat on glass frames are covered with flowers, and the flowers changed each day until the fat is sufficiently impregnated with the perfume.

For the purpose of illustrating the trade in Indian essential oils I have prepared a diagram showing the value of

the exports for the past twenty-seven years. In 1879 the exports were valued at Rs. 1,20,439, they rose in 1902-3 to Rs. 7,70,872, and have remained at a high figure since then. On consulting the table it will be seen that there are two serious depressions, one occurring in 1896-97 and the other in 1900-01. It will be remembered that these periods coincided with two disastrous famines which were particularly felt in the Central Provinces, the region of the grass oil industry. The famine of 1896-97 affected the Khandesh district and naturally resulted in short supplies of the oil. In 1899-1900 the famine of the Central Provinces was worse in the Western provinces of Nimar and Betul. In Nimar the death rate reached the melancholy height of 105 per mille. The exceptional drought decimated the plants just at the season of distillation and for some months that year the Bombay dealers received no stocks. This scarcity not only affected the trade in India but also caused great inconvenience in the European markets, the price had to be raised, and the door was opened to smaller dealers to resort to adulteration. The monsoon that burst in July, immediately after the famine, was very heavy, and the young grass suffered in consequence, but in 1901 and 1902 the industry recovered itself as will be shown in the table. In studying the essential oil industry in India where the occupation is chiefly in the open air one has thus to reckon with drought, floods, frost and other adverse climatic conditions which in certain seasons give the trade a 'set-back.'

After these general remarks on the Indian trade as a whole, I propose to refer to the various perfume plants which afford commercial oils and specify a few others which might be rendered to some account as trade articles in the future.

One of the most important essential oils in this country is East Indian geranium or palma rosa oil. It is known in the vernacular as *rusa-ka-tel*, and is referred to in ancient works on perfumes and medicines. The oil is obtained from a grass—*Andropogon Schoenanthus*—or rusa grass, which is widely distributed in India. This grass is abundant in the North-

east of the Bombay presidency, in Malwa, Merwara and Rajputana in Central India, and in the Central Provinces and Berar. The art of distilling the essential oil from the grass was probably commenced in Khandesh in the 18th century when this district was in a flourishing condition under its Muhammadan rulers. The original seat of the industry appears to have been at Pimpalnur, but as the oil became in greater request the manufacture spread to Nandubar, Shahada and Taloda. The Nimar district in the Central Provinces has always been an important centre, so much so that the oil was for many years known commercially as 'Nimar Oil.' It was first brought to the notice of Europeans by Dr. Maxwell in 1825, and Mr. J. Forsyth, in 1827, was the first to make an inquiry into the industry. He found the grass in patches in the jungles throughout Nimar and the Nerbudda Valley, but in greater abundance along the foot of the Vindhyan range in the vicinity of Jaun ghat, and 30 miles further west on the table land near Nalcha. The plant commences to flower at the end of August and continues to flower vigorously to October and November and during this time it gives sufficient oil to cover the expenses of its preparation. The distillation was conducted eighty years ago according to the same methods in use at the present day. The grass is boiled with water in wrought iron stills fitted over an earthen fireplace. From the still-head two straight tubes, from 5 to 6 feet long, conduct the vapours into two copper receivers immersed in cold water. The process occupies about six hours, and as four boilings are made in the 24 hours, a seer of oil can be obtained in that time. One of these stills will produce one and a half maunds or 80 quarts of oil during the season. We have no computation of the number of stills employed at the present time, but in 1879-80 there were 197 stills producing 71 cwts. of oil in West Khandesh and 100 of these were in Nandurbar alone.

Within the last few years there has been a considerable expansion of the industry in the Central Provinces and Berar. In the Forest Administration Report for 1896-97 the distillation was observed to be extending in Nimar district, and was carried on

also in Hoshangabad, Betul, Mandla and Seoni. The forest revenue from the grass became an important consideration; in 1901-02 in the Betul district the receipts from leasing rusa grass *birs* went up from Rs. 1,325 to Rs. 7,332. Lately other districts have shown a revenue of over Rs. 10,000 per annum for leasing rusa grass lands.

In Berar the distillation is carried on in Ellichpur, Amraoti, Buldana, Basim and Wun. Jamod in Akola has been said to be celebrated for the industry. The oil prepared in various localities in Berar is brought to the chief market at Ellichpur town where it is brought up by dealers and exported to Bombay at Rs. 2 to Rs. 4 per pound according to quality. The grass is everywhere very abundant, and the distillation requires only a moderate amount of skill and a small initial capital. The manufacturer is therefore well recompensed for his labour which is shown by the late increase in outturn and proved by experiments made by the Forest department in 1902-03.

There are two kinds of rusa grass oil obtained in the Central Provinces, one of a fine delicate odour and yellow colour called "Motia," and the other darker and more pungent called "Sophia." Ordinary rusa oil has for its principal constituent an alcohol boiling at 232°, named geraniol. The amount of this constituent varies from 76 to 93 per cent. Rusa oil is soluble in 3 or more parts of 70 per cent. alcohol. It was formerly adulterated with ground-nut oil, but as this is readily detected it was afterwards adulterated with kerosine and turpentine oil. The dealers have lately given up the suicidal policy of sophistication, and export the oil as it comes from the distillers. A very simple test for this and all other essential oils is to place a drop or two on a piece of white blotting paper and heat it. If volatile oils are present no stain will be left, but in the case of fixed oils, like ground nut or castor, there will be a greasy stain. The only satisfactory method of testing an essential oil is to ascertain the boiling point, and to separate the constituents by fractional distillation, and separation of its alcohol by potassium sulphite, and other chemical methods.

Rusa grass oil was formerly designated Turkish geranium oil in the time when the oil entered the European market by way of Constantinople where it was used on a large scale for mixing with otto of roses. It is used by the Arabs and Turks in making hair oil, but it is most extensively employed in soap manufacture and perfumery.

*Exports of Essential Oils (chiefly Rusa-grass oil)  
from Bombay.*

		gallons.	Rs.
1896-97	...	8,199	1,49,553
1897-98	...	10,776	2,09,691
1898-99	...	16,000	4,04,140
1899-1900	...	10,400	2,78,005
1900-01	...	12,834	3,44,670
1901-02	...	19,641	6,10,783
1902-03	...	18,872	5,23,630
1903-04	...	20,680	5,38,774
1904-05	...	18,742	4,65,209
1905-06	...	23,436	5,51,425

These figures reveal a five-fold increase during the past forty years, for in 1866-67 we find that 41,643 lbs. (4,627 gals.) were shipped from Bombay to England and ports of the Red Sea. About ten years ago Egypt, the United Kingdom and Turkey in Europe were the principal consumers; at the present time, while Egypt is still absorbing one-third of the exports, Germany and France have become important buyers.

In former years, as we have shown, East Indian geranium oil always varied in composition and properties, it appeared to be made from a mixture of grasses and it was often adulterated with other oily products. Within recent years the situation has changed and an excellent oil at moderate prices is in the market. It has acquired a distinct reputation in the perfumery industry and is considered a good material for scenting soaps.

From a commercial point of view a critical stage has been reached. The production of the oil has grown in an unprecedented manner and large parcels of good and medium oil are being regularly thrown on the market. The price last year had never before reached such a low quotation and large supplies this year are threatening still further to depress its value. In consequence of these favourable conditions to purchasers on the Continent, the manufacture of geraniol on a large scale has been taken up and this added to its cheapness will cause other outlets to be invented for its use as a natural or artificial perfume.

Besides India Europe receives fair quantities of geranium oil from Algeria and Reunion, and the Spanish oil in point of quality is not approached by any other kind. The production in Algeria is estimated at 270 cwt., and at least 1,250 acres of grass are under cultivation. From Reunion the average exports of oil have been 250 cwts. Notwithstanding this competition India in the matter of quantity is far in advance of any other country in the production of this perfume.

Lemon-grass oil is another grass oil derived from a species of *Andropogon* usually referred to as *A. citratus*. Although allied to rusa grass oil in its botanical origin, it is totally distinct in its chemical composition. Lemon grass oil, as its name signifies, has a lemon-like odour and taste. It is a yellowish or reddish liquid of sp. gr. 0.899 and 0.903. It is readily soluble in 2 pts. of alcohol of 70 per cent. The chief constituent is an aldehyde, citral boiling at 228°, which occurs in the oil to the extent of 70 to 75 per cent. Citral is also found in lemon peel, the leaves of the true verbena of Spain, and in other lemon-smelling plants.

Lemon grass oil is prepared in Southern India, and the industry is more modern than that of rusa oil. I can find no earlier record than its importation into England in 1832. For many years it has been prepared on the western slopes of Travancore north of Anjengo as far as Cochin, where the grass can be obtained sufficiently green and fresh for about six months in the year. In this region the Malayalis distil the



grass in copper stills with an earthen dome and the condenser consists of a copper tube passing through a tall wooden bucket. Each boiling yields a quart of oil worth about Rs. 3 in the bazar. In the eastern part of the Travancore State the Tamils use a round copper boiler contracted into a neck at the top and about four feet high. The top is covered with a specially prepared earthen vessel which communicates with a copper tube about three inches in diameter which passes through a condenser filled with cold water to a receiving vessel. When the still is charged with grass, all the joints are made air tight by luting with rags and clay. Distillation is continued for twenty-four hours when about a pint of oil is obtained. The stills are moved about from place to place according to the abundance of the grass, and in the cold weather may be seen dotted over the landscape. In February the grass becomes coarse and is burnt. The industry and the profits were formerly in the hands of natives and operations were carried on with grass growing wild in the jungles. Gradually the wild grass of the two States of Travancore and Cochin was insufficient to supply the increasing demand for the oil from Europe. The distillers of Cochin then began to exploit Malabar where the grass was not known to have any economic value. The owners of the land on account of the new use of the grass enjoyed the benefit of seeing it rise to fourteen times its former value. Planters have commenced distillation in the Ernad and Walluvanad taluqs, in the Wynaad, and Venieri in Pudukoti. These hilly regions are covered entirely with lemon grass which is sold at a nominal sum, but the question of specially cultivating the grass for oil in suitable lands is now being considered. It has been said that the new industry will provide an outlet for the energies of the Moplahs whose fanaticism is so well known and perhaps may be traced to the straitened circumstances of their existence. In 1903 there were eleven stills at work at Waluvanad, most of them being controlled by Moplahs. The stills used here are more modern in construction than those used in the south, and are made locally at a cost of between Rs. 200

and Rs. 300 each. The copper boiler is six feet high and twelve feet in circumference. From the head of the still a pipe conducts the steam through a condensing tub filled with cold water and the oil is collected into the vessels used as receivers. An ordinary grass-cutter is paid two annas a head-load for the lemon grass, and sixteen of these bundles are sufficient to fill a boiler, which after distillation yield one bottle of oil. The best oil before it is bottled is always filtered through paper. When Travancore held the monopoly of the industry, the oil was exported from Cochin, but now that the industry has extended northwards into Malabar, Calicut is becoming a centre of distribution.

Lemon grass oil is exported in reputed quart bottles each of which is guaranteed to contain 23 ounces. One dozen of these bottles make a case. The exports from Cochin have risen from 228 cases in 1884 to 2,387 cases in 1889 and 1,917 cases in 1890. At the present time from 2,000 to 3,000 cases are exported annually from Cochin to Bombay and to various foreign ports, chiefly New York, Hamburg and London.

The following are the exports of essential oils, chiefly lemon grass oil, from Madras during the past ten years :—

	gallons.	Rs.
1896-97	5,324	79,081
1897-98	6,292	1,33,775
1898-99	4,278	89,745
1899-1900	6,280	1,29,701
1901-02	5,89	27,376
1902-03	6,258	2,42,319
1903-04	3,889	1,60,505
1904-05	2,721	1,41,489
1905-06	2,675	1,54,141

A large proportion of the oil is absorbed for the manufacture of citral, and ionone—an artificial violet perfume. On this account within the last three years the price has quadrupled.

These prices must have proved very favourable to the distillers and traders of the Western Coast, but on the other hand fresh sources of supply have appeared which may compete with the present monopoly. An export trade in the oil has recently developed in Java. It is also brought in small quantities from Singapore and Ceylon, and experimental batches have been sent from Tonkin, San Thome in Portuguese West Africa, Brazil, and Monserrat in the West Indies. Messrs. Schimmel & Co., certify that the Brazilian and West Indian oils are unable to compete with the East Indian oil on account of their insolubility in alcohol. The demand for lemon grass oil is steadily on the increase in England and the Continent, and all things being considered there is a very successful future for its manufacture in India.

Citronella oil, although prepared chiefly in Ceylon, should be referred to in dealing with grass oils. This oil is distilled from *Andropogon Nardus*, a grass cultivated on the slopes of the hills in the Southern Province of Ceylon, and according to statistics as much as 40,000 to 50,000 acres are under cultivation. The first and principal harvesting period is in July and August, and the second lasts from December until February. The average yield is from 16 to 20 bottles of oil per acre for the summer and from 5 to 10 bottles for the winter season. The stills, of which there are 600, are modern, and the success of the natives who constitute the majority of the producers is remarkable. There has been an enormous increase in production and consumption of citronella oil in Ceylon, which is shown by the exports reaching in 1899 one and a half million pounds in weight. Since this date exports have declined.

The oil contains citronellal and geraniol; it is occasionally adulterated with fatty oils, petroleum, resin spirit, acetone, and alcohol. It is much cheaper than lemon grass oil and it is sometimes used for the purpose of adulterating the latter.

Leaving the grass oils which are the chief Indian essential oils that are exported in large quantities we will consider some

of the essences and perfumes which are made and used to a considerable extent in the country. Sandal wood is one of the most important perfumes in the East, as it is one of the most fashionable in the West and is mainly derived from the province of Mysore where the trees are protected by the state. The annual auction sales of the wood from the roots and stems brings in an annual revenue of five or six lakhs of rupees. The wood is sold in grades varying from Rs. 500 per ton for selected logs to Rs. 85 per ton for fixed chips. The wood is purchased by Muhammādans in Bombay, whose agents attend the Mysore auctions, and is shipped to Europe *via* Tellicherry or Bombay.

The Mysore Government has long had establishments for extracting the oil which is sent to China and Arabia. The oil is procured from the wood by distillation, the roots yielding the largest quantity and finest quality. The yield of the oil is at the rate of 10 ozs. per maund or 2.5 per cent, and the process lasts several days. The average price of the oil in India is Rs. 8 per pound. Two or three private firms have also established stills, but the oil is said not to compare in properties with that made by European distillers. While it appears desirable from a commercial aspect to prepare the oil in the country that produces the raw material the indigenous stills are not at present capable of dealing with large quantities. At the factory of Messrs. Schimmel & Co., Leipzig, special appliances are used for comminuting the wood, and their stills are constructed for producing daily four cwts. of oil, with an average yield of 3.3 per cent.

In 1902 it was reported from Mysore that the spike disease has appeared in the sandalwood plantations which was threatening the trees with destruction. The disease had first been observed in Coorg in 1900. There has naturally been an upward movement in the price of the oil in spite of the large quantity of wood sold at the auctions owing to the numbers of trees cut down at Hunsur, Chickmagalur, Seringapatam and Coorg which showed traces of the disease. Unfortunately no

successful remedy has at present been found for the disease ; and the future does not look hopeful. A decline in supplies of sandal wood is predicted, as the young trees are particularly subject to the disease, and the growth of new plantations is not at present calculated to keep pace with the consumption.

These remarks on the ancient and favourite perfume of sandal wood oil will appropriately introduce the subject of attars or ottos, of which rose otto is the most important. In former Moghul times sandal oil was generally used as the basis in preparing all ottos. Col. Phillott, an authority in Persian and Urdu literature, has drawn my attention to an old work published in Lahore, describing the preparation of otto of roses. The copper alembic and condensing appliances are carefully detailed, the former is charged with rose petals and water, but before heat is applied a small quantity of sandal oil is to be placed in the receiver, with the object of "drawing over" 'the rose essence.' "Each time the otto is prepared sandal wood oil must be placed in the receiving vessel." The resulting essence was no doubt an agreeable perfume, but in modern times it is more satisfactory to obtain the pure essential oils first, and then blend them in known proportions afterwards.

Rose water is manufactured in Bengal and the Panjab, but a large quantity is imported from Persia. For over two centuries rose water and otto have been made in Ghazipur on the banks of the Ganges from the damask rose (*Rosa damascena*). The oil distilled there, however, is never pure, being adulterated with other oils. One hundred lbs. of rose leaves or one hundred thousand roses are estimated to produce three drachms or 180 grains of otto and 100 bottles of rose water. Rosewater to the extent of 20,000 to 30,000 gallons annually is imported into Bombay from Persian Gulf. Two qualities are met with—Yak-atishi (once distilled) and Du-atishi (twice distilled). Its value is Rs. 4 to Rs. 4½ for a carboy of 20 lbs.

Turpentine oil—the essential oil distilled from the turpentine or oleo-resin of the Chil Pine (*Pinus longifolia*) is prepared by the Forest Department in Northern India. Factories are

established at Dehra Dun, Naini Tal, and Nurpur in Kangra. These centres are capable of producing about 20,000 gallons of turpentine oil a year. The whole of this output is consumed in the country being used in the Medical Stores, Military Department, by several railway companies, and by paint and varnish manufacturers. Samples of the oil have been sent to England, and have been favourably reported upon by such eminent authorities as Professor Armstrong and Sir Boverton Redwood.

Eucalyptus or Blue gum oil is now an established industry on the Nilgiri Hills. The blue gum plantations were commenced about sixty years ago, and the wood has been used principally as fuel. About twenty years ago the oil was first distilled from the leaves in the Botanical Gardens, Ootacamund. At the time of the influenza epidemic in 1891, the manufacture was taken up by Mr. Wallace, and the oil was readily bought locally and by the Medical Stores depot in Madras. Lately other stills have been erected at Lovedale and Coonoor and the produce finds an appreciative market.

Camphor is a concrete essential oil largely used in India, and in recent years a great deal has been written regarding the cultivation of the tree in India and Ceylon. It is well known that the camphor of commerce is largely manufactured in Central China, Formosa and Japan, and is one of those articles subject to monopoly and consequently to advancing values. It has been considered a suitable tree for cultivation in this country, but the prospect of waiting fifty to a hundred years for trees to reach a mature enough condition to yield camphor has deterred many from speculating in the enterprise. It has also been suggested that camphor might be made from the leaves of comparatively young trees, but as I pointed out ten years ago there is a small yield of oil in the leaves and the amount of camphor is very variable. Experiments must be made in this direction on a larger scale before definite opinions can be expressed.

Ajwain or ajowan (the seeds of *Carum copticum*) is largely used in medicine, and the oil and water are prepared nearly all over India. The *aik* or distilled water, called *omum* water in South India, is a favourite domestic remedy replacing the well-known dill water of Europe. The oil by spontaneous evaporation at a low temperature yields a crystalline substance or steareptene known under the name of *Ajowan ke phul*. This substance is identical with thymol, contained in the Western herb, *Thymus vulgaris*. Crude thymol manufactured in Central India has an average value of Rs. 8 per lb. There are other plants of the umbelliferous order the fruits of which might be conveniently distilled and the oil exported.

Winter-green oil is largely consumed in America on account of its aromatic and medicinal properties. Its special value resides in the fact that it consists chemically of a compound of salicylic acid, and is a strong antiseptic. One or two drops placed in a bottle of ink or gum used on the office table will prevent the formation of mould. An Indian Winter-green (*Gaulthera fragrantissima*) grows on the Nilgiris and other mountains in Southern India and its essential oil is easily prepared by using an ordinary copper still.

Dipterocarpus oil (Gurjan balsam or wood oil) is obtained from various species of *Dipterocarpus* growing in Assam and Burma. The balsam or oleo resin consists of a resin acid, gurgunic acid, and an essential oil. The oil is becoming more and more important for the trade owing to its industrial and medicinal applications.

I would now enumerate a few indigenous perfumes which are often asked for by English and Continental dealers. These relate specially to delicate scents which of necessity must be made from fresh flowers and plants since the raw articles rapidly deteriorate. The preparation of these oils is thrown out as a suggestion to those who have a small capital and who would be sufficiently enterprising to make experiments.

The essence of Champaca or Champa from the flowers of *Michelia Champaca* is always wanted in perfumery. The small

supplies in Europe of this oil are continually being exhausted. The blossoms must be gathered singly just as they expand and must be distilled at once or submitted to the process of enflourage. No way has yet been devised of otherwise preserving them from rapid decay. Where these trees occur in any abundance a profitable harvest of the aromatic principle could be easily obtained.

Keora essence is another perfume much sought after by European distillers. The flowers have a most delicate scent, but samples of oil placed on the market are usually obtained by steeping the blossoms in sesame oil which destroys all the honeylike characters of the true odour. The keora known by the English name of Screw pine and by botanists as *Pandanus odoratissimus* is a native of India, Persia, and Arabia, and occurs frequently along the Western Coast.

Cassie flowers obtained from *Acacia Farnesiana* yield an excellent perfume for which there is always a demand. The oil consists of a methyl ester of salicylic acid. The tree is wild in most parts of Bengal and the Panjab, and the yellow flower heads perfume the atmosphere very pleasantly. When the plants are cultivated a tree yields 2 lbs. of flowers valued at three to four pence a pound; an acre thus realising £30 to £40.

At Cannes in the South of France cassie pomade is made by the process of infusion. This consists in infusing the substance in a mixture of lard and beef fat in a water-bath. Two pounds of the flowers are immersed entire in one pound of fat; after immersion in the fatty menstruum for the requisite period the mixture is strained off and the residue pressed. The pomade is preserved in large metal vessels. In India the animal fat may be substituted by petroleum wax or the concrete oil of *Vateria indica*, the Piney tallow of Malabar, or kokam butter—the natural fat of the seeds of *Garcinia indica*.

About fifteen years ago a large consignment of Indian made cassie pomade was shipped to London and was found to be superior to that grown at Grasse in France. This



opinion was confirmed by the eminent firm of Messrs. Schimmel & Co. It is to be regretted that this promising trade was abandoned owing to the death of the gentleman who made this perfume in Naini Tal, but it is hoped that this reference to the excellence of Indian cassie pomade will resuscitate its manufacture.

Patchouli oil is an absolute necessity for perfumery. The true patchouli is prepared from a labiate plant, the *Pogostemon Patchouli*, a native of Malaya and Indo-China. But there are various species of *Pogostemon* in Western India which are marked by their strong perfume and would doubtless yield essential oils if submitted to distillation.

The following list of raw materials for the manufacture of perfumes in India might be added to the more important ones I have been considering :—

- Mesua fenea, flowers. Nagkesur.
- Ochrocarpus longifolius, flowers. Lal-nagkesur.
- Ruta graveolens, herb. Rue, Sudáb.
- Zanthoscyllum sp., fruits. Pepper flower.
- Toddalia aculeata, leaves. Milakaranai.
- Munaya Koenigi, leaves. Curry leaf tree.
- Citrus sp. Fruits and leaves. Oranges and lemons.
- Oegle Marmelos, leaves. Běl.
- Feronia elephantum, leaves. Wood apple.
- Hardwickea pimata, oleo-resin. Yenne.
- Prunus armeniaea, seeds. Rubani.
- Prunus insititia seeds. Alu-bokhara.
- Alteggia excelsa, balsam. Nantayok.
- Myrtus communis, leaves and fruit. Myrtle.
- Carum carni, fruits. Sujah-jira, caraway.
- Fœniculum veelgaw, fruits. Fennel.
- Pencedanum graveolens fruits. Dill.
- Aralia Pseudo-ginseng root. Indian Ginseng.
- Nardostachys Jatamansi, root. Spikenard.
- Blumea balsamijera, plant. Ngai.

*Sphæranthus indicus*, flowers. Mundi.  
*Achillea Millefolium*, plant. Biranjasit.  
*Spilunthes Acmeila*, flower heads. Pipulka.  
*Artemisia vulgaris*, herb. Wormwood.  
*Sanssurea Lappa*, root. Kut. Paehak.  
*Mimusops Elengi*, flowers. Maulsiri.  
*Nyctanthes arbor-tristis*, flowers, Night Jasmine.  
*Jasminum grandiflorum*, flowers. Jasmine.  
*Plumeria acutifolia* flowers. Khair-champa.  
*Ipomœa sinuata*, leaves. Noytau plant.  
*Vitex Negundo*, leaves. Nisinda.  
*Vitex triplolia*, leaves.  
*Ocimum basilicum*, herb. Sweet basil.  
*Ocimum sanctum*, herb. Holy basil.  
*Ocimum gratissimum*, herb. Ram-tulsi.  
*Lavandula stœchas*, herb. Arabian lavender.  
*Mentha sylvestris*, herb. Wild mint  
*Origanum marjorana*, herb. Marwa, marjoram.  
*Thymus serpyllum*, herb. Wild Thyme, masho.  
*Piper Betle*, leaves. Pan.  
*Cinnamomum* sp. bark and leaves. Indian cinnamon.  
*Litsæa polyalthia*, leaves.  
*Aquilaria Agallocha*, wood. Agar, eagle wood.  
*Salix Caprea*, flowers. Bedmishk.  
*Juniperus communis*, fruit. Juniper berries.  
*Cedrus libam*, wood, oleo-resin. Deodar.  
*Kæmpfelia Galanga*, tubers. Chandra mula.  
*Hedychium spicatum*, tubers. Kapur-Kachri.  
*Alpinia Galanga*, root. Greater galangal.  
*Homalomena aromatica*, root. Gondo matri.  
*Calamus*, Sweet flag.  
*Nigella Saliva*, Seeds. Black cummin.  
*Abelmoschus moschiferus*, Seeds. Ambrette.  
*Cassias Tetrantteras*, of the laurel tribe.

**THE SECOND INDIAN INDUSTRIAL CONFERENCE.**

**Indian Essential Oils.**

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IN introducing to the Indian Industrial Conference the subject of perfumes one is struck by the fact that so little has been previously written on the subject. India as an Eastern and tropical country is renowned all the world over for its odoriferous species and perfumed blossoms, the essences of which have been extracted by recondite methods for ages past. The sources, uses and preparation of these ancient drugs is a highly interesting historic study and would be out of place to discuss here. I referred to this aspect of the subject about two years ago in an article on 'The Perfumes of the Moghuls' (*Calcutta Review*, Oct., 1904). On the present occasion it will be my aim to indicate the geographical and botanical sources of the chief commercial essential oils, review the present condition of the trade, and make a few practical suggestions in passing on the future possibilities of the industry.

Essential oils are distinguished by their strong and characteristic odours, and by being evaporated without decomposition and with little or no residue. The composition of essential oils is variable; many like turpentine oil consist of carbon and hydrogen only, others contain oxygen in addition. Their chemical constitution also differs in different cases, the majority being ethereal salts or compound ethers, aldehydes or phenols. Many essential oils consist of hydrocarbons or fluid bodies, mixed with solid oxidised compounds. When the latter are present in considerable amount a portion usually

separates out in a crystalline form. In such cases the solid is often referred to as the *stearoptene* and the liquid is called the *elæoptene*. The essential oils are almost all of vegetable origin and exist in the flowers (as the rose), in the leaves (as the basil), in the rind of fruit (as the orange), and the fruits of the umbelliferæ (as the anise and ajwain).

The extraction of the oils is performed by the following methods, but in India the first only is that in general use.

1. Distillation of plants or parts of plants by boiling with water and condensing the steam. Notwithstanding that nearly all essential oils boil at a higher temperature than water their vapours escape with the vapour of water and collect in the distillate where they separate. Another modification of this method is to employ steam instead of a naked fire, this prevents the caking and burning of the solid matter at the bottom of the still.

2. The process of the sponge and the ecuelle. In the case of fruits of the orange tribe, in which the oil glands are large and numerous, a portion of the essence can be extracted without distillation. For this purpose either a sponge, or a vessel like a cup with sharp points inside, is used for separating the oil from the peel.

3. Expression. In a few cases (orange, lemon, &c.) a part of the essential oil may be obtained by submitting the material to pressure.

4. Maceration in fat. This is to avoid as much as possible the application of heat. The flowers are macerated in vegetable tallow or paraffin, previously melted on a water-bath. The fat, charged with the essence, is afterwards shaken up with alcohol which removes the perfume.

5. Enfleurage or absorption is another process having the same object. Here layers of fat on glass frames are covered with flowers, and the flowers changed each day until the fat is sufficiently impregnated with the perfume.

For the purpose of illustrating the trade in Indian essential oils I have prepared a diagram showing the value of

the exports for the past twenty-seven years. In 1879 the exports were valued at Rs. 1,20,439, they rose in 1902-3 to Rs. 7,70,872, and have remained at a high figure since then. On consulting the table it will be seen that there are two serious depressions, one occurring in 1896-97 and the other in 1900-01. It will be remembered that these periods coincided with two disastrous famines which were particularly felt in the Central Provinces, the region of the grass oil industry. The famine of 1896-97 affected the Khandesh district and naturally resulted in short supplies of the oil. In 1899-1900 the famine of the Central Provinces was worse in the Western provinces of Nimar and Betul. In Nimar the death rate reached the melancholy height of 105 per mille. The exceptional drought decimated the plants just at the season of distillation and for some months that year the Bombay dealers received no stocks. This scarcity not only affected the trade in India but also caused great inconvenience in the European markets, the price had to be raised, and the door was opened to smaller dealers to resort to adulteration. The monsoon that burst in July, immediately after the famine, was very heavy, and the young grass suffered in consequence, but in 1901 and 1902 the industry recovered itself as will be shown in the table. In studying the essential oil industry in India where the occupation is chiefly in the open air one has thus to reckon with drought, floods, frost and other adverse climatic conditions which in certain seasons give the trade a 'set-back.'

After these general remarks on the Indian trade as a whole, I propose to refer to the various perfume plants which afford commercial oils and specify a few others which might be rendered to some account as trade articles in the future.

One of the most important essential oils in this country is East Indian geranium or palma rosa oil. It is known in the vernacular as *rusa-ka-tel*, and is referred to in ancient works on perfumes and medicines. The oil is obtained from a grass—*Andropogon Schoenanthus*—or rusa grass, which is widely distributed in India. This grass is abundant in the North-

east of the Bombay presidency, in Malwa, Merwara and Rajputana in Central India, and in the Central Provinces and Berar. The art of distilling the essential oil from the grass was probably commenced in Khandesh in the 18th century when this district was in a flourishing condition under its Muhammadan rulers. The original seat of the industry appears to have been at Pimpalnur, but as the oil became in greater request the manufacture spread to Nandubar, Shahada and Taloda. The Nimar district in the Central Provinces has always been an important centre, so much so that the oil was for many years known commercially as 'Nimar Oil.' It was first brought to the notice of Europeans by Dr. Maxwell in 1825, and Mr. J. Forsyth, in 1827, was the first to make an inquiry into the industry. He found the grass in patches in the jungles throughout Nimar and the Nerbudda Valley, but in greater abundance along the foot of the Vindhyan range in the vicinity of Jaun ghat, and 30 miles further west on the table land near Nalcha. The plant commences to flower at the end of August and continues to flower vigorously to October and November and during this time it gives sufficient oil to cover the expenses of its preparation. The distillation was conducted eighty years ago according to the same methods in use at the present day. The grass is boiled with water in wrought iron stills fitted over an earthen fireplace. From the still-head two straight tubes, from 5 to 6 feet long, conduct the vapours into two copper receivers immersed in cold water. The process occupies about six hours, and as four boilings are made in the 24 hours, a seer of oil can be obtained in that time. One of these stills will produce one and a half maunds or 80 quarts of oil during the season. We have no computation of the number of stills employed at the present time, but in 1879-80 there were 197 stills producing 71 cwts. of oil in West Khandesh and 100 of these were in Nandurbar alone.

Within the last few years there has been a considerable expansion of the industry in the Central Provinces and Berar. In the Forest Administration Report for 1896-97 the distillation was observed to be extending in Nimar district, and was carried on

also in Hoshangabad, Betul, Mandla and Seoni. The forest revenue from the grass became an important consideration; in 1901-02 in the Betul district the receipts from leasing rusa grass *birs* went up from Rs. 1,325 to Rs. 7,332. Lately other districts have shown a revenue of over Rs. 10,000 per annum for leasing rusa grass lands.

In Berar the distillation is carried on in Ellichpur, Amraoti, Buldana, Basim and Wun. Jamod in Akola has been said to be celebrated for the industry. The oil prepared in various localities in Berar is brought to the chief market at Ellichpur town where it is brought up by dealers and exported to Bombay at Rs. 2 to Rs. 4 per pound according to quality. The grass is everywhere very abundant, and the distillation requires only a moderate amount of skill and a small initial capital. The manufacturer is therefore well recompensed for his labour which is shown by the late increase in outturn and proved by experiments made by the Forest department in 1902-03.

There are two kinds of rusa grass oil obtained in the Central Provinces, one of a fine delicate odour and yellow colour called "Motia," and the other darker and more pungent called "Sophia." Ordinary rusa oil has for its principal constituent an alcohol boiling at 232°, named geraniol. The amount of this constituent varies from 76 to 93 per cent. Rusa oil is soluble in 3 or more parts of 70 per cent. alcohol. It was formerly adulterated with ground-nut oil, but as this is readily detected it was afterwards adulterated with kerosine and turpentine oil. The dealers have lately given up the suicidal policy of sophistication, and export the oil as it comes from the distillers. A very simple test for this and all other essential oils is to place a drop or two on a piece of white blotting paper and heat it. If volatile oils are present no stain will be left, but in the case of fixed oils, like ground nut or castor, there will be a greasy stain. The only satisfactory method of testing an essential oil is to ascertain the boiling point, and to separate the constituents by fractional distillation, and separation of its alcohol by potassium sulphite, and other chemical methods.

Rusa grass oil was formerly designated Turkish geranium oil in the time when the oil entered the European market by way of Constantinople where it was used on a large scale for mixing with otto of roses. It is used by the Arabs and Turks in making hair oil, but it is most extensively employed in soap manufacture and perfumery.

*Exports of Essential Oils (chiefly Rusa-grass oil)  
from Bombay.*

	gallons.	Rs.
1896-97	8,199	1,49,553
1897-98	10,776	2,09,691
1898-99	16,000	4,04,140
1899-1900	10,400	2,78,005
1900-01	12,834	3,44,670
1901-02	19,641	6,10,783
1902-03	18,872	5,23,630
1903-04	20,680	5,38,774
1904-05	18,742	4,65,209
1905-06	23,436	5,51,425

These figures reveal a five-fold increase during the past forty years, for in 1866-67 we find that 41,643 lbs. (4,627 gals.) were shipped from Bombay to England and ports of the Red Sea. About ten years ago Egypt, the United Kingdom and Turkey in Europe were the principal consumers; at the present time, while Egypt is still absorbing one-third of the exports, Germany and France have become important buyers.

In former years, as we have shown, East Indian geranium oil always varied in composition and properties, it appeared to be made from a mixture of grasses and it was often adulterated with other oily products. Within recent years the situation has changed and an excellent oil at moderate prices is in the market. It has acquired a distinct reputation in the perfumery industry and is considered a good material for scenting soaps.



From a commercial point of view a critical stage has been reached. The production of the oil has grown in an unprecedented manner and large parcels of good and medium oil are being regularly thrown on the market. The price last year had never before reached such a low quotation and large supplies this year are threatening still further to depress its value. In consequence of these favourable conditions to purchasers on the Continent, the manufacture of geraniol on a large scale has been taken up and this added to its cheapness will cause other outlets to be invented for its use as a natural or artificial perfume.

Besides India Europe receives fair quantities of geranium oil from Algeria and Reunion, and the Spanish oil in point of quality is not approached by any other kind. The production in Algeria is estimated at 270 cwt., and at least 1,250 acres of grass are under cultivation. From Reunion the average exports of oil have been 250 cwts. Notwithstanding this competition India in the matter of quantity is far in advance of any other country in the production of this perfume.

Lemon-grass oil is another grass oil derived from a species of *Andropogon* usually referred to as *A. citratus*. Although allied to rusa grass oil in its botanical origin, it is totally distinct in its chemical composition. Lemon grass oil, as its name signifies, has a lemon-like odour and taste. It is a yellowish or reddish liquid of sp. gr. 0.899 and 0.903. It is readily soluble in 2 pts. of alcohol of 70 per cent. The chief constituent is an aldehyde, citral boiling at 228°, which occurs in the oil to the extent of 70 to 75 per cent. Citral is also found in lemon peel, the leaves of the true verbena of Spain, and in other lemon-smelling plants.

Lemon grass oil is prepared in Southern India, and the industry is more modern than that of rusa oil. I can find no earlier record than its importation into England in 1832. For many years it has been prepared on the western slopes of Travancore north of Anjengo as far as Cochin, where the grass can be obtained sufficiently green and fresh for about six months in the year. In this region the Malayalis distil the

grass in copper stills with an earthen dome and the condenser consists of a copper tube passing through a tall wooden bucket. Each boiling yields a quart of oil worth about Rs. 3 in the bazar. In the eastern part of the Travancore State the Tamils use a round copper boiler contracted into a neck at the top and about four feet high. The top is covered with a specially prepared earthen vessel which communicates with a copper tube about three inches in diameter which passes through a condenser filled with cold water to a receiving vessel. When the still is charged with grass, all the joints are made air tight by luting with rags and clay. Distillation is continued for twenty-four hours when about a pint of oil is obtained. The stills are moved about from place to place according to the abundance of the grass, and in the cold weather may be seen dotted over the landscape. In February the grass becomes coarse and is burnt. The industry and the profits were formerly in the hands of natives and operations were carried on with grass growing wild in the jungles. Gradually the wild grass of the two States of Travancore and Cochin was insufficient to supply the increasing demand for the oil from Europe. The distillers of Cochin then began to exploit Malabar where the grass was not known to have any economic value. The owners of the land on account of the new use of the grass enjoyed the benefit of seeing it rise to fourteen times its former value. Planters have commenced distillation in the Ernad and Walluvanad taluqs, in the Wynaad, and Venieri in Pudukoti. These hilly regions are covered entirely with lemon grass which is sold at a nominal sum, but the question of specially cultivating the grass for oil in suitable lands is now being considered. It has been said that the new industry will provide an outlet for the energies of the Moplahs whose fanaticism is so well known and perhaps may be traced to the straitened circumstances of their existence. In 1903 there were eleven stills at work at Waluvanad, most of them being controlled by Moplahs. The stills used here are more modern in construction than those used in the south, and are made locally at a cost of between Rs. 200

and Rs. 300 each. The copper boiler is six feet high and twelve feet in circumference. From the head of the still a pipe conducts the steam through a condensing tub filled with cold water and the oil is collected into the vessels used as receivers. An ordinary grass-cutter is paid two annas a head-load for the lemon grass, and sixteen of these bundles are sufficient to fill a boiler, which after distillation yield one bottle of oil. The best oil before it is bottled is always filtered through paper. When Travancore held the monopoly of the industry, the oil was exported from Cochin, but now that the industry has extended northwards into Malabar, Calicut is becoming a centre of distribution.

Lemon grass oil is exported in reputed quart bottles each of which is guaranteed to contain 23 ounces. One dozen of these bottles make a case. The exports from Cochin have risen from 228 cases in 1884 to 2,387 cases in 1889 and 1,917 cases in 1890. At the present time from 2,000 to 3,000 cases are exported annually from Cochin to Bombay and to various foreign ports, chiefly New York, Hamburg and London.

The following are the exports of essential oils, chiefly lemon grass oil, from Madras during the past ten years :—

	gallons.	Rs.
1896-97	5,324	79,081
1897-98	6,292	1,33,775
1898-99	4,278	89,745
1899-1900	6,280	1,29,701
1901-02	5,89	27,376
1902-03	6,258	2,42,319
1903-04	3,889	1,60,505
1904-05	2,721	1,41,489
1905-06	2,675	1,54,141

A large proportion of the oil is absorbed for the manufacture of citral, and ionone—an artificial violet perfume. On this account within the last three years the price has quadrupled.

These prices must have proved very favourable to the distillers and traders of the Western Coast, but on the other hand fresh sources of supply have appeared which may compete with the present monopoly. An export trade in the oil has recently developed in Java. It is also brought in small quantities from Singapore and Ceylon, and experimental batches have been sent from Tonkin, San Thome in Portuguese West Africa, Brazil, and Monserrat in the West Indies. Messrs. Schimmel & Co., certify that the Brazilian and West Indian oils are unable to compete with the East Indian oil on account of their insolubility in alcohol. The demand for lemon grass oil is steadily on the increase in England and the Continent, and all things being considered there is a very successful future for its manufacture in India.

Citronella oil, although prepared chiefly in Ceylon, should be referred to in dealing with grass oils. This oil is distilled from *Andropogon Nardus*, a grass cultivated on the slopes of the hills in the Southern Province of Ceylon, and according to statistics as much as 40,000 to 50,000 acres are under cultivation. The first and principal harvesting period is in July and August, and the second lasts from December until February. The average yield is from 16 to 20 bottles of oil per acre for the summer and from 5 to 10 bottles for the winter season. The stills, of which there are 600, are modern, and the success of the natives who constitute the majority of the producers is remarkable. There has been an enormous increase in production and consumption of citronella oil in Ceylon, which is shown by the exports reaching in 1899 one and a half million pounds in weight. Since this date exports have declined.

The oil contains citronellal and geraniol; it is occasionally adulterated with fatty oils, petroleum, resin spirit, acetone, and alcohol. It is much cheaper than lemon grass oil and it is sometimes used for the purpose of adulterating the latter.

Leaving the grass oils which are the chief Indian essential oils that are exported in large quantities we will consider some

of the essences and perfumes which are made and used to a considerable extent in the country. Sandal wood is one of the most important perfumes in the East, as it is one of the most fashionable in the West and is mainly derived from the province of Mysore where the trees are protected by the state. The annual auction sales of the wood from the roots and stems brings in an annual revenue of five or six lakhs of rupees. The wood is sold in grades varying from Rs. 500 per ton for selected logs to Rs. 85 per ton for fixed chips. The wood is purchased by Muhammadans in Bombay, whose agents attend the Mysore auctions, and is shipped to Europe *via* Tellicherry or Bombay.

The Mysore Government has long had establishments for extracting the oil which is sent to China and Arabia. The oil is procured from the wood by distillation, the roots yielding the largest quantity and finest quality. The yield of the oil is at the rate of 10 ozs. per maund or 2.5 per cent, and the process lasts several days. The average price of the oil in India is Rs. 8 per pound. Two or three private firms have also established stills, but the oil is said not to compare in properties with that made by European distillers. While it appears desirable from a commercial aspect to prepare the oil in the country that produces the raw material the indigenous stills are not at present capable of dealing with large quantities. At the factory of Messrs. Schimmel & Co., Leipzig, special appliances are used for comminuting the wood, and their stills are constructed for producing daily four cwts. of oil, with an average yield of 3.3 per cent.

In 1902 it was reported from Mysore that the spike disease has appeared in the sandalwood plantations which was threatening the trees with destruction. The disease had first been observed in Coorg in 1900. There has naturally been an upward movement in the price of the oil in spite of the large quantity of wood sold at the auctions owing to the numbers of trees cut down at Hunsur, Chickmagalur, Seringapatam and Coorg which showed traces of the disease. Unfortunately no

successful remedy has at present been found for the disease ; and the future does not look hopeful. A decline in supplies of sandal wood is predicted, as the young trees are particularly subject to the disease, and the growth of new plantations is not at present calculated to keep pace with the consumption.

These remarks on the ancient and favourite perfume of sandal wood oil will appropriately introduce the subject of attars or ottos, of which rose otto is the most important. In former Moghul times sandal oil was generally used as the basis in preparing all ottos. Col. Phillott, an authority in Persian and Urdu literature, has drawn my attention to an old work published in Lahore, describing the preparation of otto of roses. The copper alembic and condensing appliances are carefully detailed, the former is charged with rose petals and water, but before heat is applied a small quantity of sandal oil is to be placed in the receiver with the object of "drawing over" 'the rose essence.' "Each time the otto is prepared sandal wood oil must be placed in the receiving vessel." The resulting essence was no doubt an agreeable perfume, but in modern times it is more satisfactory to obtain the pure essential oils first, and then blend them in known proportions afterwards.

Rose water is manufactured in Bengal and the Panjab, but a large quantity is imported from Persia. For over two centuries rose water and otto have been made in Ghazipur on the banks of the Ganges from the damask rose (*Rosa damascena*). The oil distilled there, however, is never pure, being adulterated with other oils. One hundred lbs. of rose leaves or one hundred thousand roses are estimated to produce three drachms or 180 grains of otto and 100 bottles of rose water. Rosewater to the extent of 20,000 to 30,000 gallons annually is imported into Bombay from Persian Gulf. Two qualities are met with—Yak-atishi (once distilled) and Du-atishi (twice distilled). Its value is Rs. 4 to Rs. 4½ for a carboy of 20 lbs.

Turpentine oil—the essential oil distilled from the turpentine or oleo-resin of the Chil Pine (*Pinus longifolia*) is prepared by the Forest Department in Northern India. Factories are

established at Dehra Dun, Naini Tal, and Nurpur in Kangra. These centres are capable of producing about 20,000 gallons of turpentine oil a year. The whole of this output is consumed in the country being used in the Medical Stores, Military Department, by several railway companies, and by paint and varnish manufacturers. Samples of the oil have been sent to England, and have been favourably reported upon by such eminent authorities as Professor Armstrong and Sir Boverton Redwood.

Eucalyptus or Blue gum oil is now an established industry on the Nilgiri Hills. The blue gum plantations were commenced about sixty years ago, and the wood has been used principally as fuel. About twenty years ago the oil was first distilled from the leaves in the Botanical Gardens, Ootacamund. At the time of the influenza epidemic in 1891, the manufacture was taken up by Mr. Wallace, and the oil was readily bought locally and by the Medical Stores depot in Madras. Lately other stills have been erected at Lovedale and Coonoor and the produce finds an appreciative market.

Camphor is a concrete essential oil largely used in India, and in recent years a great deal has been written regarding the cultivation of the tree in India and Ceylon. It is well known that the camphor of commerce is largely manufactured in Central China, Formosa and Japan, and is one of those articles subject to monopoly and consequently to advancing values. It has been considered a suitable tree for cultivation in this country, but the prospect of waiting fifty to a hundred years for trees to reach a mature enough condition to yield camphor has deterred many from speculating in the enterprise. It has also been suggested that camphor might be made from the leaves of comparatively young trees, but as I pointed out ten years ago there is a small yield of oil in the leaves and the amount of camphor is very variable. Experiments must be made in this direction on a larger scale before definite opinions can be expressed.

Ajwain or ajowan (the seeds of *Carum copticum*) is largely used in medicine, and the oil and water are prepared nearly all over India. The *aik* or distilled water, called *omum* water in South India, is a favourite domestic remedy replacing the well-known dill water of Europe. The oil by spontaneous evaporation at a low temperature yields a crystalline substance or stearoptene known under the name of *Ajowan ke phul*. This substance is identical with thymol, contained in the Western herb, *Thymus vulgaris*. Crude thymol manufactured in Central India has an average value of Rs. 8 per lb. There are other plants of the umbelliferous order the fruits of which might be conveniently distilled and the oil exported.

Winter-green oil is largely consumed in America on account of its aromatic and medicinal properties. Its special value resides in the fact that it consists chemically of a compound of salicylic acid, and is a strong antiseptic. One or two drops placed in a bottle of ink or gum used on the office table will prevent the formation of mould. An Indian Winter-green (*Gaulthera fragrantissima*) grows on the Nilgiris and other mountains in Southern India and its essential oil is easily prepared by using an ordinary copper still.

Dipterocarpus oil (Gurjan balsam or wood oil) is obtained from various species of *Dipterocarpus* growing in Assam and Burma. The balsam or oleo resin consists of a resin acid, gurgunic acid, and an essential oil. The oil is becoming more and more important for the trade owing to its industrial and medicinal applications.

I would now enumerate a few indigenous perfumes which are often asked for by English and Continental dealers. These relate specially to delicate scents which of necessity must be made from fresh flowers and plants since the raw articles rapidly deteriorate. The preparation of these oils is thrown out as a suggestion to those who have a small capital and who would be sufficiently enterprising to make experiments.

The essence of Champaca or Champa from the flowers of *Michelia Champaca* is always wanted in perfumery. The small



supplies in Europe of this oil are continually being exhausted. The blossoms must be gathered singly just as they expand and must be distilled at once or submitted to the process of enfleurage. No way has yet been devised of otherwise preserving them from rapid decay. Where these trees occur in any abundance a profitable harvest of the aromatic principle could be easily obtained.

Keora essence is another perfume much sought after by European distillers. The flowers have a most delicate scent, but samples of oil placed on the market are usually obtained by steeping the blossoms in sesame oil which destroys all the honeylike characters of the true odour. The keora known by the English name of Screw pine and by botanists as *Pandanus odoratissimus* is a native of India, Persia, and Arabia, and occurs frequently along the Western Coast.

Cassie flowers obtained from *Acacia Farnesiana* yield an excellent perfume for which there is always a demand. The oil consists of a methyl ester of salicylic acid. The tree is wild in most parts of Bengal and the Panjab, and the yellow flower heads perfume the atmosphere very pleasantly. When the plants are cultivated a tree yields 2 lbs. of flowers valued at three to four pence a pound; an acre thus realising £30 to £40.

At Cannes in the South of France cassie pomade is made by the process of infusion. This consists in infusing the substance in a mixture of lard and beef fat in a water-bath. Two pounds of the flowers are immersed entire in one pound of fat; after immersion in the fatty menstruum for the requisite period the mixture is strained off and the residue pressed. The pomade is preserved in large metal vessels. In India the animal fat may be substituted by petroleum wax or the concrete oil of *Vateria indica*, the Piney tallow of Malabar, or kokam butter—the natural fat of the seeds of *Garcinia indica*.

About fifteen years ago a large consignment of Indian made cassie pomade was shipped to London and was found to be superior to that grown at Grasse in France. This

opinion was confirmed by the eminent firm of Messrs. Schimmel & Co. It is to be regretted that this promising trade was abandoned owing to the death of the gentleman who made this perfume in Naini Tal but it is hoped that this reference to the excellence of Indian cassie pomade will resuscitate its manufacture.

Patchouli oil is an absolute necessity for perfumery. The true patchouli is prepared from a labiate plant, the *Pogostemon Patchouli*, a native of Malaya and Indo-China. But there are various species of *Pogostemon* in Western India which are marked by their strong perfume and would doubtless yield essential oils if submitted to distillation.

The following list of raw materials for the manufacture of perfumes in India might be added to the more important ones I have been considering :—

- Mesua fenea, flowers. Nagkesur.
- Ochrocárus longifolius, flowers. Lal-nagkesur.
- Ruta graveolens, herb. Rue, Sudáb.
- Zanthoscyllum sp., fruits. Pepper flower.
- Toddalia aculeata, leaves. Milakaranai.
- Munaya Kœnigi, leaves. Curry leaf tree.
- Citrus sp. Fruits and leaves. Oranges and lemons.
- Oegle Marmelos, leaves. Bél.
- Feronia elephantum, leaves. Wood apple.
- Hardwickea pimata, oleo-resin. Yenne.
- Prunus armeniaea, seeds. Rubani.
- Prunus insititia, seeds. Alu-bokhara.
- Altengia excelsa, balsam. Nantayok.
- Myrtus communis, leaves and fruit. Myrtle.
- Carum carni, fruits. Sujah-jira, caraway.
- Fœniculum veelgaw, fruits. Fennel.
- Pencedanum graveolens fruits. Dill.
- Aralia Pseudo-ginsing root. Indian Ginsing.
- Nardostachys Jatamansi, root. Spikenard.
- Blumea balsamijera, plant. Ngai.

*Sphæranthus indicus*, flowers. Mundi.  
*Achillea Millefolium*, plant. Biranjasit.  
*Spilunthes Acmella*, flower heads. Pipulka.  
*Artemisia vulgaris*, herb. Wormwood.  
*Sanssurea Lappa*, root. Kut. Paehak.  
*Mimusops Elengi*, flowers. Maulsiri.  
*Nyctanthes arbor-tristis*, flowers. Night Jasmine.  
*Jasminum grandiflorum*, flowers. Jasmine.  
*Plumeria acutifolia* flowers. Khair-champa.  
*Ipomœa sinuata*, leaves. Noyeau plant.  
*Vitex Negundo*, leaves. Nisinda.  
*Vitex triplolia*, leaves.  
*Ocimum basilicum*, herb. Sweet basil.  
*Ocimum sanctum*, herb. Holy basil.  
*Ocimum gratissimum*, herb. Rām-tulsi.  
*Lavandula stœchas*, herb. Arabian lavender.  
*Mentha sylvestris*, herb. Wild mint  
*Origanum marjorana*, herb. Marwa, marjoram.  
*Thymus serpyllum*, herb. Wild Thyme, masho.  
*Piper Betle*, leaves. Pan.  
*Cinnamomum* sp. bark and leaves. Indian cinnamon.  
*Litsæa polyalthia*, leaves.  
*Aquilaria Agallocha*, wood. Agar, eagle wood.  
*Salix Caprea*, flowers. Bedmishk.  
*Juniperus communis*, fruit. Juniper berries.  
*Cedrus libam*, wood, oleo-resin. Deodar.  
*Kæmpelia Galanga*, tubers. Chandra mula.  
*Hedychium spicatum*, tubers. Kapur-Kachri.  
*Alpinia Galanga*, root. Greater galangal.  
*Homalomena aromatica*, root. Gondo matri.  
*Calamus*, Sweet flag.  
*Nigella Saliva*, Seeds. Black cummin.  
*Abelmoschus moschiferus*, Seeds. Ambrette.  
*Cassias Tetrantteras*, of the laurel tribe.

## The Best Indian Woods for the Manufacture of Matches and Match-boxes.

BY RAI SAHIB UPENDRANATH KANJILAL, F.L.S.,

*Instructor, Imperial Forest College, Dehra Dun.*

IN Sweden, the most noted match-manufacturing country of the world, Aspen (*Populus tremula*, Linn) is the wood found best suited for matches and match-boxes, and pines occupy the second rank as regards the former. In India Aspen does not grow anywhere indigenously. The nearest approach to it in botanical relationship is made by a tree which is found in Kashmir and the Punjab Himalaya as also in countries west of that region such as Afghanistan and Baluchistan. But it is nowhere in great abundance and a great obstacle to increasing its stock is that it very seldom produces any flower or fruit. It can therefore reproduce itself naturally, chiefly by the shoots which spring from the roots or artificially by means of cuttings. The botanical name of this tree is *Populus alba* and the Kashmiris call it *Jangli Frast*. The wood of this tree is not wholly unknown even in distant Bengal for it is in small round boxes made of this wood that we see grapes sold in the cold weather by the men known to us as Kabulis.

Although this wood is eminently well suited to the purpose, its small supply will preclude its use anywhere outside the northern districts of the Punjab.

'Pines' is a term applied loosely in commercial parlance to a number of trees which, although coming under the same Natural Order, Coniferæ, belong to very different Genera or

groups of it. None of the European pines, however, grow naturally in India; we have therefore to find their substitutes in the coniferous trees that are indigenous in our forests.

Before proceeding to select the most suitable woods it seems necessary to investigate briefly what characteristics should be sought for in such woods.

Both for the purpose of matches and match-boxes it is necessary that the wood should be easy to split and at the same time elastic and strong enough not to break in splitting or in bending to make the boxes; and for matches it is also necessary that it should take fire easily and should continue to burn steadily with a flame when ignited and that it should not emit an unpleasant smell in burning. It is also an essential point that the supply should be sufficient locally or be easily available in quantities where match factories are likely to be established.

To begin with the first characteristic, that of splitting with ease. This depends mainly on the structure of the wood. Avoiding anatomical and technical details, wood may be said to consist of fibres which run parallel to the axis of growth and which in dicotyledons (*i.e.* in plants other than of the nature of palms, bamboos or ferns) are held together by thin fibrous plates which lie in vertical planes radiating from the centre of the tree. Ease in splitting depends on the length and straightness of the vertical fibres and on the fineness, regularity and abundance of the vertical plates which are called *medullary plates*. These plates are best seen on a transverse section where they show as radiating lines, like rays from a luminous point, either continuous or broken, and are usually and more aptly called *medullary rays*. Knotty wood is more difficult to split than wood free from knots, for around knots the fibres get twisted and are more closely packed, and there is generally much want of uniformity of structure in their neighbourhood. Some trees naturally grow straight and more or less free from knots and it is preferably from among these that we have to make our selection. When trees are grown scientifically in forests

or plantations, they can be forced to grow straight and comparatively free from knots even though they would not do so in nature.

For the particular purpose of matches the wood should also be soft and light. A soft and light wood, provided the fibres are straight and elastic and the medullary rays fine, regular and numerous, splits with a smoother and cleaner surface than a heavy and hard wood. A little amount of strength and elasticity must be combined with softness, otherwise it would be impossible to obtain splinters of any required length, and the match-sticks would break in rubbing to ignite them. It is owing to want of strength that the refuse sticks of the jute plant known in Bengal as Pát-káti ( পাট-কাটি ) or Pan-kati ( পাণ-কাটি ), though very soft and light are unsuitable for lucifer matches, although they were excellent for the old-fashioned sulphur matches of two generations ago, for which they were very extensively used.

In modern factories in Sweden the wood is first turned on lathes against a broad blade which peels off from it a long sheet of wood of the thickness of a match. This sheet is then cut up and split by machinery into separate sticks of the size of matches. But whatever be the process, the quality of wood sought for will remain much the same.

The second desideratum, that of taking fire easily, is also considerably affected by the softness and lightness of wood, for a soft and light wood takes fire more easily and if perfectly dry also burns steadily when ignited. A straight-grained, soft and light wood has the additional advantage of drying quickly and thus becoming fit to burn well soon.

In the higher grades of lucifer matches the combustibility of the sticks is artificially augmented by impregnating them with a hydrocarbon like paraffin. Some woods like the pines are naturally resinous or oily. They can therefore to a certain extent dispense with the hydrocarbon bath. Matches of inferior quality are tipped with sulphur to make them burn well.

The third property, that of not giving an unpleasant smell in burning, in respect of our Indian woods, has not yet been sufficiently investigated. But it will be seen that it is of comparatively small importance except for the very highest grades of matches; for although sulphur-tipped friction matches give a strong pungent smell, they hold their own in the market owing to their cheapness.

The question of supply is obviously of very great importance and is really a question of the geographical distribution of the species selected. I have already mentioned *Populus alba* which would be very suitable for the purpose, but which cannot be depended upon, as we cannot get enough of it from our forests and, as has already been said, there are serious obstacles to artificially increasing its stock.

In the description which I now proceed to give of the woods that seem to be suitable for matches and match-boxes, the above points have been kept in view as far as possible. I think it but proper to add that with the exception perhaps of the Conifers and the Poplars I possess no *certain* knowledge as to the actual suitability of any of the other woods mentioned. All that I have been able to do, during the short time allowed me for the paper, has been to go through the Wood Museum of the Imperial Forest College, Dehra Dun, which is admitted to be one of the finest in the world, and to closely examine those specimens which appeared to me most suitable. For the weights quoted as also for many other items of information I am indebted to the classic work of Mr. J. S. Gamble, M.A., F.L.S., F.R.S., C.I.E. (*Manual of Indian Timbers*).

1.—*Magnolia Griffithii*, Hook F. Vernacular *Bor. Gahori Sopa* (Assam). Wood soft, greyish white, weight 28 lbs. per cubic foot. Medullary rays fine, numerous, short. Habitat—moister parts of Assam including Cachar. Apparently not very abundant.

2.—*Bombax malabaricum*, DC. Vern. *Simul* (Bengal). The well-known Silk Cotton Tree. Wood very soft, greenish brown, containing a large percentage of phosphoric acid. Weight 17 to

32 lbs per cub. ft. Medullary rays numerous. Habitat—throughout the plains of India, also Burma and Ceylon, generally affecting damp localities. Easy to grow both from seed and cuttings and very fast-growing.

3.—*Ailanthus excelsa*, Roxb, Vern. *Maha-nim* (Uriya). *Ghor-karm* (Palamow). Wood white, soft. Weight 23 to 28 lbs per cub. ft. Medullary rays numerous and close. Habitat—Chota-Nagpur, Northern Circars and the Coromandel Coast. Not very abundant but can be easily grown from seed and cuttings and is a remarkable fast-grower.

4.—*Boswellia serrata*, Roxb. Vern. *Salai* (Bengal). Wood white, moderately hard. Weight 28 to 40 lbs per cub. ft. Medullary rays, rather broad, very short, not very numerous. From point of structure this wood is not very suitable but it contains a gum-resin owing to which it gives an agreeable smell when burnt and matches made of it are likely to burn steadily and well. Habitat—dry hills from Rajputana to Chota Nagpur, Orissa and Northern Circars: usually quite abundant where it grows.

5.—*Gomphandra axillaris*, Wall. Wood greyish white, soft. Weight 31 lbs per cub. ft. Medullary rays broad. A small tree of Sylhet and the Malabar coast.

6.—*Holigarna Beddomei*, Hook. F. Wood greyish white and soft. Weight 26 lbs per cub. ft. Medullary rays fine and short, not very numerous. A large tree of the Western Ghats.

7.—*Spondias mangifera*, Pers. Vern. *Amra* (Bengal). Wood greyish white and soft. Weight 20 to 30 lbs. Medullary rays—some fine and other broader, fairly numerous. Habitat—Sub-Himalayan forests, Assam, Eastern Bengal, Burma and the Deccan. Grows very fast and can be very easily propagated by cuttings.

8.—*Sesbania grandiflora*, Pers. Vern. *Bak* or *Bak-phul* (Bengal). Wood soft and white, weighing about 30 lbs. per cub. ft. Medullary rays fine, numerous. It is not an indigenous forest tree but can be easily grown in Bengal and most other parts of India.



9.—*Erythrina suberosa*, Roxb. Vern. *Dholdhak* (Hind.). Wood very soft, whitish. Weight 17 to 20 lbs per c. ft. Medullary rays short and broad. Habitat—dry forests of India and Burma.

Other species of *Erythrina* of which *E. indica*, Lam., is well known in Bengal as *Palitamadar* occur in E. Bengal and Burma and have wood very similar to the above.

10.—*Pithecolobium lobatum*, Benth. Vern. *Tanyin* (Burma). Wood grey, moderately hard. Weight 30 to 35 lbs. per c. ft. Medullary rays very fine and numerous. Habitat—tropical forests of Burma.

11.—*Gyrocarpus Jacquini*, Roxb. Vern. *Pitella* (Uriya). Wood grey, soft. Weight about 22 lbs. per c. ft. Medullary rays very short and moderately broad. Habitat—Orissa to N. Circars and the Deccan, also the Cocos Islands.

12.—*Tetrameles nudiflora*, R. Br. Vern. *Sandugaja*, (Bengal). Wood white, soft. Weight per c. ft. about 24 lbs. Medullary rays fine but clearly marked. Habitat—Darjeeling Terai and the Garo Hills: also Burma and the Western Coast. Much used for tea-boxes.

13.—*Anthocephalus Cadamba*, Mig. Vern. *Kadam* (Bengal). Wood whitish, somewhat hard, weighing about 40 lbs per cub. ft., often of an unpleasant smell. Medullary rays fine and numerous. Very common in E. Bengal and Assam and in the Darjeeling Terai. Also found in the forests of Pegu in Burma. Growth very fast.

14.—*Hymenodictyon Obovatum*, Wall. Vern. *Sirid* (Marhatti). Wood brownish grey, soft and smooth-grained, weighing about 28 lbs per c. ft. Medullary rays some fine and close, others broad and distant. A large tree of the W. Ghats.

Very similar but having a somewhat harder wood is *Hymenodictyon excelsum*, Wall. Vern. *Bhalena* or *Bhaultan* (Hind.), which is found in dry forests throughout India.

15.—*Cordia Myxa*, Linn. Vern. *Bahal* (Bengal); *Lassora* (Hind). Wood greyish, somewhat hard. Weight very variable,

the average being about 33 lbs per c. ft. Medullary rays short, moderately broad and fairly numerous. Habitat—India and Burma, mostly in damp forests and ravines up to 5,000 ft.

16.—*Wightia gigantea*, Wall. Vern. *Bop*. (Lepcha). Wood white, very soft and porous. Weight 14 lbs. per cubic ft. Medullary rays uniform, rather broad. Habitat—Eastern Himalaya and the hills of Assam and Burma.

This wood will probably be found too soft for the purpose and there may be some difficulty in securing a large supply.

17.—*Gmelina arborea*, Roxb. Vern. *Gamar*, *Gambhari* (Bengal). Wood brownish white, soft and even-grained. Weight about 36 lbs. per cub. ft. Medullary rays short, moderately broad, and fairly numerous. Habitat—the moister regions of India and Burma.

It has a fair demand as timber, especially in Bengal, and will probably be found too valuable to use for matches.

18.—*Trewia nudiflora*, Linn. Vern. *Pithali* or *Pithuli Bhurkunda* (Bengal). Wood white and soft. Weight about 30 lbs per c. ft. Medullary rays fine, numerous, uniform and closely packed. Habitat—Sub-Himalayan damp forests, also forests of Chittagong and Burma. Common about villages in some parts of Bengal.

19.—*Excœcoria Agallocha*, Linn. Vern. *Genwa* (Bengal). Wood very soft and spongy. Average weight 25 lbs per c. ft. Medullary rays very numerous and extremely fine. Habitat—tidal forests of India, Burma and the Andamans; very common in the Sundarbans and extensively used in Calcutta for bedsteads and other kinds of cheap house furniture.

20.—*Broussonetia papyrifera*, Vent. The Paper Mulberry tree of Japan. Vern. *Molaing* (Burma). Wood soft and greyish white, weight about 25 lbs per c. ft. Medullary rays rather broad and short but fairly numerous. Indigenous in the hills of Upper Burma and Martaban, but it can easily be grown in Central and Eastern Bengal to serve the double purpose

of supplying wood for matches and bark for an excellent paper stock. The growth is fast and the tree produces shoots copiously from stools and roots.

21.—*Ficus hispida*, Linn. Vern. *Dumur* (Bengal). Wood ash colour, soft and somewhat mottled. Weight about 32 lbs per c. ft. Medullary rays some fine and others broad in long narrow plates. Habitat—Bengal, Assam and the Outer Himalayan forests up to 3,500 ft.

22.—*Populus alba*, Linn. Vern. *Jangli Frast* (Kashmir); *Mal* (Punjab). Wood white or reddish white, soft, even-grained and elastic. Weight 28 to 44 lbs per c. ft. Medullary rays very fine, numerous and regular. Habitat—from the Punjab Himalaya westward through Kashmir to Afghanistan and Baluchistan. This tree has already been mentioned. It is undoubtedly one of the best woods for matches, especially for match-boxes.

23.—*Populus ciliata*, Wall. Vern. *Dangikat* (Nepali); *Garpipal* (Kumaon). Wood brownish grey and soft. Weight 25 to 35 lbs per c. ft. Medullary rays fine, numerous and regular. Habitat—Himalaya from the Indus to Bhotan, 4,000 to 10,000 ft.

The wood of this tree may be found almost as good as that of the last preceding species for matches and match-boxes. For a factory established in Bengal a supply can be obtained from Darjeeling, where another species of the same Genus, called *Sungribong* by the Lepchas is also found, the wood of which is expected to be of the same quality.

The following trees belonging to the Natural Order Coniferae are commonly known as pines. Some of their nearest allies are very extensively used in Sweden and Germany. Containing resin to a large or small extent, they burn very well and are, owing to the extreme regularity of the structure of their wood, peculiarly well suited to the purpose.

24.—*Pinus excelsa*, Wall. The Blue Pine. Vern. *Tongschi* (Bhutan); *Kail* (Jaunsar). Wood moderately hard, reddish white. Weight about 30 lbs. per c. ft. Medullary rays fine and numerous but rather irregular. Habitat—Western Himalaya and Bhutan.

25.—*Pinus longifolia*, Roxb. The Long-leaved Pine, Vern. *Chir* (Hind), *Griet* (Lepcha). Wood moderately hard, reddish brown. Weight 35 to 45 lbs. Medullary rays as in the preceding species. Habitat—Outer Himalaya from Afghanistan to Bhutan.

26.—*Picea Morinda*, Link. The Himalayan Spruce. Vern. *Rai* (Hind). Wood white, fairly, soft, weighing about 30 lbs. per c. ft. Medullary rays fine and very numerous. Common in the Himalaya, generally above 7,000 ft. from Afghanistan to Bhutan.

27.—*Abies Pindrow*, Spach. The Himalayan Silver Fir. Vern. *Morinda* (Hind). Wood white and soft. Weight rather less than 30 lbs per cub. ft. Medullary rays very fine, very numerous and regular but rather short. Habitat—Outer Himalaya between 7,000 and 9,000 ft., westward from Nepal.

This, as well as the last preceding tree, will probably be found to be the best procurable in India for matches. For match boxes, however, it is feared that they will prove too brittle to stand the usual process of manufacture.

To the above list may be added thick-walled straight bamboos like *Bambusa Balcooa*, Roxb. and *Bambusa Tulda* Roxb. so common in Bengal. The inner soft tissue when sufficiently dry burns very well, and the internodes can be split into match sticks most easily, especially when green, without the help of any special machinery.

If match sticks are made out of bamboos, match boxes can also be made of the same material, preferably from the more hollow kinds. These boxes of course will be cylindrical instead of the usual rectangular shape. A long internode can be cut up into several pieces of the length of the matches. One of the open ends can be closed with a thin circular disk of any kind of wood to form the bottom, and the lid can be of another piece of bamboo internode plugged by another disk, as made to fit the other end of the tube,—somewhat like the wooden cases used in Homœopathic pharmacy. The mixture for the friction surface (phosphorus in the case of safety matches

and powdered glass and glue in the case of ordinary friction matches) may be applied on either end of the tube or on a flat surface which can be easily prepared for it on the side. The cylindrical box can be as easily covered with paper and labeled as the ordinary rectangular boxes, perhaps even more easily. The rough sketches given below will explain my idea.

Wooden disk for the lid.

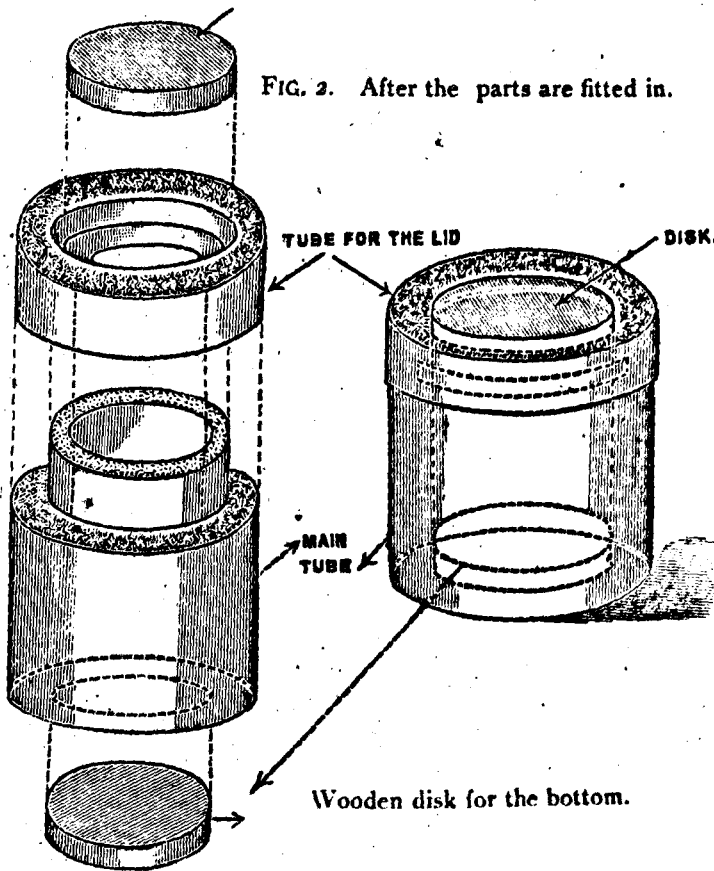


FIG. 2. After the parts are fitted in.

FIG. 1. Before the parts are fitted in.

It is recommended that if a match factory be established in Calcutta or its neighbourhood, trial should first be given to such local trees as *Simul* (No 2), *Amra* (No 7), *Genwa* (No 19) for matches, and to *Kadam* (No 13) and *Pithali* (No 18) for match-boxes. If these prove suitable, the expense of obtaining Firs and Poplars from the hills will be saved.

I may add in conclusion that if samples be required of woods that are not locally available, application should be made for them to the Imperial Forest Economist, Imperial Forest College and Research Institute, Dehra Dun, who can arrange to have them forwarded from the nearest source.

## The Best Indian Woods for the Manufacture of Matches and Match-boxes.

BY RAI SAHIB UPENDRANATH KANJILAL, F.L.S.,

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groups of it. None of the European pines, however, grow naturally in India; we have therefore to find their substitutes in the coniferous trees that are indigenous in our forests.

Before proceeding to select the most suitable woods it seems necessary to investigate briefly what characteristics should be sought for in such woods.

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To begin with the first characteristic, that of splitting with ease. This depends mainly on the structure of the wood. Avoiding anatomical and technical details, wood may be said to consist of fibres which run parallel to the axis of growth and which in dicotyledons (*i.e.* in plants other than of the nature of palms, bamboos or ferns) are held together by thin fibrous plates which lie in vertical planes radiating from the centre of the tree. Ease in splitting depends on the length and straightness of the vertical fibres and on the fineness, regularity and abundance of the vertical plates which are called *medullary plates*. These plates are best seen on a transverse section where they show as radiating lines, like rays from a luminous point, either continuous or broken, and are usually and more aptly called *medullary rays*. Knotty wood is more difficult to split than wood free from knots, for around knots the fibres get twisted and are more closely packed, and there is generally much want of uniformity of structure in their neighbourhood. Some trees naturally grow straight and more or less free from knots and it is preferably from among these that we have to make our selection. When trees are grown scientifically in forests



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The third property, that of not giving an unpleasant smell in burning, in respect of our Indian woods, has not yet been sufficiently investigated. But it will be seen that it is of comparatively small importance except for the very highest grades of matches ; for although sulphur-tipped friction matches give a strong pungent smell, they hold their own in the market owing to their cheapness.

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2.—*Bombax malabaricum*, DC. Vern. *Simul* (Bengal). The well-known Silk Cotton Tree. Wood very soft, greenish brown, containing a large percentage of phosphoric acid. Weight 17 to

32 lbs per cub. ft. Medullary rays numerous. Habitat—throughout the plains of India, also Burma and Ceylon, generally affecting damp localities. Easy to grow both from seed and cuttings and very fast-growing.

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18.—*Trewia nudiflora*, Linn. Vern. *Pithali* or *Pithuli Bhurkunda* (Bengal). Wood white and soft. Weight about 30 lbs per c. ft. Medullary rays fine, numerous, uniform and closely packed. Habitat—Sub-Himalayan damp forests, also forests of Chittagong and Burma. Common about villages in some parts of Bengal.

19.—*Excoecoria Agallocha*, Linn. Vern. *Genwa* (Bengal). Wood very soft and spongy. Average weight 25 lbs per c. ft. Medullary rays very numerous and extremely fine. Habitat—tidal forests of India, Burma and the Andamans; very common in the Sundarbans and extensively used in Calcutta for bedsteads and other kinds of cheap house furniture.

20.—*Broussonetia papyrifera*, Vent. The Paper Mulberry tree of Japan. Vern. *Molaing* (Burma). Wood soft and greyish white, weight about 25 lbs per c. ft. Medullary rays rather broad and short but fairly numerous. Indigenous in the hills of Upper Burma and Martaban, but it can easily be grown in Central and Eastern Bengal to serve the double purpose

of supplying wood for matches and bark for an excellent paper stock. The growth is fast and the tree produces shoots copiously from stools and roots.

21.—*Ficus hispida*, Linn. Vern. *Dumur* (Bengal). Wood ash colour, soft and somewhat mottled. Weight about 32 lbs per c. ft. Medullary rays some fine and others broad in long narrow plates. Habitat—Bengal, Assam and the Outer Himalayan forests up to 3,500 ft.

22.—*Populus alba*, Linn. Vern. *Jangli Frast* (Kashmir); *Mal* (Punjab). Wood white or reddish white, soft, even-grained and elastic. Weight 28 to 44 lbs per c. ft. Medullary rays very fine, numerous and regular. Habitat—from the Punjab Himalaya westward through Kashmir to Afghanistan and Baluchistan. This tree has already been mentioned. It is undoubtedly one of the best woods for matches, especially for match-boxes.

23.—*Populus ciliata*, Wall. Vern. *Bangikat* (Nepali); *Garpipal* (Kumaon). Wood brownish grey and soft. Weight 25 to 35 lbs per c. ft. Medullary rays fine, numerous and regular. Habitat—Himalaya from the Indus to Bhotan, 4,000 to 10,000 ft.

The wood of this tree may be found almost as good as that of the last preceding species for matches and match-boxes. For a factory established in Bengal a supply can be obtained from Darjeeling, where another species of the same Genus, called *Sungribong* by the Lepchas is also found, the wood of which is expected to be of the same quality.

The following trees belonging to the Natural Order Coniferae are commonly known as pines. Some of their nearest allies are very extensively used in Sweden and Germany. Containing resin to a large or small extent, they burn very well and are, owing to the extreme regularity of the structure of their wood, peculiarly well suited to the purpose.

24.—*Pinus excelsa*, Wall. The Blue Pine. Vern. *Tongschi* (Bhutan); *Kail* (Jaunsar). Wood moderately hard, reddish white. Weight about 30 lbs. per c. ft. Medullary rays fine and numerous but rather irregular. Habitat—Western Himalaya and Bhutan.

25.—*Pinus longifolia*, Roxb. The Long-leaved Pine, Vern. *Chir* (Hind), *Griet* (Lepcha). Wood moderately hard, reddish brown. Weight 35 to 45 lbs. Medullary rays as in the preceding species. Habitat—Outer Himalaya from Afghanistan to Bhutan.

26.—*Picea Morinda*, Link. The Himalayan Spruce. Vern. *Rai* (Hind). Wood white, fairly, soft, weighing about 30 lbs. per c. ft. Medullary rays fine and very numerous. Common in the Himalaya, generally above 7,000 ft. from Afghanistan to Bhutan.

27.—*Abies Pindrow*, Spach. The Himalayan Silver Fir. Vern. *Morinda* (Hind). Wood white and soft. Weight rather less than 30 lbs per cub. ft. Medullary rays very fine, very numerous and regular but rather short. Habitat—Outer Himalaya between 7,000 and 9,000 ft., westward from Nepal.

This, as well as the last preceding tree, will probably be found to be the best procurable in India for matches. For match boxes, however, it is feared that they will prove too brittle to stand the usual process of manufacture.

To the above list may be added thick-walled straight bamboos like *Bambusa Balcooa*, Roxb. and *Bambusa Tulda* Roxb. so common in Bengal. The inner soft tissue when sufficiently dry burns very well, and the internodes can be split into match sticks most easily, especially when green, without the help of any special machinery.

If match sticks are made out of bamboos, match boxes can also be made of the same material, preferably from the more hollow kinds. These boxes of course will be cylindrical instead of the usual rectangular shape. A long internode can be cut up into several pieces of the length of the matches. One of the open ends can be closed with a thin circular disk of any kind of wood to form the bottom, and the lid can be of another piece of bamboo internode plugged by another disk, as made to fit the other end of the tube,—somewhat like the wooden cases used in Homœopathic pharmacy. The mixture for the friction surface (phosphorus in the case of safety matches

and powdered glass and glue in the case of ordinary friction matches) may be applied on either end of the tube or on a flat surface which can be easily prepared for it on the side. The cylindrical box can be as easily covered with paper and labeled as the ordinary rectangular boxes, perhaps even more easily. The rough sketches given below will explain my idea.

Wooden disk for the lid.

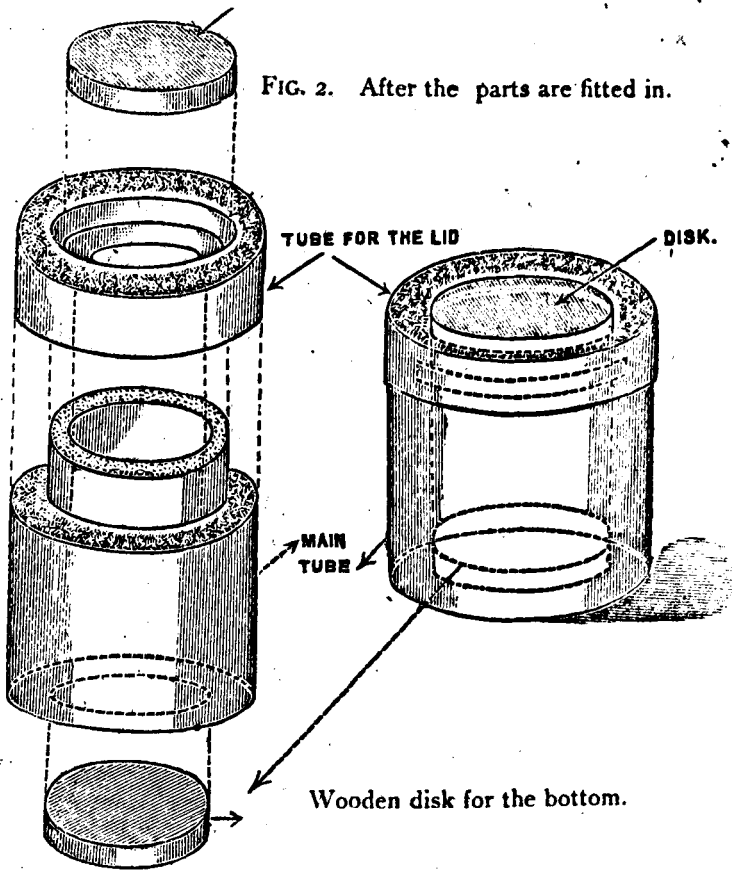


FIG. 1. Before the parts are fitted in.



It is recommended that if a match factory be established in Calcutta or its neighbourhood, trial should first be given to such local trees as *Simul* (No 2), *Amra* (No 7), *Genwa* (No 19) for matches, and to *Kadam* (No 13) and *Pithali* (No 18) for match-boxes. If these prove suitable, the expense of obtaining Firs and Poplars from the hills will be saved.

I may add in conclusion that if samples be required of woods that are not locally available, application should be made for them to the Imperial Forest Economist, Imperial Forest College and Research Institute, Dehra Dun, who can arrange to have them forwarded from the nearest source.

# CHEMISTRY AND INDUSTRY.

*(A paper read before the Industrialists-Confederation held at  
Bombay in March 1967.)*

BY

**DARAB DINSHA KANGA, M. A.**

*Professor of Chemistry, Analytical and Consulting Chemist,  
Handwriting Expert, Techno-Chemical Laboratory.*

*With the best  
compliments to  
the author*

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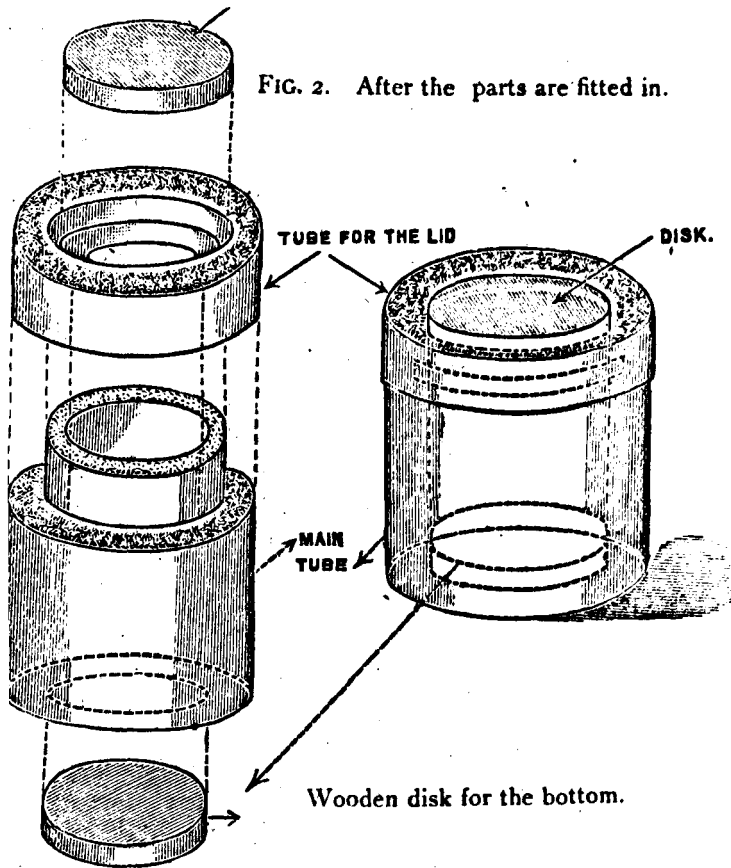


FIG. 2. After the parts are fitted in.

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1912

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Press,  
Bomb

TO  
**PROFESSOR T. K. GAJJAR,**

M. A., B. Sc., F. C. S., M. S. C. I.

In expression of the deep thankfulness for the many kindnesses received from him and as a token of admiration for his sound knowledge in applied chemistry and for the great and solid work he is doing for the country in the way of spreading scientific and technical education—this little brochure is dedicated by his grateful pupil

**DARAB DINSHA KANGA.**

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1919

(No. 770)

## CHEMISTRY AND INDUSTRY.



When we trace the history of chemistry to its early sources in the age of alchemy, we find that the chief function and aim of chemistry was considered to be the transmutation of the base metals into silver and gold and chemistry was the name given to that branch of knowledge which dealt with the artificial preparation of the noble metals; the Iatro-chemical period was the next stage in the evolution of the science of chemistry, when it became the great helpmate of pharmacy and medicine; the absorption of chemistry into medicine and the happy fusion of the two were the things sought after by such great men as Paracelsus and others; the third stage was reached during the period of the Phlogiston Theory when chemistry strove hard to become an independent and self-supporting branch of natural science and the most important problem that occupied the attention of the eminent chemists of the day appertained to the phenomenon of combustion and the chemical reasons underlying the same; we next reach the period which dealt with the Chemical Atomic Theory and with Quantitative Research and we find that chemistry then came to be recognized as a true science, capable of inquiry and investigation, of experiment and observation and it was recognized that an insight into the different conditions of chemical reaction would only be possible by means of exact, well-thought-out, quantitative researches and, lastly, reaching the present period, we find that the chief function and object of chemistry is now considered to be the determination of the composition of different substances and the finding out of the general laws underlying them and that as we thus trace the history of these successive stages in the developments of chemistry—from the earliest times beginning with the age of alchemy, passing

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through the Iatro-chemical period and the different periods of the Phlogiston Theory, Chemical-Atomic Theory and the Quantitative Research,—we find that different ideas and conceptions had engaged the minds of the chemists at these different periods. At one time it was in search for the philosopher's stone, at another time it acted as the hand-maid of medicine and subordinate to it and finally, we find it flowering forth as a science by itself, pouring fresh life and new vigour into a number of other sister sciences, not to mention the help it has rendered and is rendering, directly and indirectly, to a very large number of chemical industries, its sole object being the search after truth.

To say in a general way that there is no one chemical industry which is not indebted to this noble science for its origin and growth or which, already existing, cannot boast of receiving help from it in the way of various improvements and side-developments, to say that without the help and guidance of chemistry, these industries would not have reached their present flourishing condition is to reiterate a truth which has been stated a thousand times over from different platforms and in different scientific journals ; my task to-day is not to generalise in this wide manner and then to deduce from such generalization the conclusion that a knowledge of chemistry is essential to the advancement and well-being of all chemical industries ; I would rather be a little more definite and go into some details in order to show in a practical way how with each new chemical discovery, one industry or another was started and those already existing improved and developed ; how chance which had its full scope and which reigned supreme in different chemical industries in their inception had gradually to make way for a definite chemical knowledge of the different reactions ; how the different industrial processes came definitely under control as the result of the most careful analysis of the original intermediate and final products which became possible only after a

series of definitely-planned experiments and well-reasoned researches by a host of eminent chemists ; how the knowledge of the chemical composition of the waste-products in several industries, which were thrown away and many a time considered a great nuisance to the public health and to vegetation, helped to utilize them and to turn them into useful and valuable substances and how it was the saviour of many an industry from the premature death to which but for this alchemical transmutation of waste products into useful substances, they would have been helplessly and hopelessly driven in these days of keen and sustained competition.

Look to the Coal-tar industry of Germany and the Soda and the Sulphuric Acid manufacture of England ; see how troublesome and useless the coal-tar was once considered to be and how it was hopelessly thrown away and mark how a deep insight into the chemical composition of this complex product and a knowledge of the constitution of the different heterogeneous substances obtained by refining it helped to create one of the biggest industries in Germany and made the name of Germany famous within the four corners of the world and gave her the first place in the application of the chemical knowledge to the origination and development of industries ; how the production of artificial and at the same time economical Indigo and Alizarine colors in every way superior in beauty of shade, cheapness of manufacture and diversity of application to the old ones, drove the industries in the latter out of the market, are facts well-known to us and need not be repeated and, last but not the least, how it furnished to the world the best example of the beneficial influence of theory upon practice, for it is impossible to sever science from industry ; this fact has been emphasised by many an eminent scientist. Sir Henry Roscoe, so early as 1882, said " My object has been to show that in certain branches of chemical industry at least, it is only the highest and the most complete scientific training that can command commercial

success." Dr. Perkin emphasised this point in 1885 in discussing Technical Education by saying that "What is wanted is a thorough knowledge of chemical science and knowledge how to use it by conducting research"..... "The linking together of industrial and theoretical chemistry has undoubtedly been the cause of its wonderful development." Quite true. Chemical research and chemical manufacture are so closely interdependent upon each other that it is on the mutual and salutary cooperation of them that an industry may expect to rise to the highest position of eminence, for, have we not observed that periods of most rapid progress and development in the one were always followed by epochs of prosperity with the other?

How elevating and inspiring is the history of the production of the artificial and economical Indigo! What a noble example of patience, hope and confidence does the conduct of the Prussian Government in this respect supply to the world! That Government recognized to the fullest extent the immense importance of a sound theoretical knowledge and of research based upon well-thought-out, rational and definitely-planned experiments by picked men of science who were handsomely and ungrudgingly paid by that Government and who worked at the problem for a long period of ten years, at the end of which alone did the news of the production of the artificial and commercially-cheap Indigo descend like a thunderbolt and spread like lightning throughout the world vindicating in the fullest measure the importance and utility of a sound chemical knowledge and the beneficial influence it exercised over the national well-being by its application to chemical industries.

Nowhere would you find a better and a more striking instance of the good done to a nation by the application of the chemical investigation to the chemical industries than that furnished by the Soda and Sulphuric acid manufacture of England. How with every new invention both these

industries grew and developed ; how the whole process was made continuous ; how the hydrochloric acid, which is produced in the Leblanc process for the manufacture of soda was once allowed to run waste ; how obnoxious and harmful it proved to the health of the people and to vegetation and, in a word, how this once worthless and noxious bye-product was transmuted into a very useful and valuable substance by the most careful investigation into its properties and constitution by the different chemists, are facts well-known to the students of chemistry and have we not here the alchemy the middle-age chemists sought after ?

Similarly what an immense advantage has been gained by the knowledge of the composition of the chamber gases generated in the manufacture of sulphuric acid ; how ably the different reactions going on in the chambers have been brought under control ; how usefully the analytical methods have helped to show what the disturbing factors are and how they can be avoided and removed ; in fine, the important part played by analytical chemistry in finding out simple and reliable methods for analysing the original intermediate and final products in different industries is a fact which cannot be sufficiently impressed upon our people. Imagine what a valuable product Sulphuric acid is and how its use really constitutes a measure of the industrial activity of the people ;—the more its consumption, the greater the number of chemical industries in the country ;—how it and soda form the basis of a large number of other industries and how they are followed by the manufacture of Hydrochloric acid, Bleaching powder, Potassium chlorate and other salts of Potassium, Nitric acid and note how only by a knowledge of the different processes involved in their manufacture and by investigation into the most favourable conditions of the working out of these processes, all these industries obtained their full growth and vigour.

Taking one chemical industry after another and pointing out in detail the practical application of chemical knowledge in each of them would fill a volume ; it will be better if I here simply give a list of those industries which have originated with and which already existing have grown and developed by the help of chemical investigation and research.

#### Explosives, Pyrotechnics and the Match Industry.

How enormously they have developed by the increased knowledge of the chemical preparations and processes can be shown by the striking difference between the chemical tinder of 1807, *i. e.*, matches composed of potassium chlorate and sulphur which were ignited by dipping them into sulphuric acid and the friction matches of the present day !

Manufacture of spirits and alcoholic preparations, of ethers which are used in perfumery and the preparations of artificial liqueurs, of chloroform, iodoform and chloral of immense use in medicine ; the preparation of the different products by the dry distillation of wood, pyroligneous acid, acetic acid, vinegar, methyl alcohol, acetone. How the different fermentation processes involved in these preparations were brought in clear relief and under better control by a knowledge of chemical investigations and how excellent an example the manufacture of spirits furnishes as being one of the greatest industries which has risen to such a high development by chemical work.

Who does not recognize its importance in the manufacture of soaps and candles ? What individual is ignorant of its utility and usefulness in the manufacture of cellulose and paper and who does not know its value in the preparation of starch, sugar, gum and dextrine ? Who can dispense with its help in glass and bottle-manufacture, in earthenware and pottery ?

Be it in coal-tar industry, in dyeing and tanning operations or in illuminants and various chemical preparations; be it in heating materials and metallurgical processes or in the manufacture of alloys and galvanoplastic and electro-metallurgical processes; be it in agriculture and manures or pharmaceutical preparations the utility and helpfulness of chemistry is always recognized. In fine, chemistry is a key which unlocks the door to vast stores of knowledge and opens the gateway to a large number of industries.

If we but cast a glance at the immense good which analysis of different substances used in different processes has done to different chemical industries, we will certainly recognize its great value and importance and appreciate its worth. Take, for instance, the analysis of water used in the steam-boiler; how important it is, yet how few recognize its importance; how many of our mill-managers or mill-engineers care to have the waters analysed; how many of them know how harmful and injurious, hard and scale-forming waters are to the boiler plates; how many of them know "that an incrustation of  $\frac{1}{8}$  inch thick causes the use of about 16 per cent. more fuel than would be necessary with clean plates; whilst one which is  $\frac{1}{4}$  inch thick involves a waste of as much as 50 per cent. and one of  $\frac{1}{2}$  inch thick a waste of 150 per cent." or, in other words, instead of 100 tons of coal that would be necessary with clean plates, 116 tons of coal would be required for an incrustation  $\frac{1}{8}$  inch thick, 150 tons of coal for an incrustation  $\frac{1}{4}$  inch thick and for one of  $\frac{1}{2}$  inch thick as many as 250 tons of coal; or, to put the whole case more explicitly still, if we take the average daily consumption of coal in a mill which produces 7,000 lbs. of cloth and 12,000 lbs. of yarn per day to be 11 tons, it comes to 330 tons of coal in a month or 3,960 tons in a year; now supposing the incrustation on the boiler plate to be only  $\frac{1}{8}$  inch thick, the waste of fuel would come, according to previous calculation, to as many as 633 tons of coal and taking the

average price of coal (say in Bombay) to be Rs.15/ per ton the waste in money would come to Rs. 9,495 per year; we have taken into account above, incrustation which is only  $\frac{1}{6}$  inch thick but if we calculate what the waste in money would come to for an incrustation  $\frac{1}{2}$  inch thick, which is not unusual, the waste of coal in a year would come to 5.940 tons which when changed into money value comes to Rs. 89,100 an enormous sum wasted, needlessly wasted for want of proper guidance and management, for the neglect and short-sightedness in not spending a few hundreds of rupees after a trained chemist; what can this be called if not a penny-wise-pound-foolish policy.

Imagine on the other hand a mill in the hands of a capable manager or engineer who recognizes the necessity of the waters being analysed, its quality being ascertained and proper softening and suitable boiler compositions used; what a great saving he would effect! what a great profit he would help the mill to realize!

Similarly the immense importance of the analysis of waters used for the other industrial uses can never be overestimated and can never be sufficiently impressed upon the people. One or two instances will suffice: what a large quantity of water is used in the laundries and wash-houses; now if the waters used are hard, what a great waste of soap would that entail; how little is actually used for washing purposes. Like sulphuric acid, the consumption of soap in a country is considered as a measure of the civilization of the people; this maxim would cease to be a proper test if more soap is ignorantly wasted upon hard waters than actually used for the washing purposes.

What a great waste of soap is entailed and wasteful precipitation of colouring matter results in dye-works and bleach-works respectively by the use of hard, calcareous waters. How many of our dyers and bleachers know that calcareous and ferruginous waters should not be used in

dyeing and bleaching operations and that if such waters are used, the shade is either dull or the gloss is not natural, or the cloth or the yarn is spotted yellow.

How much of a successful working of such chemical industries depends upon the use of suitable waters but how few of our people know this fact and knowing it care to get the waters analysed and either reject them altogether or try to remedy them by proper softening agents before using them.

Similarly hard calcareous waters containing grease or salts of iron are very harmful in tanning operations. Again, the necessity of ascertaining the quality of the waters used in the following chemical industries cannot be sufficiently urged upon our people :—

Water in paper making.

Water in photography.

Water in sugar refining.

Water in making ice and beverages.

Water in preparing tannin and dye-wood extracts.

Water in cider making.

Water in brewing and distilling, &c., &c.

Not only waters but all the different substances that are required to be used in different processes must be analysed and their qualities and properties determined.

These facts show how important it is for each mill or factory or chemical work to have its own chemist or if not, to have some expert as its consulting chemist. This is the secret of success of the different chemical industries in England, Germany and other places on the continent. It would be worth while here to give an idea of the number of thoroughly trained chemists on the staff of the biggest German and English firms which carry on a



large business in chemical manufactures; to give one instance out of many, there were on the staff of Meister Lucius and Brüning Ltd., Manufacturers of Aniline Colours, Alizarine, Artificial Indigo and Pharmaceutical Products, Germany, one hundred and ninety chemists in the year 1906.

It is these people who recognise the importance of analysis and appreciate the true worth of thoroughly trained chemists whilst the greatest drawback of our people is that they do not either understand the value and worth of analysis or they ignorantly affirm that it is not important and the money spent upon it is wasted. They labour under the illusion of effecting an economy by saving the expenses for analysis and consultation but they do not know what a great loss, trouble and harm this pennywise illusive economy entails upon them in the long run. Is it then surprising if we hear them complaining that they are not able to turn out good and elegant finish in their work, that they are not working at a profit and so on.

Another and a very serious drawback of our people is their desire to take up every chemical industry without going through a thorough course of chemistry, theoretical, practical, and analytical; this reminds me of a person who with his son went to the Royal School of Mines and requested the principal to teach his son "How to do copper"; he did not wish his son to learn all the theories and the principles of chemistry, theoretical and practical, on which the different industrial processes were based, but he desired that his son should be taught how copper was extracted from the ore, by means of a few mechanical operations and rule-of-thumb methods. Such is the tendency of our people; in these days of swadeshi movement each man wishes to start a chemical industry and to turn out the product by some rule-of-thumb methods; he takes up a particular industry and tries to manufacture a particular substance; he wastes a

few thousand rupees on the same only to find that he cannot succeed ; that there is some defect or another in his processes ; he either knows not where or if he knows it, still he is unable to remedy it ; in times of emergency he is at a loss how to get over the difficulty ; he feels despondent, wastes his money on useless work simply on account of want of accurate knowledge ; in short, he ruins himself and also brings the chemical industry into disrepute. Nay more, other enthusiastic people are deterred by his example from investing their money in such industries even if a really capable man—a man who has been well grounded in the main principles of chemical technology, wishes to help a particular industry. What is wanted in India is the setting of an example of successful enterprise, so that other earnest people may be induced to follow the good example.

Now, just note, what is the practice followed in Germany? The great industrial centres never take up anybody as an apprentice; the practice of taking up apprentices followed in other handicrafts is never followed in chemical industries; only those who have gone through a thorough chemical and scientific training are employed for they know that efficiency and management of a high standard can only be maintained by the employment of such people; in case of their being confronted with new and difficult problems, they will try to solve them not by desultory groping in the dark, but they will fall back for their solution upon those methods of strict scientific investigation which they had learnt in their students' days.

One institution in the Bombay Presidency which draws our attention is the Techno-chemical Laboratory of Prof: Gajjar. This is the institute which on a small scale follows the plan of the technical institutes of Germany and Europe and follows their methods. It therefore deserves our praise and will be an important factor in the

industrial regeneration of India. The work which Prof : Gajjar is doing modestly and without show and ostentation is really very sound, solid and practical and is worthy of the sound good man he is. He is certainly the pride of our country, a rare gem, shedding the light of thorough scientific knowledge on a few earnest students training them up as expert chemists and technologists, and giving a special chemical industry in charge of each of them ; a few industries have already been started under the management of the students trained under him and ground in up-to-date chemical knowledge, theoretical, practical and analytical, in his laboratory and they give hopes of prospering. India ought to be greatly indebted at the present day to actual, solid, practical, self-sacrificing, silent workers like Prof : Gajjar, for we must have workers as well as speakers and though of the latter, we have many, the former are few and far between.

If India has produced a Bose, a Gajjar and a Roy, she cannot be said to be wanting in intelligence ; she is wanting in facilities and opportunities ; she is wanting in an energetic, enterprising spirit. A notable instance of the enterprising spirit is recorded of a syndicate which carried on prospecting operations for gold in Balarat for a long period of 10 years, spent some hundreds of thousands of rupees but still could not find out any gold deposits worth working ; at length they discovered a very rich reef of gold which more than made up for all the expenses they had incurred and crowned their long toil and labour and their untiring patience and enterprising spirit with ultimate success ; travel all over India, search each and every nook and corner and you will hardly find a dozen men whose hearts pulsate with such an enterprising spirit.

When we consider that England which has made a great progress in spreading a thorough and practical knowledge of scientific education and providing facilities for gaining a perfect practical knowledge in every branch

of science by the organization and equipment of large laboratories according to modern requirements—when we consider that even she complains of her backwardness and of the deficiencies of her system of education in the methods of applied chemistry and looks with awe and wonderment at the rapid progress which Germany has been making in the development of her industries by the application of scientific knowledge leaving England far behind and carrying off the laurels from her hands and rising to the highest position and front rank in chemical industries—when we find England crying aloud for progress, how much greater need there is in India for the spread of scientific education ; how much greater room there is in India for the establishment of technical schools.

The progress which Germany has made during the last 45 years by the foundation of Technical High Schools is almost unparalleled in the annals of educational history.

There are nine technical high schools in Germany and Prussia and they are almost perfectly organized and equipped for modern requirements. These schools are raised to the level of the Universities as they have been granted the privilege of conferring degrees and rank with the older universities.

We cannot enough praise and admire the importance of this step taken by the Prussian Government and other German states.

The fees for these Technical High Schools are very low, average about £s 9 for a term or £s 18 for the whole year. The comparatively low fees for the lectures and practical work paid by students at German Technical High Schools show plainly that these schools cannot be self-supporting and as these schools are with few exceptions unendowed institutes, it is further evident that the annual recurring deficits are met by the Government of the various states in which the schools are situated.

The most striking and noteworthy point is that notwithstanding the foundation of so many Technical High Schools in different parts of Germany and Prussia, chemical industrial circles in Germany are by no means satisfied with the great progress and measure of success already attained and are actively endeavouring not only to maintain but to increase the present facilities for technical education. The number of students studying at the nine Technical High Schools was about 14,906 in the year 1902 and is increasing every year.

According to the eminent chemist Prof: Fisher, Germany possessed in the year 1899, 4,000 thoroughly trained chemists who had passed through the full courses of the Universities or Technical High Schools. The number of trained chemists for the year 1901 was estimated at 4,500. These chemists are all employed in large chemical works. This estimate refers to chemists residing in Germany. The number of German chemists in foreign countries ranges probably from 700 to 1000 ; it does not include further, professors, lecturers, and assistants at Universities, Technical High Schools and private chemists. A very large number, too, of trained chemists there is in England. So many thousand trained chemists in Germany, so many hundreds in England, how many are there in India ?

What a miserable spectacle India shows in this respect ! If we take, for instance, the Bombay Presidency, in the course of 42 years from the year 1865 when the University of Bombay was founded upto the year 1906 she produced only 36 M. A. students in Physical Sciences, the average being not even one student per year ; what is more unfortunate still is that out of these 36, almost all have gone in for teaching line ; what is most unfortunate is that from the year 1891 to 1899 not a single chemistry student in M. A. passed out from the University ; it is a matter of gratification to note that since the year 1903

the ball was set rolling by Prof: Gajjar and during the last four years as many as 20 students have come out from the University with chemistry as their voluntary subjects.

So many Technical High Schools in German Empire, how many worth mentioning in India! So strong and mighty a support and so healthy and enviable an encouragement to these Technical High Schools by the German Government for the spread of scientific education, what support and encouragement does the Indian Government give to any scheme for establishing Technical High Schools for the application of scientific knowledge to industrial purposes!

At this juncture may be mentioned the princely charity made by the late Mr. J. N. Tata for establishing the Technical Research Institute in our country similar to those in Germany. Such a scheme as this—a most practical, far-reaching and all-embracing scheme as all other schemes of the late Mr. Tata's were—has been unfortunately delayed so long. It ought to have come into existence and begun its beneficent work in the life-time of its worthy father. This scheme will do an incalculable good to the country and deserves every support and encouragement from native states and Government. The late Mr. Tata's name will always be remembered with pride and gratitude by our countrymen and his colossal work will remain as a monument in the history of the industrial development of India.

Establish such Technical High Schools and Research Institutes in different parts of India on the same lines as has been done in Germany; equip them with laboratories workshops, museums and libraries; give our youths a sound theoretical and practical knowledge in different branches of applied science; make them go through the same course of studies as they do in German Technical High Schools; don't make this education so costly as to

restrict it to a few rich persons but make it so cheap that even the poorest may take advantage of it; give the students every facility; appeal to the Government to give a substantial support to these schools as is done in Germany and you will find that India will no longer remain in industrial stagnation; that her mineral resources will be developed; that a large number of chemical industries will be created which will give employment to thousands of people; that she will no longer remain a purely agricultural country and be constantly in menace of the oft-recurring droughts and famines.

It is needless to add that the people themselves must cooperate with the Government in the solution of this grand question.

This is the time for action. "Awake, arise," ye sons of India from your deep lethargy; mark, how Japan has risen from a small power to one of the great empires in a short time; follow her example; bring forth the latent energies that are lying dormant in you and show to the world of what mettle you are made.

India of old! What Indian does not remember with pride thy ancient glory and greatness!

India of to-day! What Indian does not feel pity and disappointment at thy poverty and helplessness!

Once more, arise ye Indians, from your long slumber and work for your country, for the regeneration of her industries, for the development of her indigenous resources and your efforts will not go unrewarded. Let Science be your watchword for in Science alone lies the material salvation of India.

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CALCUTTA  
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[No. 779]



## IRRIGATION BY PUMPING.

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ONE of the many difficulties which have to be faced, by those who are striving to improve the economic situation in the South of India, is the high price which has to be paid for fuel, owing to the fact that nowhere south of Singareni in the Hyderabad State has coal been found to exist in workable deposits. The few possible sites, where water-power can be obtained, are in remote and almost inaccessible situations, and the time has not yet arrived for the vast schemes which must be worked out to enable such of those natural sources of power as we possess to be utilised. Much must be done before a rival can be set up to the great electric system of power distribution which the Mysore State has created within its own territory. There are no great engineering difficulties to be faced, and the generating stations could be set up cheaply enough. The difficulties are due to the lack of industrial organisation and the petty nature of the widely scattered demand for power which would render the cost of distribution prohibitive. Under these circumstances the internal combustion engine, which has lately been brought to such a high degree of perfection, has proved an ideal source of motive power. Within the last year or two, hundreds have been purchased and are now supplying power for pumping water for irrigation, for the water-supply of towns, for drainage works and for driving rice hulling machinery, oil mills, coffee pulpers and tea-making machinery. For a variety of miscellaneous purposes they are also employed, but in the main for those already specified.

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So long as liquid fuel is available at somewhere about the present prices the ordinary type of oil engine is the most convenient form of internal combustion motor to employ for small powers, but for units of over 20 H.P., especially in the neighbourhood of forests where timber is cheap and charcoal can be manufactured in large quantities, the suction gas producer plants are unquestionably superior; whilst in special cases, where very large amounts of power are required, the Diesel form of oil engine working with liquid fuel furnishes the most economical motor at present available. Kerosine oil is too expensive a fuel to employ in oil engines and the continuance of the supply of liquid fuel at the present prices, or in fact at any reasonable price at all, is by no means a certain matter. It is therefore desirable that as far as possible efforts should be made to extend the field in which suction gas producer plants can be employed with advantage. It is important to remember that the charcoal they need is a local product, an extensive demand for which would greatly benefit the very large areas of reserved forest in this Presidency. It would, I think, be almost a fatal error to build up an industrial system in Madras based upon foreign sources of fuel supply and the oil engine should be regarded as a temporary expedient which must ultimately give place to engines using gas. Obviously therefore we, in Madras, should devote ourselves to the introduction of suction gas producer plants and the improvement of the methods by which the wood in our forests and plantations may be converted into charcoal and the various bye-products for some of which there is a considerable demand. The destructive distillation of wood is a chemical industry of considerable importance in other parts of the world where the natural facilities for carrying it on are no greater than those which exist in the south of India. For more than a year past, it has therefore been the

subject of detailed study and investigation with very promising results. Unfortunately it is a highly specialized industry of which we possess no experience in this country and if it is to be worked with commercial success it must be started on a large scale. The inquiries made out here must therefore be supplemented by further investigations in Europe and America before it can be definitely stated that it would be wise for private enterprise or Government to provide the funds required for the first factory.

In the present paper I do not propose to pursue these ideas any further, as it would lead us into the discussion of highly technical matters which had best be left for the consideration of experts. Last year one of the papers, which I presented to the Industrial Conference held at Surat, dealt with lift irrigation and I would ask you to regard this paper as a second contribution on the same subject. My excuse for bringing it forward again after so short an interval is that it is one of great importance and the movement in favour of employing mechanical means for lifting water is making rapid progress. Experiments were first started early in 1902 and at the end of the following year the results obtained were considered sufficiently valuable to justify working on a more extended scale and a special staff was provided to carry on the work. In April 1905 eleven oil engines were at work, in 1906 thirty-five engines, in 1907 fifty-four engines and in 1908 ninety-four engines, whilst at the present time (December 1908) it is probable that there are about 150 engines either actually pumping or in course of erection. During these five years the Madras Government have expended upwards of a lakh of rupees on this work, chiefly in maintaining an establishment to assist private persons in installing such means of lifting water and in putting down

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boreholes to ascertain whether water-bearing strata exist at any reasonable depth below the surface of the ground. In a small way experiments have also been made to ascertain the effect of torpedoing, or blowing up with dynamite, boreholes put down from the bottom of the large rocky wells which are found in many parts of this Presidency.

As not a few installations have been at work for a considerable time it ought to have been possible to have collected a large amount of valuable information regarding their working; but unfortunately my efforts in this direction have met with but a small degree of success. This is for two reasons: (1) Many of the owners of engines and pumps are averse to giving any information regarding them as they fear it may be subsequently used to their detriment whenever the next revision of the settlement occurs, and (2) others, and they probably form the majority of pump owners, see no necessity for keeping accurate accounts, and as no small part of their transactions are still in kind it is difficult to get at the real facts. However they express themselves satisfied with the working of their engines and pumps and their neighbours are following their example; so that it may be concluded that they have done well by themselves. Already the number of pumping stations is so large that it is impossible to keep in touch with them all and I am unable to supply any accurate summary of the work which they are doing. The total horse power is over 1,200 and the total capacity of the pumps nearly five million gallons per hour. If our estimates regarding the quantity of water which should be supplied to dry crops are at all accurate this volume of water for ten hours per day would suffice for the irrigation of about 11,000 acres, but it is quite certain that the actual area irrigated is far below this figure. This is partly due to the fondness of the ryot for cultivating

paddy which requires a very large quantity of water but from which, at the present prices, he derives considerable profits even when the water has to be lifted by an engine and pump. It is probable that about 5,000 acres are irrigated by engines and pumps and the whole of this area is either double cropped or devoted to the cultivation of such crops as sugarcane, plantains, and turmeric which remain on the ground throughout the whole year and which yield very large returns.

From the details of cultivation, furnished by the owners of pumping plants and carefully scrutinized by my Supervisors, it will be seen that the irrigators are inclined to adopt a very intense system of cultivation and that as a rule the gross value of the crops per acre is seldom less than Rs. 100 and often a great deal more. The necessity for artificial manures has been forced upon the attention of the cultivators and a good deal of experimental work is in progress to determine the best way of preventing the exhaustion of the soil. There is a tendency to use too much water, a mistake seldom made when it has to be lifted by cattle power or by men working picottahs. This is due, in most cases, to the owners of wells being able to obtain more water than they really require for their land and the remedy will probably be found in the more extensive adoption of the system of selling water which is already being introduced. The owners of most of the pumping stations are intelligent and energetic men with capital at their disposal, and any assistance which can be given them by the Agricultural Department is likely to prove labour well spent and to be productive of good results.

The following notes regarding the working of a number of installations have been compiled by my Supervisors from information supplied to them by the owners of engines and pumps. The data have

been carefully checked and I think they may be regarded as sufficiently accurate for practical purposes. In very few instances have any records been kept of the number of hours the pumps were at work so that the figures regarding the cost of working afford no information as to the actual cost of lifting water. In almost every instance it will be seen that the cost of lubricating oil is a very large percentage of the cost of running the engine and there is reason to suspect that in this direction there is considerable waste. This is counterbalanced, however, by the low cost of wages :—

(1) Installation of a 7½ H.P. engine and 4" pump at Kalinjikuppam. This was put down by M.R.By. V. Desikacharri, a retired pleader at Tiruvéndipuram in the South Arcot district. The well is 20 feet in diameter and 26 feet deep, and it irrigates 18 acres of land which was formerly dry. Dealing with the year ending September 1908, 8 acres of paddy were grown between October and March and the value of the crop was Rs. 270. A second crop on the same land between May and August yielded Rs. 480. Groundnut and ragi were grown on 10 acres between January and July. The groundnut crop was worth Rs. 1,000 and the ragi Rs. 500, the total value of the crops during the year amounting to Rs. 2,250. The working expenses of the engine amounted to Rs. 552-8-0 made up as follows :—

	RS.	A.	P.
Liquid fuel ... ..	300	0	0
Wages of driver at Rs. 6 a month ... ..	72	0	0
Kerosine oil ... ..	24	0	0
Lubricating oil ... ..	90	8	0
Repairs ... ..	6	0	0
<b>Total ... ..</b>	<b>552</b>	<b>8</b>	<b>0</b>

No accurate figures have been furnished regarding the cost of cultivation, but the following estimate is probably not far short from the truth :—

	Rs.
Each paddy crop at Rs. 20 per acre ...	320
Cost of groundnut cultivation at Rs. 40 per acre ... ..	400
Cost of ragi cultivation at Rs. 25 per acre ... ..	250
Total ...	970

The total working expenses were therefore Rs. 1,522-8-0 and the profit Rs. 727-8-0. The cost of the installation was Rs. 3,065.

(2) Installation of a 5 B.H.P. engine and 3" pump at Panamkuppam belonging to M.R.Ry. Srinivasa Gounden. The water-supply is derived from a well 9 feet in diameter and 20 feet deep and the area cultivated is 20 acres of land which was formerly dry. The whole area has been leased to ryots at a rental of Rs. 75 per acre and the net yield to the proprietor is Rs. 1,500. His son drives the engine and the expenditure during the year was Rs. 250. Allowing Rs. 10 a month as the value of the services of the driver the gross profit on the installation amounted to Rs. 1,130. This is a very good return on the capital cost of the installation which amounted to Rs. 1,707.

(3) Installation of a 9 B.H.P. engine and 4" pump at Nellikuppam belonging to M.R.Ry. S. Tilla Govinda Gramini. The well is 20 feet in diameter and 18 feet deep and derives its water from a bed of coarse sand. The water-supply is more than ample, as the area under cultivation is only 15 acres. From March to July the whole area was under groundnut and from September to January under

paddy. The value of the groundnut crop was Rs. 2,625 and of the paddy Rs. 1,575 making a total of Rs. 4,200. The cost of working the engine amounted to Rs. 683-1-4 made up as follows :—

			Rs.	A.	P.
Liquid fuel ...	...	...	318	15	4
Lubricating oil ...	...	...	138	2	6
Kerosine oil ...	...	...	47	7	6
Repairs and belting ...	...	...	58	8	0
Driver's wages ...	...	...	120	0	0
<b>Total ...</b>			<b>683</b>	<b>1</b>	<b>4</b>

Cultivation expenses amounted to Rs. 513-12-0 for the groundnut crop and Rs. 597-3-0 for the paddy crop. Against a gross yield therefore of Rs. 4,200 the expenditure amounted to Rs. 1,794-0-4 and the gross profit to Rs. 2,406. The cost of the installation was Rs. 2,750.

(4) Installation of a  $7\frac{1}{2}$  B.H.P. engine and 4" pump belonging to Mr. Balagurumurthy Chetty at Punjerikuppam. The well is 17 feet in diameter and 23 feet deep and the area under cultivation is 23 acres. Fifteen acres were under groundnut and subsequently under ragi, 5 acres under gingelly and 3 acres under paddy. The value of the crops grown was as follows :—

			Rs.
Groundnut ..	...	...	2,280
Ragi ...	...	...	720
Gingelly ...	...	...	155
Paddy ...	...	...	450
<b>Total ...</b>			<b>3,605</b>

No accounts were kept of the cost of running the engine or the agricultural expenses, but they may be estimated approximately as follows :—



Engine	...	...	...	Rs.	600
Groundnut crop	...	...	...		600
Ragi	...	...	...		375
Gingelly	...	...	...		40
Paddy	...	...	...		120

Total ... 1,735

This leaves a gross profit of Rs. 1,870. The cost of the installation was Rs. 3,200.

(5) Two installations belonging to M.R.Ry. S. Panduranga Mudaliyar of Cuddalore, one a 9 B.H.P. engine and 4" pump and the other a 9½ B.H.P. engine and 4" pump. Each of these installations works on a well 36 feet deep from which a certain amount of water is derived by percolation, but the main supply is derived from beds of sand in which the water exists under sufficient pressure to rise to within 15 feet from the ground. In both the wells the borings are lined with a 7" pipe, sunk in one case to a depth of 84 feet from the ground level and in the other to a depth of 58 feet. The total area under the two installations is 48 acres and during the year the following crops were grown :—

Crop.	Area.	Cultivation expenses.		Value.	
		ACS.	RS. A. P.	RS. A. P.	
Paddy	10.29	201	0 0	535	0 0
Plantains	2.75	202	8 0	688	0 0
Sugarcane	4.28	430	14 0	192	0 0
Groundnut	6.15	348	0 0	701	0 0
Ragi	9.83	252	0 0	240	0 0
Groundnut	11.83			1,348	0 0
Groundnut	2			220	0 0
Gingelly and Indigo	15.48	181	12 0	-80	0 0
Ragi	3	76	0 0	216	0 0
Total	...	1,642	2 0	4,355	0 0

The working expenses of the two engines were Rs. 904 made up as follows :—

	Rs.
Liquid fuel .. ...	440
Lubricating oil ... ..	148
Kerosine oil ... ..	40
Driver's wages ... ..	204
Repairs and belting ... ..	72
Total ...	904

The gross profit amounted to Rs. 1,808-14-0 whilst the capital cost of the two installations was Rs. 7,000.

(6) Installation of a 9½ B.H.P. engine and 6" pump belonging to Government and leased to M.R.Ry. V. Subramania Aiyar of Panampet near Villupuram.

The water is derived from a tank 60 feet square and 18 feet deep. The pump is mounted on a well 8 feet in diameter and 26 feet deep at the edge of the tank. The land under irrigation belongs to the ryots of the village and they buy the water-supply from the pump, paying for it at the rate of 11 annas per hour. The area irrigated during the year was 70 acres, which from January to June was under ragi and groundnut together ; whilst in July, August and September 50 acres were under kambu and 20 acres were under thenai. It is only possible to form an approximate estimate of the value of the crops :—

	Rs.
Ragi ... ..	2,240
Groundnut ... ..	6,300
Kambu ... ..	750
Thenai ... ..	825
Total ...	10,115

From January till the end of August the engine worked 2,323 hours as follows :—

					HOURS.
January	...	...	...	...	153
February	...	...	...	...	235
March	...	...	...	...	305
April	...	...	...	...	481
May	...	...	...	...	540
June	...	...	...	...	382
July	...	...	...	...	183
August	...	...	...	...	44
Total					2,323

Assuming the average discharge of the pump was 25,000 gallons per hour, the duty of water obtained in April and May was 95 acres and 84 acres per cusec. This low duty is mainly due to the porous character of the soil, which is a light loam overlying a bed of coarse sand.

The working expenses amounted to Rupees 1,018-1-6 made up as follows :—

					RS. A. P.
Liquid fuel	...	...	...	...	492 15 0
Lubricating oil	...	...	...	...	104 8 0
Kerosine oil	...	...	...	...	28 6 3
Driver and watchman	...	...	...	...	184 0 0
Repairs and belting	...	...	...	...	208 4 3
Total					1,018 1 6

The income by sale of water was Rs. 1,534-9-0 and the net profit to the lessee was Rs. 516-7-6. The cost of this installation was about Rs. 5,000, so that selling the water from the pump at 11 annas per hour was not a very profitable transaction and the price charged would probably have been much higher had not the installation been handed over to the lessee free of rent for a period of three years

as an experiment. On the other hand the ryots benefited very considerably as is shown by the demand for water which in May necessitated running the engine for 540 hours. At first ryots were very averse to running their engines more than seven or eight hours a day and entirely opposed to running them during the hours of darkness, but already where the water supply permits of it the engines are run day and night whenever necessary.

(7) Installation of a  $7\frac{1}{2}$  H.P. engine and 4" pump belonging to M.R.Ry. A. Venkatasubba Reddiar, Arukilavadi village near Arkonam. The water is derived from a well 10 feet in diameter and 20 feet deep. The total area under cultivation during the year including second crop was  $41\frac{1}{2}$  acres yielding the following return :—

	ACS.	RS.
Paddy .. ...	20	1,291
Ragi ... ..	5	280
Groundnut ...	8	300
Gingelly ... ..	6	220
Plantains ... ..	1	100
Garden produce. ...	$1\frac{1}{2}$	70
Total ... ..		<u>2,261</u>

The cost of cultivation amounted to Rs. 760 and the working expenses of the oil engine to Rs. 568 leaving a gross profit of Rs. 933. The cost of the engine and pump was Rs. 2,535.

This plant was procured on the hire-purchase system and the owner has paid three instalments out of the four without borrowing money, and it is stated that he contemplates purchasing a second installation as soon as the payment on the first has been completed.

(8) Installation of a 5" pump and a 12 H.P. engine belonging to M.R.Ry. Govindaswami Nayudu of Natham near Gudiyattam. The pump is located in a well 20 feet in diameter and 16 feet deep, and in the bottom an inner well 14 feet in diameter has been sunk. The cost of the installation was Rupees 3,100 and previous to its erection sixteen pairs of cattle were kept. The engine and pump enabled the owner to dispense with ten pairs of cattle which he sold and realised Rs. 1,500. The working expenses of the engine and pump averaged Rs. 80 a month and the following returns so far have been received :—

	ACS.	RS.
Paddy ... ..	12	1,200
Ragi ... ..	2	100
Cocoanuts ... ..	13	400

The cost of keeping sixteen pairs of cattle is stated by Mr. Govindaswami Nayudu to be Rs. 240 per month or Rs. 15 per pair. The saving effected by dispensing with ten pairs of cattle is 150 per month against which must be set the cost of the engine, about Rs. 80 per month. Apart from the fact that he has now a much better water-supply, a net saving of Rs. 70 per month is effected equal to Rs. 840 per annum which is 50 per cent. on the net expenditure incurred after allowing for the value of the cattle which were sold.

(9) At Mélróapuram, which was the first pumping installation started, there is a 3½ H.P. engine and 3" pump raising water from a well. During last year the Rev. Mr. Andrew reports that the engine ran for 1,005 hours and raised 1,870,305 cubic feet of water an average height of 23 feet. The area under cultivation was 17.66 acres which yielded crops worth Rs. 1,691. The cost of running the engine was Rs. 303-10-9 to which may be added another Rs. 300 for interest and depreciation making

the total cost of irrigation per acre Rs. 34.1. The details of the running expenses were as follows:—

			RS.	A.	P.
Liquid fuel	...	...	111	6	6
Kerosine oil	...	...	35	10	0
Lubricating oil	...	...	48	1	6
Wages	...	...	74	0	0
Repairs	...	...	34	8	9
Total	...	...	303	10	9

(10) At the Agricultural College, Saidapet, a  $6\frac{1}{2}$  H.P. engine and a 4" pump were employed in lifting water from the Adyar river. During 1907-1908, 25,660,000 gallons of water were raised an average height of 21.57 feet the lift varying between 19.3 and 24.1 feet. The total cost of working the engine was Rs. 620-14-3, to which may be added Rs. 350 for interest and depreciation. The area of land irrigated was 25.71 acres and the cost of irrigation per acre Rs. 37.7. The details of the working expenses were as follows:—

			RS.	A.	P.
Liquid fuel	...	...	173	12	0
Kerosine oil	...	...	19	12	0
Lubricating oil	...	...	87	13	9
Wages	...	...	238	4	4
Repairs and belting	...	...	97	13	0
Miscellaneous	...	...	3	7	2
Total	...	...	620	14	3

The pump was run on 194 days for 1,976 hours or an average of 10.19 hours per day. The volume of liquid fuel consumed was 1,200 gallons, at the rate of 0.61 gallons per working hour.

(11) Installation of a 4" pump and a  $6\frac{1}{2}$  H.P. engine on a small tank at Surapet belonging to Mr. Gopinatha Tawker. Subsequent to the installation

of the engine and pump a boring at the bottom of the tank tapped a sub-artesian supply which through a 4" pipe furnishes sufficient water to keep the engine running 12 hours a day. The cost of installing the engine and pump and making channels for the distribution of the water was Rs. 3,242. The area under irrigation is 28 acres and consists of a mango and cocoanut tope the trees of which have not yet come to bear fruit. Between the trees plantains have been cultivated, there being about 450 to the acre against an average of 900 to the acre in an ordinary plantain garden. The accounts now furnished extend over two years and show that Rs. 2,833-1-0 was realized from the sale of the plantains and Rs. 871 from the sale of a crop of paddy which was grown on 21 acres after the plantains were removed. The expenses of cultivation during the two years amounted to Rs. 1,074 for the plantains and Rs. 277-8-0 for the paddy. The cost of running the engine during the two years was Rs. 869-15-6 so that against gross receipts of Rs. 3,704-1-0 the total expenditure amounted to Rs. 2,221-7-6 leaving a surplus of Rs. 1,482-9-6. An allowance of Rs. 405 a year should be made for interest on the capital outlay and depreciation in value of the plant, but against this must be set the increased value of the mango and cocoanut topes which during the two years have been well watered.

(12) Installation of a 3" pump and a 5 H.P. engine belonging to M.R.Ry Muniappa Gramani at Tondiarpet. The lift varies from 12 to 25 feet and the engine works from 9 to 11 hours a day and waters two cocoanut plantations each of about 4 acres. One of these gardens is let out on lease for Rs. 100 a month, the water being supplied free. The other the owner works himself. The yield of toddy is about 70 measures a day and is sold for 3½ annas a measure. The total monthly sales average Rs. 400 and the expenditure Rs. 140

leaving a net profit of Rs. 260 a month. No details are kept regarding the cost of working the engine but it amounts to an average of Rs. 60 a month and repairs and renewals average Rs. 120 a year. The total expenditure therefore is Rs. 2,520 and the income Rs. 6,000 leaving a gross surplus of Rs. 3,480 which is unquestionably a good return on a garden of not more than 8 acres.

(13) Installation of a  $7\frac{1}{2}$  H.P. engine and 4" pump belonging to M.R.Ry. T. S. Narayanasawmi Aiyar of Tirukkarugavur. The water-supply is derived from a tank 120 feet square and the pump is carried on a circular well 9 feet in diameter sunk in the bank of the tank. There is more than sufficient water-supply and the land under irrigation consists of sugarcane 3 acres, plantains 5 acres, cocoanut garden 7 acres and paddy 13 acres. The owner writes as follows:—"The gross income is Rs. 700 from sugarcane and Rs. 300 from plantains. With the assistance of the plant I am able to sow seed-beds very early and thus reap the first crop so that my second-crop transplantation is simultaneous with the single crop lands of my neighbours. By this I get Rs. 15 per acre more than my neighbours who, though they grow double crops, have to wait for water from the channels to sow their seeds, while I can transplant the first crop when they begin to sow their seed-beds. The total cost of the plant including Rs. 1,000 spent on the well and tank was Rs. 3,900 and apart from my own cultivation my additional income from 39 acres of wet land is Rs. 595."

From the above notes the following table has been extracted to show the actual cost of supplying each acre of land with water.



[No. 770]

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Reference number of installation.	Diameter of discharge pipe of pump in inches.	Area irrigate acres.	Duty of water in acres per cusec.	Working expenses.		Interest and depreciation.		Total.		Cost of irrigation in rupees per acre per annum.
				Rs.	A. P.	Rs.	A. P.	Rs.	A. P.	
1	4"	18	81	552	8 0	382	2 0	935	10 0	520
3	4"	15	87.5	683	1 4	343	12 0	1,026	13 4	68.5
4	4"	23	103.5	600	0 0	400	0 0	1,000	0 0	43.5
5	4" (2)	43	103	904	0 0	888	12 0	1,792	12 0	37.4
6	6"	70	95	1,018	1 6	668	4 0	1,684	5 6	34.10
7	4"	31.3	96	568	0 0	317	0 0	885	0 0	41.5
9	3"	17.66	240	303	10 0	300	0 0	603	10 0	34.1
10	4"	25.71	119	620	14 3	350	0 0	970	14 3	35.7
11	4"	28	126	435	0 0	405	0 0	840	0 0	30.0
12	3"	8	54	840	0 0	237	8 0	1,077	8 0	134.6

The data upon which the figures for the duty of water have been calculated are approximations. It is hardly worth while to discuss them in detail as the only object in inserting them in the tabular statement is to dispel the idea that very high duties are obtained under pumps. It is not improbable that the low duty in some cases is attributable to the limited area under the pumps and that more water was given to the fields than was really necessary or desirable. Both the nature of the crop and the physical condition of the soil are important factors to be taken into consideration in estimating the duty of water and to these must be added the character of the distribution of the rainfall as well as its total volume. With so many variants it is impossible that any one set of observations should be of great value. If the most is to be made of a supply of water risks must be run and experience is the only safe guide in such matters. To secure absolute certainty means that in four years out of five the water-supply is not fully availed of. Agriculture is the most speculative of industrial occupations and irrigation only eliminates one element of uncertainty.

The total cost of pumping has been estimated by adding  $12\frac{1}{2}$  per cent. of the capital outlay to the running expenses to provide for interest and depreciation on capital. It will be seen from these figures that the cost of irrigation from wells, even when water is lifted by engines and pumps, is a very considerable item. Excluding the cocoanut gardens it ranges from Rs. 25 to nearly Rs. 70 an acre; nevertheless, as we have seen, the profits realised are very considerable. The ryots appreciate this and the popularity of oil engines and pumps is steadily increasing. Yet, through the sub-division of the land into small plots, the smallness of individual holdings and the large capital outlay involved in each installation, it is difficult for land-owners and

ryots to become possessors of such aids to cultivation, and I think there is not much doubt that for every ryot who owns a pumping installation there are at least a hundred who would be glad to have one, if only their circumstances would permit of it. With rising prices and with a sure water-supply the agriculturist is in a very satisfactory condition and in places there is evidence that by co-operation they are trying to secure for themselves the advantages of cheap methods of raising water.

Some little time ago the villagers of Atmakur formed a limited liability company with a capital of about Rs. 14,000 and with this money we have installed for them two 10-inch pumps on the banks of the Kistna Western Delta main canal and through a channel which extends to a length of nearly four miles they are irrigating 500 acres of land considerably above the full supply level of the canal. In the South Arcot district, where it is easy to obtain a water-supply, some of the wealthier ryots have pumping installations and are selling the water they do not require for their own lands to their less wealthy neighbours. In the case of the Panampet installation alluded to above, the water is sold at the rate of 11 annas per hour which is equivalent to about 2,000 gallons for one anna. At this rate a cubic foot per second will fetch nearly Rs. 17 a day and will be worth at least Rs. 2,000 during the ordinary irrigation season of four months. In the Kistna Delta the duty of water rises to as much as 100 acres per cubic foot per second and for this a water-rate of Rs. 5 per acre is charged, or roughly one-fourth of that paid by the ryots in the Panampet village. Nevertheless the water-rate in the Kistna Delta is sufficiently high as the whole project pays a very high rate of interest on the total capital expenditure involved in the construction of the Kistna Delta irrigation system. It is the same with many of the other great irrigation systems in this

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Presidency. The lands under them are supplied with water at very low rates and the undertakings are at the same time very profitable to the State. The very careful and detailed examination of the country by the Irrigation Commission, which met a few years ago, has placed beyond doubt the fact that very little water can in the future be made available for irrigation on similarly favourable terms, although the percentage of the total water-supply which is so utilised is extremely small. Vast projects involving an enormous capital outlay are feasible, but their construction can only be justified when it can be clearly shown that they offer a fair prospect of an adequate return on the money which must be invested in them.

The skill and ingenuity of the irrigation officers of the Public Works Department will probably yet succeed in some cases in providing additional supplies of cheap water for irrigation, but the limits prescribed by the scale of charges for water have been nearly reached and there must inevitably ensue a period of stagnation in the extension of irrigation unless efforts are made in other directions. Engineering science has made enormous strides since Sir Arthur Cotton first held up the waters of the Górávari river by the dam which he constructed across it at Dowlaishwaram, and many projects are feasible now which would have been impossible then. As an example I would commend to your attention the splendid pumping station which has been provided to lift the waters of the Kistna river for the irrigation of some 50,000 acres of land on Divi island, whereby water which ran uselessly to the sea is now made to fertilise lands which have hitherto lain waste or yielded at best a very precarious harvest. Again in the mountains of Travancore the waters of the Periyár river, which formerly flowed into the Arabian Sea, have been diverted through the watershed ridge to irrigate a vast extent of land

in the Madura district, thereby rendering it secure from scarcity and famine. It would be easy to multiply examples of this kind; it is not however my object to glorify the engineering profession but to draw attention to the fact that in other directions, here in India, we have not made similar progress.

The resources of the hydraulic engineer are by no means exhausted and he could still do much to render the occupation of the great bulk of the people of this country much less precarious if only it were possible for them to second his efforts and display a more intelligent appreciation of the value of the water which he supplies. It would not I think be difficult to show that in this Presidency the area under wet cultivation could be doubled if the ryots, who are now without the benefits of irrigation, were prepared to pay a much higher water-rate than that now paid by those whose lands are so favourably situated that they are commanded by the channels from existing works. The question is can they do so? Is it possible for the ryot to pay from Rs. 15 to Rs. 20 an acre for water instead of the Rs. 5 or Rs. 6 which is regarded as the normal rate under Government irrigation channels? The enquiry is not whether existing water-rates should be enhanced, but whether lands not now irrigated could be made to yield a sufficient return to make it worth while supplying them with water at a much greater cost than has hitherto been deemed practicable. It is generally considered that irrigation greatly enhances the value of land, partly by increasing the yield of the crops and partly by diminishing the risks of cultivation. The bulk of the irrigation supplies in this Presidency are devoted to the cultivation of paddy and it is only under spring channels and wells that what we know as garden cultivation may be said to exist. The fact is that paddy cultivation pays fairly well and the cultivators have an easy time of it; but when the

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ryot has to lift his water from a well or contribute his share of the labour of digging spring channels in hot sandy river-beds, he learns to appreciate its value, and by putting more labour into the land he obtains from it a more generous return.

The information which has been collected regarding the cost of lifting water by engines and pumps and the evidence that such water can be profitably used is, I consider, extremely valuable, but I do not wish to spoil my case by basing generalizations on it which are not justifiable. The irrigation under the oil engines and pumps, which has been referred to above, is all of an exceptional character. Admittedly, they are selected cases to show what can be done when capital, energy and intelligence are forthcoming. They are, however, typical instances of irrigation with oil engines and pumps, where an adequate water-supply has been found, and I have reason to believe that there is room for many thousands of such installations in the Coast districts and on the margins of many of our rivers. Their influence on agricultural developments is already considerable and not a few are regarded in their own neighbourhood as model farms. The results obtained in them have awakened a new interest in well cultivation and throughout the Presidency there is a growing demand for the exploration of the sub-soil with boring tools. The demand is for a perennial water-supply which will enable irrigation to be carried on all the year round so that more valuable crops, which require to be on the land for a long time, may be cultivated.

Government irrigation works connote paddy cultivation because almost invariably the supply of water is only available for a portion of the year. To some extent this must also be the case in the future, but by no means entirely so. All the great projects now under investigation will involve the

construction of enormous storage works, partly to regulate the supply during the irrigation season and partly to raise the flood waters to a sufficiently high level to command the lands that require irrigation. When the water has fallen below the sills of the regulators which will control the supply to the high level channels there will still remain a vast quantity of water stored in the river-beds behind the dams, and this may be drawn off at such a rate as to provide for the perennial irrigation of very considerable tracts of land. On these lands very high water-rates should be realised as very valuable crops can be grown. In the Bombay Presidency, on some of the storage works which have been constructed in the Deccan, sugarcane cultivation is extensively pursued notwithstanding the fact that a water-rate of Rs. 50 per acre per annum is charged. Such cultivation involves considerable capital outlay and a large expenditure in manure. It is analogous to the oil engine cultivation which we are developing on this side and which kind of cultivation it is my object to point out might be developed on a much larger scale if, in the future, it is found feasible to construct the great masonry dams which have been projected for holding up the waters of the Kistna, the Cauvery, the Tungabhadra and other rivers. More irrigation in the South of India we must have, and because we have exhausted all the easy methods of obtaining water for irrigation there is no reason why the country should stand still and accept the fact that nothing more can be done. If water cannot be obtained at Rs. 5 an acre it is an undoubted fact that large supplies could be given at a cost of Rs. 10 an acre, and still larger supplies if it could be shown that water is worth Rs. 20 an acre. The cultivation under oil engines and pumps, the enormous area under irrigation from wells and the high rates paid for water in the zemindari tracts all tend

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to show that there is still a very wide margin for the irrigation engineer to operate on.

Accepting the figures, which I have placed before you as accurately representing what can be done under the conditions specified, there can be no doubt that if such work could be carried on over thousands of acres as it is now carried on over tens, it would be a comparatively simple matter to finance the great engineering works which will be necessary to supply water. Unfortunately it is practically certain that at the present time the cultivators are not in a position to take large volumes of water on the same terms as are easily obtained in all the cases I have brought to your notice. The average ryot lacks capital, lacks initiative and above all is imbued with the idea that irrigation means an easy life and not a strenuous one. Before the great irrigation works of the future can be carried out the average ryot, who cultivates dry land, will have to be brought to understand that his slovenly and lazy methods of working can be no longer tolerated, and that if he wishes to continue in the possession of his land he must be prepared to cultivate it properly. There is much for him to learn and the problem is how to teach him. The extension of irrigation by pumping will probably prove one of the most effective means of diffusing throughout the country a better knowledge of the principles of agriculture and all means which are adopted to encourage the extension of this method of lifting water will tend to bring about the desired end. Nearly everywhere it is the poverty of the individual and the extreme sub-division of the land which makes progress slow. Nevertheless where the conditions are favourable great strides have been made.

In the South Arcot district in the Villupuram and Cuddalore taluks the conditions in regard to water-supply are unusually favourable. Vast beds



of sand lie at no great depth below the surface of the ground and from these it is practicable to obtain a supply of from 20,000 to 30,000 gallons of water per hour from wells not more than 15 or 20 feet in diameter sunk into the sand. Already over 50 pumping plants have been installed in these two taluks and many more are under consideration. In not a few instances the whole capital outlay involved has been realised within the first year and in nearly every case within two years the cost of these pumping installations has been recouped. In place of 50 engines and pumps there is probably room for 1,000, and that too without seriously affecting the water-supply. If private enterprise were stronger and capital more abundant the irrigation problem in these two taluks would be easily dealt with. The ryots have water and land and if supplied with power to lift the water so as to make it available for cultivation, they can obtain large profits. Under these circumstances the capitalist would step in and provide power on terms which would be advantageous both to the supplier and the user. A central power station would be established either near the railway or away on the borders of the Salem district in the middle of the forest from which it could derive its supply of fuel. The combination of a wood distillation plant with a central power station should prove a very remunerative undertaking if worked on proper lines. In the forests the timber would be cut down and converted into charcoal. The charcoal on the spot would be used in large suction gas plants to generate electricity. Electric currents under high pressure would be carried across the country to the points where the power could be used and there it would be transformed down to a reasonable pressure, and from each sub-station wires would radiate to the wells in the neighbourhood.

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In many cases ryots already own wells which will yield large quantities of water or which can be greatly improved by sinking them a few feet deeper. If the Power-supply Company would instal its own motors and pumps and undertake to lift the water there is scarcely any doubt that the demand would be considerable. The ryots can afford to pay as much as one anna per thousand gallons and probably by charging a fixed rent for the motor and pump plus a rate for the actual amount of power taken there would be no difficulty in putting the distribution of power on a sound commercial basis. The charcoal manufacturing plant should be of a modern type fitted with all the apparatus necessary to obtain the valuable by-products of which the most important are acetate of lime, methyl, alcohol and tar. Of course such a plant can only be worked with profit when the scale of operation is sufficiently large. Half the charcoal manufactured in the wood distillation plant would be required for the recovery of the by-products and for working them up into a marketable condition whilst the other half would be available for the suction gas plants which would supply gas to the engines driving the dynamos. Three thousand horse power would, I think, in a short time be taken up within the area I have mentioned, as not only would it be used for pumping water but also for driving oil mills and other machinery. To a limited extent there will be a demand for lighting purposes and it can hardly be doubted that, once a supply of power was available, a considerable number of miscellaneous ways in which it could be usefully employed would soon be discovered. A plant, with an average output of 3,000 horse power for 12 hours a day, would require 20 tons of charcoal per day or roughly 7,000 tons in the course of a year; so that if all the by-products were recovered upwards of 14,000 tons

of charcoal would have to be manufactured every year. This would involve the carbonization of about 50,000 tons of wood per annum, and assuming that the annual increment in the forests is one ton of wood per acre per annum an area of 50,000 acres of forest would be required. This could be reduced if suitable plantations of casuarina or some other quick growing timber were made. Already there are in the South Arcot district some 11,000 acres of private plantations and a large extension of these to supply fuel for power purposes would ultimately be of immense benefit to the district.

It is useless at the present moment to endeavour to work out such a scheme as I have outlined in any detail. My object in bringing it forward is to indicate one of the directions in which work should be undertaken in future. The scheme I have outlined is typical of the way in which industrial problems must be tackled. Whilst it is possible to do a great deal by establishing a large number of small centres of industrial activity, it must be remembered that these are, as it were, the pioneers who clear the ground for the greater undertakings which must follow. In South Arcot the small undertakings are proving exceedingly profitable and their rapid increase in numbers can be safely counted upon. They will bring wealth and prosperity to those parts of the district which benefit by them, and ultimately I am sanguine enough to anticipate that there will be an accumulation of surplus profits seeking for new outlets.

I have put forward these ideas simply to suggest the direction in which we are moving and to indicate in faint outline the tendency of the policy we are pursuing in this particular instance. The industrial regeneration of India is a vast problem which can only be achieved by steady persistent effort continued for a long period. The difficulties to be faced are

enormous and the first step must be to educate the people to a sense of their own deficiencies and to bring them to gradually take an interest in the practical solution of the problems presented. I think I may claim that the success, which has attended our efforts to introduce oil engines and pumps for lifting water, marks the first stage in the new movement and it has awakened in the minds of thousands of landholders and ryots an interest in mechanical methods of doing work which is entirely new to this country. Considering the marked inaptitude of the agricultural community for mechanical methods of working it is surprising how easily they have learnt to manage oil engines and pumps and I think it is unquestionably because they fully appreciate the advantages which they confer and are willing to take the necessary trouble to understand how they work. Quite recently I have inspected a considerable number of these pumping stations entirely managed by the ryots themselves and I think there is no doubt that the engine and pump is to the ryot who possesses it what the motor car is to the average European. The one is spreading a knowledge of mechanics through the literate classes of Europe and the other through the illiterate classes of Southern India.

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## APPENDIX.

The following table gives information under the various heads enumerated regarding a number of the installations which have been erected. In many cases the ultimate area which will be irrigated will greatly exceed the area noted as full advantage is not yet taken of the water-supply available :—

Name of Installation.	Horse power of engine.	Diameter of delivery pipe of centrifugal pump.	Maximum lift in feet.	Total cost.	Area irrigated.	Names of water-supply.
Alinjivakkam ...	5	3"	20	Rs. 2,000	7	Well.
Kumaravaram ...	5	3"	19	2,310	15	"
Salai ...	5	3"	22	2,046	13	"
Panamkuppam ...	5	3"	19	1,705	15	"
Tondayarpet ...	5	3"	26	2,000	8	"
Orrakadu ...	6	4"	19	2,240	14	"
Anamalai ...	6	3"	27	2,445	12	Upper river.
Panjetti ...	6	4"	21	2,375	15	Sub-artesian.
Kolianur ...	6	4"	20	2,092	18	Well.
Anichambalayam ...	6	4"	16	2,065	20	"
Siruvanur ...	6½	4½	21	2,615	40	"
Thattanpalayam ...	6	4½	26	2,380	31	"
Surapet ...	6½	4½	18	3,241	28	Sub-artesian.
Kalasti ...	7½	3½	30	2,096	10	Well.
Bavanasamodram ...	7½	4	23	2,749	16	"
Sothuperambuda ...	7½	4	24	2,487	11	"
Vichur ...	7½	4	21	2,686	12	Sub-artesian.
Surapet ...	7½	4"	22	2,185	14	"
Mangudicherry ...	7½	4"	21	2,277	7	Well.
Arugalavadi ...	7½	4"	23	2,535	22	"
Kiramambakam ...	7½	4"	17	2,200	17	"
Kaliyanur ...	7½	4"	25	2,368	30	"
Manavanthangal ...	7½	4"	21	2,266	12	"
Trukarugavur ...	7½	4"	14	3,900	28	Tank.
Kalinjikuppam ...	7½	4"	25	2,435	40	Well.
Punjerikuppam ...	7½	4"	23	2,300	23	"
Kodamangalam ...	7½	4"	18	2,195	18	"
Valavanur ...	7½	5"	20	2,285	21	"
Ariyalur ...	7½	5"	17	2,586	45	"
Melrajanikuppam ...	7½	5"	18	2,516	50	"
Shohavalli ...	9	4"	15	2,380	16	"

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Name of Installation.	Horse power of engine.	Diameter of delivery pipe of centrifugal pump.	Maximum lift in feet.	Total cost.	Area irrigated.	Nature of water supply.
Nellikuppam ... ..	9	4"	16	2,750	15	Well.
Cuddalore ... ..	9	4"	80	7,000	48	Sub-artesian.
Do. ... ..	9	4"	19	2,700	84	Well.
Palur ... ..	10	4"	15	2,940	18	"
Do. ... ..	9	6"	16	5,000	70	Tank.
Panampet ... ..	9	4"	15	2,345	20	Well.
Kavanipaukam ... ..	10	4"	15	3,490	14	"
Thukanambakkam ... ..	10	4"	23	3,340	19	"
Melpattanbakam ... ..	9	6"	18	2,665	35	Tank.
Achiyalpuram ... ..	12	6"	18	3,800	29	Sub-artesian
Surapet ... ..	12	10"	8	14,500	500	Kistna west- ern delta main canal.
Atmekur ... ..	12	10"	8	14,500	500	Kistna west- ern delta main canal.
Do. ... ..	12	10"	8	14,500	500	Kistna west- ern delta main canal.
Gudiyattam ... ..	12	5"	25	3,100	27	Well.
Laccaveram ... ..	14	6"	14	5,000	20	River.
Manoor Lanka ... ..	16	10"	7	6,000	200	Colair lake.
Kattalai ... ..	25	12"	16	15,000	300	River Cauvery.

# OUR MILL HANDS

AND

## THE FACTORY LABOUR AGITATION

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GENERAL MANAGER,

Shri Shahu Chattrapati S. & W. Mills,

KOLHAPUR.

Indu Prakash Steam Press, Bombay.

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## PREFACE.

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This paper first appeared as a serial in a daily journal. In sending it forth in this shape it is perhaps necessary to say that I speak on behalf of the mill-hands from personal knowledge acquired in the course of over twenty years' close contact with them in Bombay and elsewhere,--from the lowest paid position to that of a Carder, a Spinner and an Engineer. My mingling with them outside the Cotton Mills has not been less free or less cordial to afford me ample opportunities of studying them, of knowing at first hand their strong and weak points, their real wants and their just grievances. Here is an humble attempt to present as true a picture as possible of their present condition in view of the measures now before Government which may, in the long run, affect for better or for worse the well being of nearly two and a quarter crores of the voiceless workers in the textile industry of this country. It is the ultimate good of the labouring classes which Government have at heart and if this little book can, in the smallest degree, prove helpful in that direction, the effort will not have been made in vain.

Kolhapur,  
16th August, 1909.

V. A. T.



# OUR MILL HANDS. AND THE FACTORY LABOUR AGITATION.

BY

VINAYAK A. TALCHERKAR,

*General Manager, Shri Shahu Chattrapati  
Spinning and Weaving Mills, Kolhapur.*

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[ "To sum up, we have before us the following facts: That England once possessed a monopoly of the manufacture of cotton goods; that this advantage was the result of cheap production; that private enterprise in the trade has been annihilated; that co-operative enterprise has been unsatisfactory and is in a most perilous position; and that the causes are as follows: reckless and ever-increasing gambling in the raw material, the speculative promotion of new Mills, the unreasonable demands of trade unions and their obstructive tactics with regard to improvements, the mischievous and imperfect enactments of the legislature, and the protection extended to our competitors by their own Governments. Until these evils are cured our cotton trade will continue to decline whilst that of our rivals will increase. We expend thousands of lives and millions of money in securing fresh outlets for our manufactures, and impose grievous direct taxation upon our commercial and producing classes, and then throw open these markets to our foreign rivals without money and without price."

*Albert Simpson.*

## INTRODUCTORY.

The question of regulating factory labour in India will before long be again agitating the public mind in this country when the result of the recent Factory Commission comes to be crystalized in the shape of an amended Factory Labour Bill for legislative action. The time is therefore opportune for certain facts

bearing on the subject to be placed before the public whether these facts be already known or now first brought prominently to notice. It is idle perhaps to probe deeply into the motives that have once more brought this matter before the Government of the country. To the credit of Government be it said that they did not origi-

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ginate the movement which aims at restricting the liberty of the labouring classes in the matter of their working hours—a movement which is fraught with grave and far-reaching consequences to them. The spring of all this movement is in England—and it would be affectation to say that nothing but purely altruistic instincts have set free the main spring. It is manifestly a question of self-preservation. The English cotton trade has been and is suffering. The motto heading this paper sufficiently explains it. Things have not much improved since that wail was first heard. And the depressed trade must naturally cast about for expansion and relief. Our sympathies go to Lancashire in this connection but greater far must be our concern for the starving thousands of our own countrymen depending on the same cotton industry. The transfusion or aquisition of new blood may be a desirable remedy for the bloodless moribund patient; but this blood can come out from the arteries of those only who have a plethora of that vital fluid in their system. Limiting the working hours of the Indian working classes and otherwise handicapping the cotton trade of Hindustan is,

in a way, akin to the old drastic remedy known as “transfusion of blood”—a remedy sometimes fraught with grave risk to the saviour and the to-be-saved alike.

It is the humble aim of this paper to show that the poor Indian worker is ill fitted, as he now is, to be experimented upon in this wise and that it would be true beneficence to leave him unfettered in his choice of working hours. A much greater philanthropy would be to ameliorate his condition in other directions, moral and educative, and such alrnuisum cannot but react beneficially on the philanthrophists.

ACTUAL CONDITION OF THE  
CLASSES  
FROM WHICH OUR COTTON  
MILL LABOUR IS DRAWN.

A vivid picture of the poverty in which the labouring classes are hopelessly sunk is best seen in the descriptions of well-known writers who have devoted much thought to this subject. It is from the submerged classes so described that our mill-hands are drawn—the Bombay Presidency alone absorbing 148000 out of the 211000 employed in the cotton Mill industry in all India. A few extracts from

these writers would perhaps carry more conviction than any thing I may say of them from personal knowledge. In any organised efforts to improve the condition of the army of operatives engaged in the textile industry, this grim picture must needs be kept constantly in sight. The late Sir W.W. Hunter wrote that "forty millions or one-fifth of the whole population of British India go through life on insufficient food." Mr. Digby, C.I.E. has somewhere observed: "When the average loss of starving people year in and year out, is two millions, and when, in some of the years covered by that average, the loss is five or six or even seven millions surely the beginning of the end of our impossible condition of things cannot be far away." Mr. A. O. Hume, C. B. bore this testimony: "When I went to India in 1849 there was not a tolerably well-to-do cultivator in any part of Northern India who had not stored away in a grain-pit somewhere about his premises at least a six months' supply of grain for himself and family. Now not one per cent of the cultivators have even a month's supply of grain." This remark applies to the whole of India. From personal contact and close observation vouchsafed to few Englishwomen, Miss Noble records her impressions: "Rice must again be accumulated instead of withdrawn. A people are not prosperous unless they are growing in prosperity. A people are not prosperous unless they are individually prosperous. A Government surplus is no sign for, or against, the prosperity of a country. An army might possess itself of such a "surplus," in a country which it was devastating. Hackneyed phrases only darken counsel. We must try to discard these and get back to facts. The basic fact is that an agricultural country in which peasant-homes are prosperous, established in prosperity, or prepared against reasonable strain of bad harvests, is a prosperous country; and an agricultural country in which the peasant is less secure than this, is not prosperous, though her lawyers sup on gold and her kings go decked in diamonds. The condition of the peasant is the only test, for the simple reason that it could never be to the interest of a Government, which depended upon his taxes, or a city that looked to him for its supplies, to kill him off, so that he paid no tax, and raised no rice for

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evermore thereafter. To run a country in such a way that it falls into perpetual famine, on the slightest excuse, is, even from an imperialist point of view, to kill the goose that lays the golden eggs. An Ashoka could never do this. An Akbar could never do it. It could only be done by those who avowedly possessed no permanent interest in the land." "From time beyond memory," writes William L. Hart, "India has been subject to failure of rainfall, and often through consequent failure of crops there have been periods of famine. It is also a fact that, by the accumulated experience of people, means have been found to provide a surplus food supply against the day when crops should fail. Man has thus grappled with nature and has been able to avert by commonsense the inevitable starvation. It must be observed that the Indian cultivators or rayat in times past held the land in communal tenure; there were village stores of corn and by the observance of wise old fashioned customs the land could not be alienated and the crops were mainly consumed on the spot. The land tax in ancient times was largely regulated by the amount of produce payable in kind. The seizure of India by a trading company led to the establishment of quite a different state of things. Gradually, land settlements were made that is, all the old systems were unsettled and new civilised system established by force of law. Taxes payable in money were levied, export of grain encouraged, and by wars, the whole continent was tacked on to the British auction system and little by little the means of resisting famine were destroyed. The English land laws were in many parts introduced, the English system of money lending legalised, and encouraged, bringing in its turn the mortgage forced sale and the accumulation of large estates under the control of a few persons." A writer in the *Indian Review* thus unfolds the result of the new methods superseding the primitive social and economic arrangements of a simple agricultural people: "The advent of British Government" he writes, "have so far changed the state of affairs that those people who were formerly immersed in deep meditation and found their consolations in spiritual ecstasy have now entered upon the worldly and selfish life of competition and Mammon-worship in right earnest. The agricultural

classes have become a prey to all. They have to maintain 17624 lawyers, 16965 law agents, petition-writers, lawyers' clerks, &c 19586 brokers and the lazy army consisting of the family of these and several millions of trading classes who become wealthy, seated comfortably in the cool, airy rooms of their mansions by lending money to these labourers and trading with their produce and finally devouring them. Besides these there are 314724 mendicants let loose upon all."

It should be remembered that out of the 30 crores of Indian population eighty per cent depend entirely upon cultivation to whom the foregoing remarks apply with peculiar force. In any further upsetting of primitive methods or violent modifications of a settled order of things under new methods, the views set forth by these and other thoughtful writers must be borne in mind no less than the accumulated experience of the people themselves in respect of land and the old established system of works and wages. Before the labourers' working hours are curtailed at the cost of his wages, a sacrifice he can ill afford in any circumstances, this chronic poverty and helplessness of the *rayat* needs to be remembered by

the legislators at every step of their experiments. The natural helplessness of the starving cultivator class in other respects is intensified by the rigid enforcement of the Arms Act. They and their cattle are thus at the mercy of the wild beasts. Over twenty-five thousand persons are so killed annually. Famine is a normal condition more or less and it has had, for over a decade now, an ally in Plague. Already more than 60 lakhs have been carried away by this pestilence and none can say how many more are yet to perish. The death-rate from all causes has also gone up by leaps and bounds during the last 10 years, to wit, from 21 to 36 in a thousand. In dealing with these ignorant and voiceless classes who supply recruits to our cotten mills, all these grave factors have to be noted before their amelioration can be attempted by forcing them to work fewer hours and thereby earning less wages in towns and cities.

#### THEIR INTELLECTUAL AND MORAL CONDITION.

The Hon'ble Mr. M. Robert speaking about shortage of labour for industrial purposes remarked as follows before the first Conference of the Indian Chambers of Commerce held in Calcutta:-

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"The idea of leaving his ancestral village and quitting the associations of his birth-place environment was strongly repugnant to the average native. Temptation of high wages exercised comparatively little influence. The average native placed small value on earnings in excess of what was required to satisfy his daily simple wants in the matter of food and raiment, being devoid of any semblance of ambitions, and his natural instinct was to let 'well alone.' To dislodge and transplant the average native was the problem they had to solve. High wages did not operate as an inducement and some other influence and persuasion must be brought to bear." This is true: starvation alone will force the Indian labourer to leave his village in search of food. His simple wants are easily satisfied and he has no aspirations. A single pie in his pocket for "pan-supari" is to him a sufficient reason for not seeking work. This is exasperating no doubt but one has to face the fact. Their false pride, superstition, extravagant habits on ceremonial occasions, and their ignorance, are at the root of it and these have to be eradicated first before this class can be elevated. Although cultivation of soil is their present lot yet in the good old days they were a sturdy race of fighting men; they enjoyed much liberty and were happy. The inherited habits of those better days cling to them. Compulsory education on lines suited to their present lives can alone wean them gradually from these habits. Left to themselves they will not be educated nor will they adopt improved methods of tilling the land, because their forefathers did not practise them. They would rather pay to the *Savakar* a hundred times the price of the ancestral property in the shape of interest than part with the land. His *abroo* or *azzat* (prestige) he prizes above all and in order to maintain it he will borrow money recklessly on marriage and other festive occasions. He and his family may be actually starving, but he will make believe he is well off. He will smear his moustaches with a little ghee and roam the village through with the big discoloured turban on his head, the worn-out blanket on his shoulder, a long stick in his hand, and strong heavy sandals on his feet, telling friends and neighbours fibs about the tooth-some and rich meals prepared by his good wife and the wasteful expendi-

ture of ghee which accounted for his glossy moustaches! In times of famine it is death to such people to beg or to take shelter in relief works. Since writing the above my attention has been drawn to the following pen-picture which though delineating the character of the Bengal peasant in times of stress, yet so well portrays his Maharastri brother under similar environment, that I cannot resist the temptation of quoting a few lines. Knowing personally something of the Bengalee mill hands this common characteristic appeals the more strongly to my mind. Writes Sister Nivedita ( Miss Noble ) in her 'Glimpses of Famine and Flood in East Bengal':—"This intense sensitiveness and delicacy of these Indian villagers played its own part in helping to deepen our understanding of the prevailing desolation. Every story told meant so much pride overcome....and I was a little diffident with the first boatman I had accosted, in making enquiries as to whether the prevailing famine and rise in prices had made themselves felt severely by them and theirs. Their first effort was to put me at my ease. Gravely and kindly they took up the question. Work, they said, had become scarce every where. No one who could

possibly do without it would employ labour at such a time. Every one naturally was cutting his expenses down. They themselves, for instance, had lain to, at the little quay where we found them, for ten days past, and this was the first time they had been employed. Inevitably, therefore, things were a little difficult. But they had managed. Oh yes! they had managed. And they had no doubt that in some way or other they would continue to go on. With this abrupt reserve, this lowering of the visor, so to speak, the subject was dropped, and could be pursued no further. Yet it was not that the new comer had been rebuked for impertinence, but rather that all alike we had realised the sudden pain of the attempt to lay bare our necessities to others. And everywhere in famine-villages I found the same thing. Here and there as we went about, we would come upon some one whose store of money or provisions was not yet wholly exhausted, some one who was still hoping that public help would prove unnecessary to his little house-hold. And wherever this happened the personal question would be skillfully evaded, and any discussion of the situation, quaintly refused, ... .. And yet, in the districts

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near the city of Barisal, the process of desensitising the finer nerves had not gone even so far as here. The gentle peasant women and the strong and decent peasant men whom I met there in their own farm houses, willing to talk of their anxiety and their ruin, but they could no more than ourselves, have made a direct appeal for assistance. For the sturdy independence and democratic pride that are characteristic of well-doing farmer-folk the world over, are certainly as great in East Bengal as anywhere. These people may be more refined than folk of their own rank in Europe; even as the Asiatic Madonna is in contrast with Dutch Betji or Britonne Françoise."

I may have occasion to draw a little upon this work once again later on at the risk of being deemed tedious, because the writer coming in personal contact with the sufferers, writes in her own inimitable and realistic manner and in full sympathy with the agonised beings around her; and though she paints the horrors of famine in distant Bengal, her impressive observations about men and things apply equally to Maharastra in similar dire circumstances.

No sooner does the villager find that he is on the point of

starving and his creditor dining him than he escapes from his *gaum* to the industrial centres. Even here he is not free from the local usurers and grain dealers. When hard pressed by these or feeling homesick he will not hesitate long before running back to his village. Drinking, gambling, loitering about and spending extravagantly bring ruin to these people. Much can be done to help and elevate them so that intelligent and thrifty labour can compete on equal terms with that of other nations. Primary compulsory education, night classes, cheap literature, temperance lectures, medical help, sanitary housing are some of their pressing needs. Money is a rare sight to these work people in their villages. Whatever they earn even their extra wages in most cases go into the pockets of their Savakars in their villages and of the Marwadis, grain dealers and tavern-keepers in towns. He comes to Bombay without a pie in his pocket and he has to wait for over two months before he can get his wages. This is how the mill hand always falls a prey to money-lenders. Weekly or fortnightly payment is the only cure for this condition of things. One cause of their chronic indebtedness in cities



is the present system of paying wages. A new arrival must work for over two months' wages. Weekly or fortnightly payment would certainly relieve their wants. The remedy lies with the men themselves and they can compel payment earlier if they but knew the ways of their brethren in Europe with their Labour Unions. Their ignorance and utter helplessness are responsible for the continuance of the existing system. At the same time it must be confessed that employers are not altogether averse to pay their men weekly, but are restrained by the tendency among the operatives to keep off from work for days together after receiving their wages; arrears of pay withheld is one of the means of keeping the men to their work at a stretch. The weekly pay system was in vogue at one time and employers had no trouble, but then the operatives were more under the control of their headmen, and regular attendance was easily ensured. These people have no leaders now. No jobber would in these times venture to guarantee similar attendance once the workmen have their full earnings in their hands: for this reason arrears of wages held back by em-

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ployers act as a whole, some check on the men.

**THEIR PHYSICAL CONDITION:  
CERTIFICATES AS TO AGE  
AND PHYSICAL FITNESS.**

These certificates are designed to protect the young, the ailing, the old and infirm and those of poor physique from sweating, much the same as an emaciated bullock is protected by the S. P. C. A. from drawing carts heavily laden with cotton bales. The motives in both cases are humane but, I submit, something more is needed if legislation must go to the root of the matter and insist upon none but the able bodied for employment in mills. Why is the mill hand poor in physique? Because he is ill-fed, ill-clad and ill-housed, and so long as he remains illiterate without a particle of ambition for earning better wages wherewith to buy nutritious food and live in healthy homes, he will be content to live a half-starved life amid squalor. Whilst things are so it is hopeless to expect any improvement in the men's physique and in their efficiency as a special class of workmen born and bred to the one profession—the "one job" men and that alone—and contributing to capital their best productive labour as

mill hands. Education,—compulsory or otherwise—can alone create that ambition in this hopelessly backward class: it alone can teach them thrifty habits and ultimately improve their physical and moral condition. Any number of model chawls built on the latest sanitary principle and any amount of medical help to improve the mill labourers' standard of living and to make him earn higher wages in his own and his employers' interest, is a sheer waste of energy. The greatest problem for the Government and the mill owners lies here. Medical examinations and certificates by themselves can go a very little way. Half-starved and ill-clad people cannot be expected to live cleanly lives and to appreciate the value of sanitation. Even where dwellings meeting all the requirements of hygiene have been provided for them no perceptible good has resulted. A number of model chawls have been built lately in this city for the accommodation of police sepoy, office peons, railway porters and others and yet the old cry is heard that these quarters are kept by the inmates in an untidy and dirty condition with all windows and openings for ventilation scrupulously closed. The reason for this is not far to

seek. Greater ventilation in such rooms occupied by poorly fed people, means greater circulation of pure air or oxygen and more oxygen ultimately means better assimilation of food and a keener appetite for more of it. Now, as long as no sufficient food is to be got by the labouring classes it is idle to expect them to appreciate the value of light, pure air and pure water in model sanitary houses. Ventilation to these people means the undue cooling of their ill-covered and ill-nourished bodies. Absence of free ventilation and an accumulation of dirt on the body and clothing are found to maintain the needful warmth and to add to their comfort. Nevertheless *bastis* on sanitary lines erected by mill owners, Municipalities and others, are necessary and these should, if possible, be at a distance from the mills of at least half an hour's brisk walk in the open air. But when all is said and done, no amount of sanitary housing and medical factory inspections will put muscle and energy into them for turning out efficient workmen, without sufficient and nourishing food and the imparting of some knowledge to open their eyes and to raise some aspiration in them.

## COTTON OR FOOD?

Reference has been made above to the poverty of the peasant class from which Mill labour is recruited, and to the perpetual famine conditions in India. An Anglo-Indian journal thus discoursed on the subject of food for the millions nearly forty three years ago. "We are sorry to learn from the report of Mr. Forbes, Cotton Commissioner, that there is an increase of nearly a million acres in the area of cotton cultivation in Western India this year as compared with the last. We are sorry to hear it, because increase of cotton culture means famine. A million acres more given to cotton means a million acres less given to grain. The equilibrium of supply and need in the matter of grain, has always in India been so very delicate that the least disturbance entails a famine somewhere. Since the great stimulus given to cotton culture seven years ago, there have been famines in Madras, Orissa the Central provinces, the N. W. Provinces and Rajpootana. We have not yet had any very serious or general famine in this presidency; shall our turn come next? Have any steps been taken to secure an extra cultivation of a million acres of grain somewhere also to coun-

terbalance the million here with drawn from it? We are distinctly told that one cause of the terrible famine that has been—not decimating but tertiating the population of Rajpootana, has been the substitution of cotton for grain culture, and we were told the same thing when a million and a half perished of starvation in Orissa. The good people of Manchester hold meetings and pass strong resolution to the effect that it is the duty of the Indian Government to secure him all the cotton they need; and the Indian Government give reverend heed to the admonitions of the Manchester people; but there is too much reason to fear that the interposition of Government is costing India more than the grain that accrues to cotton dealers here and in England. The people of this country can do better without piece-goods than they can without food. Cotton is falling in Liverpool; it is just possible that the larger crop expected next year may not realize more than last year's crop. This is a wretched argument to adduce after the terrible one already stated; but alas! It is one that weighs with men as much perhaps as the other." Things have not mended since, and what has been said of cotton applies equally to the

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jute plantations of Bengal and the indigo cultivation in Assam to this day. For the last several years an increase of about 7% is perceptible in the area of grain cultivation, whereas in that of cotton and jute, the increase is as much as from 50% to 70%. Driven from agriculture for lack of food the rayat is forced to seek refuge in textile factories. Leave him there unfettered to earn his bread in peace; pursue him no farther either through benevolence or self-interest: to restrict his liberty by forging factory-law fetters is virtually to kill the voiceless and law-abiding peasant by a slow process and such a course must be extremely embarrassing to the Indian Government and must give pause even to the pious agitators thousands of miles away when they come to know fully the far-reaching consequence of their action.

#### AND WHAT THE YEAT ?

Mention has been made about the cultivating classes or

labour feeders of our Cotton Mills living on *insufficient* food; a word here is necessary as to what that food is. The few varieties of cheap stuff given below which serve to fill in the cavities of the stomach—more to allay for a while the pangs of hunger than to satisfy the normal cravings of nature—will give an idea of what food really means to these poor people. Let it be remembered that all this stress is felt during seasons when crops of food grains smile in plenty all round; and yet the peasantry have to dodge hunger and to resort to shifts to stifle its cravings. These plentiful crops all round are to these men what the boundless sea was to the Ancient Marines—“Water, water everywhere but not a drop to drink.” One may conceive what the cultivators’ condition must be when dread famine actually stares them in the face and the grim fact is officially notified in the affected districts.\*

[\*“For famine is many things besides hunger. True, it is hunger so keen that one man whom I know, spending some days in a district as yet undelivered, could not sleep at night, for the wail of the famine-stricken in his ears. Hunger so keen, Oh God! so keen! But it is more than this, as we have already seen. It is the extreme of poverty, bringing amongst other things, nakedness, darkness at nightfall, ignorance, and unrepair in its train. It is poverty breeding

The staple food of the peasantry is well known to be the coarse rice grown in the hard unyielding soil of the Konkan and the *Sondhala* ( or javari ) and *bajari* in the fruitful soil of the high table land—the Desh. And the struggle of the toiling workers, who know that they cannot count upon these nourishing cereals all the year round—is to save these grains as much as possible for the rainy day—and they can save these but little,—and to subsist for the remainder on such other stuff as they can swallow. A few of these poor substitutes for food are here given:—

( 1 ) *Wild fruits*. In the Konkan where cultivation is forced even on rocks by spreading a thin layer of earth over it, no labour is spared in raising Peru ( Guava ), Bor ( Jujube ), Karvand ( Wild Berry ), Phanas ( Jackfruit ) Kel ( Plantain ) Janbhul ( Eugenia janbolana ) Amba ( Mango ) and various other wild fruits growing in forest. These wild products are intended to

take the place of their staple food for three months out of the twelve. Labour on this field is not generally remunerated on the money payment system, but by free meals in the morning and by the present of jackfruits and other such eatables with some tobacco thrown into the bargain when the day's work is over at sundown.

( 2 ) *Nachani*. This corn is known for its lasting quality: it stands good for ten or fifteen years. Every farmer takes good care to cultivate this grain every year. Eight *tipris* (about 6 lbs. ) of *Nachani* is worth about two annas and this quantity is sufficient to keep up a man for eight days on the table land of the Deccan.

( 3 ) *Nachna Ambil* this pottage is made of Nachana flour well mixed with water and then allowed to ferment for about twelve hours. This is further diluted with hot water and some spices added, the whole forming a mess which can be drunk easily. This is their main food specially

poverty. Under its pressure the milk-cows are sold to the butcher, sometimes for eight annas or a shilling, because their owners can no longer maintain them, and by the new master are killed immediately for their hides at the value of which he bought them. When it comes the seed of the next year is eaten as food, the savings of lifetimes are scattered to the winds. Economic relationship that seemed inherent in the social organism are broken to pieces”

*Glimpses of Flood and Famine etc*

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in the hot season. An onion is occasionally used with this beverage and this *ambil* shift for substantial meals is resorted to for the sake of holding in reserve the much prized *bajri* (spiked millet) *juari* (Indian millet) &c.—the staple corn of the Deccan.

(4) *Kannya* or Gruel made of crushed corn. This porridge, or *Kannayachi Pej* made of *jondhala*, is used in the Deccan as *conjee* of Rice is in the Konkan. This *Kanje* or *Pej* is drunk in considerable quantities to fill the stomach to its utmost capacity in order to stay the pangs of hunger, thereby again conserving the staple corn of the respective districts for the inevitable rainy season.

(5) *Cakes of corn with vegetables mixed*, is another shift for stuffing the belly for the sake of saving the staple food. This is made of *jondhala* or *bajri* flour one part, and vegetables two parts, with a dash of salt well mixed together. Two tips of *jondhala* worth about half an *anna*, ground into flour and mixed with vegetables, can maintain husband, wife and two children for one day. The vegetables chiefly used for these breads are the leaves of ordinary Tur pulse (Pigeon Pea), *Ambadi* (Brown hemp), *Chavli*

(Hermaphrodite Amaranth) plucked from fields and river banks. *Bhopla* (Pumpkin red) is also used in large quantities in rice preparations as food shifts.

(6) *The ambada* is a cheap cereal, not a food grain, but useful for extracting oil from its seed, and fibres from its stem: a small quantity of *ambada* seed flour is mixed with that of *jondhala* and *bajri*, for making into cakes.

7 *Bhatacha Konda*—the husk of rice—well pounded is also used in small proportions for giving body to cakes made of *jondhala* and *bajri*. This shell of rice is otherwise burnt and its ashes used as manure. Here, by the by, is another instance of poverty robbing the exhausted soil of its recuperative manure: the other very needful manure withdrawn from the hungry soil is *cowdung* made into cakes and used as fuel for cooking purposes.

#### STALE LEAVINGS OF FOOD.

##### ALSO UTILISED.

9 *Stale bits of Jondhala bread* as hard as wood, or mild-dewed, are soaked in *Varan* or cooked liquid preparation of Dal pulse, and this unsavoury mess is partaken of as food.

9 *State purān-polis*, or roly polis (sweet bread made of wheat and gram flour stuffed with jagri or "gool") are dried and preserved for months and eaten with *gool pani* or jagri water.

10 *Cooked Rice*. The remnant of boiled rice instead of being allowed to rot, is dried and again utilised when required. If small in quantity, the leavings of cooked rice are kept in water and eaten with whey: nothing is thrown away and nothing comes amiss to these poor half-starved people.

11 *Maka (Maize &c.)* The *bandhs* or narrow embankments of plots which are also used as foot-paths around the paddy fields are invariably cultivated for raising crops of *ambada*, *chavli*, *maka* (maize) tur dal, jute and others. Of all these the crop of maize is a luxuriant one at all times. This cereal is largely used for bread or eaten cooked in the form of rice or made into gruel, also roasted and eaten with relish. Although maize is not their staple food, yet Indian farmers maintain their families on this corn for days together in order to preserve their *jondhla* and *bajri* for the rainy days.

These are the various poor substitutes for nourishing food

to which the working classes resort in the absence of sufficient supplies of their nourishing staple grains to last them throughout the year and this is their condition when the crops are bountiful. But when the least deficiency in rainfall reduces their usual scanty store of the staple grain and leaves them only a little salt and bread, and even then when the wild fruits of the forest fail them, then comes the extreme hour so dreaded when the tillers of the soil in the face of the staring famine leave their dear homesteads for Bombay City with a little borrowed money from the Sowkar.

#### ACTUAL WORKING HOURS.

Mr. Sutcliffe in his very informing letter to the "Times of India" of 28th November 1907, has shown by incontestable facts and figures that the average working hours in mills are 8.81 or a little short of nine hours a day; the average working day 5.15 a week, and the average working hours 45.37 a week as against 56½ hours work obtaining in Lancashire. These figures can with very useful result be verified by keeping a record in the engine room of the full load the engine bears while working from morning to evening. It is a mistaken

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Idea that because the engine runs for twelve or fourteen hours the men also work these hours. It will be found on observation that from the time of starting the engine in the morning and in the afternoon and before stopping in the evening, there is hardly any load on the engine for a full hour to an hour and a half. This is quite apparent and of daily occurrence, but if we look a little deeper into it and watch the work recorded by the governors and the auxiliary governors in the engine room during the whole day—the reliability of Mr. Sutcliff's figures can be very easily tested by an altogether different method by which he has arrived at the result. There is no exaggeration or error in his calculation.

In this connection it would not perhaps be amiss to take count of a few pretexts under which our mill hands shirk continuous work and how these excuses are tolerated, in fact accepted, as an inevitable factor by the employers. They are briefly:—

- (1) Never at the post punctually when the engine starts in the morning,
- (2) Attending to calls of nature twice or thrice a day,
- (3) Off work for smoking and drinking purposes twice a day.
- (4) Taking food without leaving the department: sometimes leaving the department twice a day during the work.
- (5) Inattention to work in the morning and evening when the tea hawker or the *Feriwala* goes his round serving in the department.
- (6) Roaming about the department among machines, chewing *pan supari*.
- (7) Time wasted at the barber's shop which is attached to every mill premises.
- (8) Time spent at the sweetmeat seller's corner on the mill premises.
- (9) During the Hindu month of "Pitrapaksha" dedicated to dead ancestors or during the Mahomedan 'Ramzan' the month of fasting as well on festival days such as the 'Ganpati' the 'Id', 'the Moharam,' batches of work people are allowed to leave the mill earlier and sometimes by turns.
- (10) Attending funerals of relatives and friends—leaving an officer no option in the matter.



(11) Under certain circumstances, mostly trivial, female workers attending late and leaving earlier.

(12) Ten to fifteen percent absentees daily forcing the hands of the management to engage others as substitutes; this is one of the important items of mill time spent unutilised and unprofitably whilst the machines are at work.

There are many other occasions of recognized and tolerated malingering by mill hands whilst at work. It would be no exaggeration to say that the question of labour output in Indian Mills is managed in the way of a family concern which would not be tolerated in any other part of the world. Even the weak, the sickly and the infirm have to be borne with. Were work denied to these they would undoubtedly be a burden to their able-bodied kinspeople and castemen working in the mills, The demands of religion and customs and the social condition of the operatives lay this burden as a solemn duty on the community. It must be remembered that the Indians have no "work houses" for feeding such, nor hospitals or convalescent homes for receiving them. To legislate for the shutting out of the poor in physique

from factory work in India cannot but operate harshly on the working classes and have far reaching results indirectly in adding to the numbers of the actually starving. Since the main outlines of this paper had been drawn up I have come across the late Dr. Bahadurji's advocacy of the millhands' cause at a critical period some years ago. It is a matter of regret that we have none of his intellectual calibre, of his professional eminence and his warm sympathy to speak for the mill hands with his eloquence at the present moment. To me it has been a matter of gratification to discover that my humble views were at one time shared by such a personality. Writing on this subject in the year 1890, Dr. Bahadurji observed: "As already shown the application of English factory laws to Indian mills would mean ignoring the natural conditions of the country and its people. It would mean forcing the Indian muscle to work like the English, no matter what natural laws with regard to work done by individual muscle may teach. It would mean enervating the muscle of the Indian, and with it his whole frame, by a process of slow poisoning from exhaustion. But if the Indian muscle cannot give the work of the

English muscle, more hands will be required to keep up the production, for the industry will have its life and growth in spite of factory laws, and this will necessitate reduction in the wages of the Indian operative. This will mean reducing the Indian operative to semistarvation with the protective application of the English factory laws to Indian mills. Thus the importing of the benign and protective laws of England into India would mean killing the Indian operative either by the slow poisoning of exhaustion, or failing that, the equally certain process of semistarvation. This application to Indian mills is simply ridiculous, absurd, unnatural, and cruelly mischievous. Mistaken kindness from ignorance is often productive of mischievous results. I feel certain that when they have well digested the facts, and have allowed time for the exercise of their judgment, Mr. Holt Hallett and his mistaken humanitarian friends will halt, and change this course altogether. They will, with better knowledge denounce every attempt at introducing the English Factory laws in India and let us hope Mr. Holt Hallett will be the first, now that he is in possession of true facts, to acknowledge his mistake and his misconceptions, and, moved as he is by humanity and philanthropy, embrace this magnificent opportunity of doing by his reversed action, so to say, incalculable good to the Indian labourer, whose cause he has espoused, but whom, from not knowing fully, he was in imminent danger of killing by kindness. And the advocacy of Mr. Holt Hallett and his friends and supporters against the introduction of English factory laws into India will have quite another and far-reaching beneficent influence. It will increase the class of discontented poverty-stricken ryots now happily changed into contented and loyal artisans, and thus materially advance the stability and the fame of the humane British rule in the Indian Empire, and last but not least, it will establish beyond cavil the soundness and wisdom of the principle embodied in the pregnant remark of Lord Salisbury, that there should be no 'unnecessary hasty, and mischievous interference' on the part of the home Government, even at the instance of well meaning but uninformed philanthropists."

**A FIXED STANDARD OF  
ACTUAL WORKING  
HOURS.**

So as to make it constant in Indian Factories can never be settled properly without an uniform condition of life for the mill throughout the country. Notwithstanding that the European continental countries are so near Great Britain, their working hours in a week are as far as the poles asunder. They vary as follows:- Great Britain 56½, France 60, Germany and Belgium 72, and a few districts near Belgium 80. How then can it be possible to expect one standard for the whole of India, a continent in itself with diverse climates, manners, customs, languages and religious observances? Such a diversity cannot be found in any other people on the world. Bombay is the Manchester of India, and the efficiency of the Bombay Mill-hand cannot come up to that of the Ahmedabad Mill-hand: in the same manner the money value of Ahmedabadi labour cannot equal that of the Bengal Mill-hand.

**LESS WORKING HOURS: MEAN  
LESS PROFITS AND LESS  
WAGES FOR THE WORKMEN.**

If this difference in the productive capacity of labour is to be removed, it can only be

done by increasing the number of hands employed as well as the working hours in due proportions. In practice at present, things are adjusted that way—the only natural way; but if all this is altered artificially, by legislation it cannot but prove oppressive to Millowners and the employed alike in many parts of this great country. Short working hours as pointed out by Mr. Batliwala in his letter to the Times of

India of 17th December, 1907, of from 13 to 12 hours must bring down the output by fully 8 percent: in other words give Rs 10 lakhs less profit. This is not all. The total average working cost of Bombay Mills is about rupees three crores of which ½ or 2 crores are fixed charges. Now 8 percent of these permanent incidental charges, or about 15 lakhs, will be a charge on the diminished production; thus swelling the loss of profits to about 25 lakhs. This means, at the lowest estimate, about 20 per cent per annum of the profits gone. In times of depression accentuated by the above consideration it will be the workmen who will have to bear the brunt of it, all and sacrifice a portion of their wages in order to enable the capitalists to adjust the balance.

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Again, short working hours can never as a rule, increase production but they may improve slightly the health of the operatives, provided the short hours wages are not reduced in proportion to shortage in production. To expect or compel mill-owners by indirect methods to pay more wages without getting a proportionate return can mean nothing short of hampering the textile industry and allowing Japan, China and other foreign settlements, with whom we trade and who work their mills about 22 hours a day and about 325 days in the year, against Bombay's 13 hours and 310 days,—to compete successfully and to crush and drive out good Indian trade in yarn and cloth from this country. This is inevitable because for the cotton mills in Japan there is an unlimited supply of women workers who work at 5 pence a day and children at a few pence per week. Skilled men in the factories there earn only an average wage of 60 (Sen) or 15 pence a day and they are thus able to turn out goods very cheaply. In the opinion of all competent authorities, two Japanese workmen are equal to one European and the Chinese worker is at least equal to the Japanese. Thus it will be seen that the efficiency in this respect of China and Japan is nearly equal to that of the Westerners and higher than that of the Indians. It must not be forgotten that the Japanese trader will always have, whether labour be scarce or plentiful, one great source of strength at his back. The most efficient trade organization in Japan is the Government itself. It opens up new markets, backs up its manufacturers and encourages capitalists in every possible way, and it fosters industry after a manner which economists of the old school would term dry nursing. It has commercial pupils all over the world seeking information, and this information is put fully at the disposal of the right parties. Its Consuls are the advance agents of commerce. Its highest statesmen interest themselves in trade triumphs. Japan believes and acts on its belief that successful commerce is essential to national existence. Such being the case with Japan let us see how we are handicapped. We pay the Indian Government in the shape of commission the excise duties and other taxes. Our Government is more exacting than the mill agent himself. The latter at least works and stakes his monies while the former is the

sleeping partner and takes no risk. Taking the case of Bombay only, if in good average times the mill agents receive Rs. 25 to 30 lakhs per annum, the Government fills its coffers to no less an extent than Rs. 20 to 25 lakhs. Surely on the face of this it is the duty of Government to give financial help in the solution of some of the problems involved in the Factory Commission to the mutual advantage of all labour, capital and Government. The salvation of the great working population of India lies in relieving as many of them as possible from their hard lot as cultivators and this can be done only by establishing factories and developing new industries in the country. Any action on the part of Government in interfering with the working hours must perforce seriously check the extensions of existing factories and prevent new ones starting—with the ultimate result of driving back cultivators to their fields and their half starved condition of life. To sum up,—when the starving condition of the working classes or of the tillers of land is so prominently facing us and dislodging and transplanting the average Indian from field to

factory, when this problem is awaiting solution, why, it may be asked, are not adult men and women left to look after themselves in the matter of work, when and how they please\*. It is not a question of mere temporary lowering of wages by giving less work, but it is a question of giving the workmen no work and no wages and driving them to the fields to do, as of old, their hard and killing work and live on the miserable earnings their land yielded which provided them with food enough to satisfy their hunger only, by half. If commissions and legislative interference to regulate the working hours of factory labour are deemed necessary in the interests of humanity, why again, one might ask should not such philanthropy tackle the teeming millions sweating on the wretched paddy fields under the lash of their grim, grasping, task-master—Famine, without a curb on their working hours?

EFFICIENCY OF MILL

LABOURERS IN INDIA.

Wrote the late Dr. Bahadurji a few years ago: "If an Indian mill of the same capacity as an English mill has nearly three times the number of

\* *Advocate of India*, March 1908. Also Mr. Batliwala in the *Times of India*.

hands that the English has as I have myself seen, does not that mean that either  $\frac{1}{3}$ rd the time each operative is not working or he does actually  $\frac{1}{3}$ rd the work of the operative?

Mr. Hallett puts down the stamina of an Indian operative as only  $\frac{1}{5}$ th that of an English workman. Would he not give him therefore considerably longer time to do his work, so that he does it without fatigue and exhaustion? The average daily production having to be kept up, shortening hours would mean expenditure of extra physical energy to gain in force what is lost in time. The extra expenditure means a demand upon the reserve stock—the capital, and consuming the capital means short work. One's daily experience teaches that living upon one's capital is not only not economical but ruinous to a degree. Had Mr. Hallett carefully studied the Factory Commission Report of 1884, he could not have helped noticing the strongest proof of Indian muscles not being suited to any but intermittent work (and intermittent work requires longer hours with frequent stoppages.) The Indian dockyard authorities tell us that their labourers, in spite of the short hours of 8 to

5, long rest intervals, Sunday and other holidays, broke down and died if kept hard at work as a European would work himself."

#### WOMEN WORKERS IN INDIAN MILLS.

Female labour in Indian factories and mills is decidedly less exacting than in other countries. In England women are made to work more than men are in India. We have it on reliable authority that one Lancashire man in a mill is equal to seven such in India in spinning mills, and one such Lancashire woman is equal to three male hands in India in weaving mills. Again, it is said that an Indian workman in the weaving shed has better physique than his brother in the spinning branch; but surely it is absurd to say that a male worker in the weaving shed in India is poorer in health than the female operatives of Lancashire. If that be so how is it that the efficiency of three workmen in an Indian mill is equal to that of one woman worker in Lancashire? It can only mean that work done by females in England is of a more exacting and oppressive nature than that of their Indian sisters. Such fatiguing bodily labour on the part of the weaker sex in their

capacity as weavers must tell heavily upon their delicate condition. It must tax the physical strength and energy of even able-bodied male worker. Out here, we employ labourers to take up work which is done in England by women: after this it is absurd to speak of a sweating system of labour in India. It is strange that the attention of not one of the several humane societies in England has been seriously attracted to this evil at their own doors.

**CAPACITY OF WORK AND STANDARD OF WORK OF FEMALES DIFFER.**

The capacity and the standard of work of women vary vastly in different districts in India. In Bengal and other provinces, female workers do exactly the same kind and volume of work as the males, and women are employed in every department of a mill side by side with male workers. The Bombay standard of female workers will therefore not do for adoption throughout India. Any restriction in the working hours of women as a whole, in Indian Mills, factories and ginneries must press heavily on the class-specially in the last, where they work long hours for two or three months only in order to help

themselves in providing against starvation during the remainder of the year.

**WORK OR STARVE.**

In Bengal and other districts where men and women work together any curtailment of the working hours of females would mean the engaging of more male hands if not going short of hands in mills. Rightly viewed, therefore, any reduction in working hours, in other words reduction in wages, must spell oppression and starvation to these wage earners. The condition of female workers is so hard in the ginning districts and in other parts of India that they are compelled to work just the same as males to save themselves from starvation.

**MALE AND FEMALE WORKERS IN GINNERIES.**

These labourers in cotton growing districts prefer overwork to starvation for three out of twelve months in the year. Ginning factories which dot the cotton growing districts over, work only for a season in the year. And although the work is some times hard and the hours long yet the natural instinct of self-preservation prevails, and the remuneration a season's work in the ginning factory brings in is more acceptable than the semi-star-

vation which would result without it. The operative knows his own feelings, and this is how he expresses himself: "We earn enough in three or four months to keep us the rest of the year; when the season is over we return to our villages and live well till the next season begins."

Mr. Dreweth, Bombay Presidency Factory Inspector has borne this testimony: "I have frequently heard of their going away sick, but I have never heard of their death. I myself have worked day and night, without sleep but I have never been ill through doing so. The women have worked twenty-three out of twenty-four hours. Of course in speaking of twenty-three hours I mean that the women were relieved by their friends or relations. The women prefer to do night work to going home. The people are so poor that they are glad to get work at any price, although a number of them frequently break down from overwork than suffer from starvation." There is no parallel to this in the factories in England, and it is doubtful if English Factory laws would touch such cases if similar factories existed in this country without some material modifications to suit the dif-

ferent circumstances and conditions of work in them. The easy working system prevailing in India, with its many concessions, is certainly not an evil to be compared with hunger and starvation, and this is a point of view which must not be lost sight of in any serious attempt to interfere with existing conditions of factory labour in India.

#### CHILD LABOUR.

None can gainsay the necessity of protecting the helpless little ones where such safeguarding is imperative; but the proposal against children accompanying their parents to the mill over-shoots the mark and needs to be carefully considered. The question is beset with difficulty when we come to look into it and test its practicability. What is proposed as a relief must not bear hard as an oppression on the poor labourer. For instance, if the little ones are not to go with their parents to the mills, where else are they to be kept meanwhile? Usually mothers attending work leave their babies at home either in the care of neighbours or shut them up in the rooms after drugging them; but children of the ages of from 2 to 5 years cannot be so treated. To the workman, as a



cultivator, children are of great use in the field but it is otherwise where Factories and Cotton Mills come in. Here, in the company of their parents, children at an early age receive a training which stands them in good stead when they in turn look to the mills for their livelihood. The earlier these are so trained the better the wages they command and under the parents' eyes the less chance they have of going astray. It would be doing a positive disservice to the mill-hand to shut out his children from the mill. If child labour is at all abused, it is so only rarely by mill jobbers and Mukadams and never by Managers and other officers of the mill. The young people are helpful to their parents and relatives whose meals they bring and whilst they are roaming about the premises they learn something about every department. And it is from these juveniles that half timers are selected. Whilst their parents or guardians are at work till late in the evening the little ones have hardly any place to go to. Strict supervision is all that is necessary on the part of the mill authorities, as well as of the Mill Inspectors, to check any abuse disclosed and not the shutting out from mills of the young ones. No interference whatever in this respect seems to be called for at present.

The late Dr. Mrs. Pechey Phipson thus wrote at one time on this point. "The shadows of the protecting factory laws," she observed "have already chased away the children from the mills into streets, and have retransformed them into their original nude skinny skeletons....The same is the case with female workers. The factory laws enact that the poor women of India shall *not* do the work which they prefer to do, by reason of its protection from the heat of the direct rays of the sun, the pouring rain, and the damp under the feet; by reason of its bringing in enough money to live well and comfortably. The law would drive them to the fields to resume their more arduous work in all uncomfortable postures, to have the very marrow of their backbone parched up by the 130° to 150° of heat of the direct rays of the sun, to be soaked to the bones in the very heavy rains, and to live half starved (for the earnings are very low)—that is, to feed upon their own flesh, till nothing but skin and bone is left, to enter an early grave. We are told on high authority," she continues "that one-fifth of the Indian population live the life of the

half hungry, discontented, uncared for, broken down ryots. The mill industry has been materially reducing their number by transforming them into the well-fed, loyal, and cared for and healthy artisans, and thus has materially enhanced the humanizing influence of the British rule in Her Majesty's Indian Empire. " Quoting Lord Salisbury's words she proceeds: " In all humanity and commonsense, therefore, let no hasty, unnecessary, and mischievous interference, from ignorance of the true state of Indian operatives, reenact a transformation scene, and dissolve away from view the present well-fed, well-clad, and healthy women of the Indian mills, with bright ornaments on their persons, and replace them by the olden miserable, half consumed field labourers in rags and tatters. " This bright comparison, be it borne in mind, is between what field labour means and what the ideal well-fed and well-clad mill worker represents. That ideal condition of the working class is however yet a dream to be realized. When that comes to pass the efficiency of the Indian mill hand will no longer be only  $\frac{1}{3}$  of that of Lancashire operatives, but certainly far higher. Any way his present

condition as a mill operative is far better than that of a field labourer.

#### MODEL SCHOOLS.

An effectual remedy against the abuse of child-labour in the cotton industry is the establishment within mill compounds of model primary schools maintained by the mill-owners, as also of Municipal schools where the mill hand colonies are located. Here the children of the poorer classes should during school hours receive food, clothing and books as is done in some of the model schools of the civilized world. Merely barring the entry of children into mill premises is no protection to them: on the contrary it spells harm to them.

#### ELECTRIC LIGHT IN MILLS.

It is maintained that electric lighting came to be introduced in Indian Mills solely for the purpose of over-production by night work. This is a mistaken notion. The installation came in first in order to secure a sufficient standard of efficiency from the machines. The deterioration of machinery in Indian Mills due to rough manipulation at the hands of the ignorant workmen among whom the sense of responsibility is hardly yet awakened, is some-

thing awful and its life by much avoidable wear and tear is very short—say about half that in England. The poor reserve Funds of Indian Mills make it difficult for mill-owners to renew it at a stroke and so keep constant its full standard of efficiency in giving production. Even where ample funds are available a thorough renewal in time is seldom feasible. When at last the machinery is on its last legs it is but natural to take as much production out of it as possible by working it an hour and a half extra daily by electric light. The progress of electric science may thus be said to have in a way come to help bringing the efficiency of worn out machines to something approaching a reasonable standard. This then, and not the greed of mill-owners as often alleged, is at the bottom of electric lighting of Indian Mills and even this is at best a poor substitute so long as unskilled, ignorant and underfed operatives, with their malingering habits, have to work the machines. The only true process of maintaining the full working capacity of machinery to give proper and better production, in the absence of electric lighting, is to renew the machinery constantly.

Similarly, to increase the workman's efficiency in order to get sufficient production out of him it is necessary to improve his stamina by sufficient and nutritious food and his mind and habits by rudimentary education. One indirect advantage of electric lighting in Indian Mills is a little better work comparatively and less wastage in the early mornings and evenings than in day-light work. The superstitious operative is averse to roam about the mill compound after lamp-light. As a rule at such times the attendance is full and complete in the several departments and the men stick to their work uninterrupted. The effect on production is naturally satisfactory. The wastage made in the morning depends upon how the workmen leave their machines when retiring. The satisfactory condition in which these are left at the closing of the mill assists their restarting in the morning very smoothly and without wastage. In short, working mill machinery by electric lighting late in the evening and early in the morning gives mill-owners better production and less wastage and to mill-hands more wages and less trouble. To help keeping even moderate pace in competition with other countries the advent

of electric light has done not a little good, but neither Government, the mill-owners nor the public at large have done anything worth mentioning towards increasing the efficiency of the machinery or of the mill-hands. Provided mill labourers are paid liberally, and not in proportion to work turned out, they are by no means averse to work by electric light as is represented. There is no dislike to overtime work on the part of mill-hands of the model workmen type with families to whom every pie earned is a God-send. These are the men who are sober and thrifty in their habits. Their proportion is of course small. More than enough of such hands may be seen following their foremen or jobbers on stopping days as well as at night time, for a chance to secure overtime work. No witness to my knowledge from this thrifty or "model" class of mill operatives appeared as a witness before the learned members of the Commission to speak for themselves on these points. Spending a few additional hours in electric lighted mills and earning more wages is after all not as harmful as resorting to taverns or passing the hours in small, dirty and over crowded chawl rooms and inhaling smoke from cawdung cakes or fire-

wood charged with rock oil, or smoke from naked kerosine lamps. I have said above that electricity has in a way come to the help of the cotton industry in this country: much more is expected in the same direction when the late Mr. Tata's scheme of supplying hydro-electric power to Bombay Mills becomes a fact accomplished. Again, there is the invention of Mr. Cove of Boston, who claims that electricity may be generated in quantities from the sun's rays and utilised for commercial purposes. In this way whilst men of science in Europe and America go on discovering the hidden forces of nature, India—tropical India—with her sunshine is able to harness some of them with comparatively greater facility from her geographical position. It would, indeed, be an evil day for all, if every such advantage led to the invention of pleas for handicapping the growing industries of politically weaker races.

#### MEDICAL HELP AND FACTORY MEDICAL INSPECTORS.

If increase in the number of medical inspectors, the defining of their special duties, and the equipment necessary ever came to be sanctioned, and if such a machinery of medical help is ever actually in good

working order as intended, the whole scheme will prove to the mill labourer, as he is now, a veritable garden of Hygeia in a Kingdom of Utopia. Facing the situation, as it is, no good can be expected from the proposed medical reform if confined to Inspectors alone. In practice their duties can never be adequately discharged by any number of medical Inspectors unless every mill provides for its workmen a qualified medical officer of its own to visit the operating ground twice a day, with a medical assistant ever present on the mill premises during the working hours. In this respect mofussil mills, specially Bengal mills, are far ahead, and their system is certainly worth imitating. It is a question of general medical relief and not one of measures for dealing with diseases peculiar to mill operatives.

Referring to a formidable list of maladies drawn up by the late Rao Bahadur Lokhande for the Factory Commission of 1884, the late Dr. Bahadurji stated that from personal knowledge he could say those ailments were by no means common among the Indian mill-hands only. He maintained that the Indian mill-hand was free from the dangers of inflammation of the lungs and air

passages to which the English operatives were exposed, owing to the great difference of temperature and moisture of the atmosphere inside and outside the mill. The Indian operative, he said, could be in and out of his mill all the year round with impunity.

It is all a question of general and prompt relief. The formal routine of filling up forms as soon as an accident occurs, and the time wasted in enquiring, describing and jotting down the necessary details, whilst the injured person all the time is lying unconscious or perhaps bleeding to death, is enough to excite the compassion of the spectators for the sufferer, and their indignation and disgust at the apathy of those who persist in the continuance of this state of affairs. What is wanted is not *data* for statistical returns but immediate attention *on the spot* to the sufferer, who is perhaps sinking from exhaustion whilst the worship of the red-tape fetish is in full swing. The columns of the tabulated standard form often receive the careful and undivided attention of the officials whilst the life of the neglected human being is hanging in the balance.

I say this from personal experience. An ambulance car and a small dispensary are

indispensible adjuncts to every mill: humanity dictates their provision. After the inexorable demands of the statistical form are satisfied it occurs to some one to fetch a conveyance—which is often not procurable immediately—wherein the injured person is placed. The way in which the unconscious sufferer is lifted up and huddled into the carriage, in fact the handling throughout of the injured person by unskilled hands, can best be imagined than described.

The mill doctor's ordinary duty should be to visit patients in their chawls. His observations noted from time to time during such visits about the condition of the locality and other experiences can alone enable him to report intelligently to Factory Medical Inspectors and other Government and Municipal officials on these very important and vital points. Without this assistance from medical men in constant personal contact with the operatives in their homes it is useless to expect any radical reform in the way of ameliorating the health conditions of these workers. The system now in vogue in Bombay Mills of providing medical aid to workmen can serve no good purpose unless mill-own-

ers are made to maintain a staff as suggested under the efficient supervision of Medical Factory Inspectors. The appointment of Medical Factory Inspectors alone will not do it. The efforts of Government and of the employers of labour can well be backed by the educated classes and by philanthropists by disseminating among the mill hands by means of tracts, lectures and other ways a knowledge of good sanitary living. But when all is said and done the best remedy can lie only in their having sufficient and nourishing food for the body and compulsory education for the mind to teach them better ideals.

#### OLD WORK PEOPLE ARE RARE IN INDIAN MILLS.

This is so not because of hard sweating work for long hours exacted of them, as alleged by philanthropic agitators, but because of their strong attachment to their villages and their early withdrawal from city life. This point I have discussed elsewhere in this paper. Very few of these men, drawn from the cultivating classes, who are in receipt of handsome wages, stick to the post for thirty years or so at a stretch till they reach the age of fifty or more. Europeans, with experience of Indian Mills,

have borne testimony to this fact. The majority return to their distant hamlets to better the condition of their homesteads with their earnings from mills: this even Government officials have acknowledged. It has been well noted during famines, that love of home and superstitious fears are so ingrained in these people that they will trudge on for miles on famine relief works and return home exhausted after the hard toll of the day rather than stay at the camps, and when great distance makes the feat impracticable they will lie down and die of slow starvation rather than be torn from their villages.

**ARE NOT MILL FACTORIES IN INDIA IN A WAY PERMANENT FAMINE RELIEF WORKS?**

Any one free from bias and knowing the actual condition of the agricultural classes will say, they are. Why then, when considering the question of mill labour is this fact ignored? In dealing with the issues before the Factory Commission, the terrible picture of the starving thousands of the Indian population supplying mill labour was hardly kept in the fore-front. In the legislative stage of the scheme at any rate it is to be hoped that

every reform, relief or restriction, before it is recommended, will be weighed in the scales against the mill hands' actual conditions in life as found between the industrial town and the agricultural homestead. Ordinarily, it would be superfluous to comment on reasonable restrictions in the working hours of adults, on the issue of health certificates, on humane interference in the case of child labour, on the delicate considerations manifested towards women workers; but when we come to look upon the practical experiences of famine relief works, where thousands of emaciated and starving people are employed, it is idle to think of good health certificates or of shutting out children under age who must needs work to maintain themselves or assist their parents in relief work,—it is in these circumstances a cruel joke to speak of not allowing women to work the same hours as men in the day time and preventing them altogether from night work in ginneries. These humane considerations may be very well in normal conditions but are quite out of place in a country where a chronic state of semi-starvation exists. What provision, these people may well ask, is the *Ma-bap Sarkar*

going to make to feed the thousands whom the proposed beneficent measures in the shape of reduced working hours, will keep out of cotton mills and factories? Where are the philanthropic millionaires with open purses ready to succour these sickly men and underage children? I have spoken elsewhere of how keen these people are about their local reputation: famine relief work to them is worse than death: employment in mills is their salvation. The mill hands belong to the agricultural class, and it has been very properly pointed out that the districts they come from are very liable to suffer from famines. To begin with they do not possess in their districts any very well developed physique which is peculiar to the hill tribes generally and to the Pardesi and Navaghana classes. They come to Bombay to earn wages, which will not only maintain themselves, but also their families and relatives in their districts. The mill industry has not only helped them out of the difficulty, but has provided them with the means of improving the condition of their districts generally. These facts have been accepted by Government in a public resolution which

declares that the condition of the districts the mill hands come from has been ameliorated by the mill industry of Bombay, the periodic famine difficulty not having been experienced as of old. Any measure of reform by legislation which is likely to create disabilities towards wage earning in a mill by way of sex, age or physique, is I submit, not kindness but a distinct hardship on this class of people. True benevolence lies the other way—in compulsory free education and what it is bound to bring in its train in the long run—other ameliorating conditions are better housing, medical help and other reforms to which I refer elsewhere, which are sure to raise aspirations in them for their ultimate betterment.

#### WHO IS HEALTHIER,—THE PEASANT OR THE MILL HAND?

A point for the medical men to settle, and about which hardly any evidence has been taken by the Commission, is: whether the physical condition of the mill labourer is any way inferior to that of the peasant cultivating his paddy fields in the district from which he hails. I can say from personal observation that in general health and activity he is far better as a mill-hand than as a



starving tiller of the soil. He has perhaps no equal in Europe possessing this capacity for adapting himself to any vocation in life from a cooly or day-labourer and cultivator to a police-man, postman or mill-operative, though this wide range for earning a livelihood detracts not a little from his usefulness as a 'one-job' man, or a master of one craft, specially as a textile worker. In this connection an important question for an authoritative medical pronouncement is what system of work—intermittent or continuous—is good for him taking into consideration the climate and the condition of the Indian Mill-hand.

The question was scientifically dealt with by an eminent medical authority in the early eighties and though well known, will yet bear repetition:—

**INDIVIDUAL PHYSICAL  
ENERGY.**

The question was about the amount of physical energy put forth per day by each individual workman in a mill, the nature of the work generally, and the manner in which it is executed. Supposing, for the sake of argument, that the production in a mill in India

is equal to that of a mill in Lancashire of equal capacity — though in reality it is somewhat less—the ratio of hands employed in Indian and English mills is as three to one. It will thus be at once apparent that the total expenditure of energy of an Indian operative per diem is only one third of that of the English operative. However great the need of careful and sustained attention for the work in hand, it is not in the Indian operative to concentrate his mind and his work is always of an intermittent character, say the Factory Commissioners. It is in the English mind and muscle to work steadily and well without cessation when once set to work, but the Hindu labourer's work is by nature desultory and unsettled\*. His natural inclinations run the other way: he has no idea of what responsibility is, though he often shows unusual intelligence

in picking up work and doing it skilfully and dexterously, but dexterous or skilful though he be, yet he certainly is not strenuous — and his muscles are against any continuous work. To expect the mind and the muscle of the Indian operative as he is constituted

\* Vide Factory Commission Report: 1884, p. 123.

to work like those of the English mill-hand is to force the laws of nature to suit the needs of factory legislation. One might as well think of exacting from a draught horse the grace, the mettle and the speed of a race horse. To work the Indian operative at a stretch and to get out of him in the same limit of time, the English standard of physical energy is to work him to death by sheer exhaustion.

Longer time, short stoppages, with short spells of work are requisite to the Indian operative. The ordinary laws of physical exercise make it clear that it is not the length of time taken to do a given work, as the intensity of energy put forth to finish it within a shorter time that bring on exhaustion; a longer interval of rest afterwards is but a poor compensation for the effects of exhaustion, for exhaustion makes its demand upon the reserve stock of energy. It is like living upon one's capital instead of on the interest the capital yields. Exhausting work is not economical work, says Mr. Hector. But it is worse than that, it is killing work, for it acts like poison. Physical work means combustion in the muscles. The products of combustion act as poison if their dose exceeds the degree of tolerance natural to each individual. The dose is readily exceeded to a greater or less extent when there is more than the usual expenditure of physical energy in a given time. The feeling of giddiness, with prostration and the aching of muscles which is experienced after a run to catch a train must be familiar to many. The falling down dead of horses after an unusual gallop is another familiar example. A slight daily excess of the usual expenditure of energy would ultimately act like a slow poison, and like other poisons, the poison of exhaustion not only leads to deterioration of physique but points to an early grave. That this is the fact, and, moreover, that it is not so much the number of hours over which the work is spread, as the nature of the work and the actual amount of physical labour involved that tells upon the health of the labourer, is proved to demonstration by the declared experience of the Indian Dockyard authorities\*, that the men employed in the Dockyard (who by the way, possess better physique than

\* Factory Commission Report: 1884, p. 174

mill hands ) whose longest hours are from 8 A. M. to 5 p. m. with an hour's recess for mid-day meals, and who get four Sundays and other holidays, wear out in a very few years, by being kept at work as hard as a European would work himself. The natives cannot stand this but break down and die. \*

It is thus obvious that an unbroken stretch of continuous work, so much in vogue in the Western world, would spell death to an Indian in this climate, whatever effect it may have on workers in cold countries. In India the mill labourer is under no necessity, as matters stand, of subjecting himself to such a fatal strain, but can shift from one vocation to another as he lists and take a run to his village for as much rest as he likes. Add to this the happy-go-lucky manner in which he works in mills and the tolerant treatment he receives from his employers. These facts contrasted with the English continuous system of work and the climate and manners and customs of the respective countries should convince even a medical man as to which system,—intermittent or

continuous—is overkilling and in what country therefore real reform, if any, is urgently called for.

#### CONCLUSION.

The new Factory Act now before the Legislative Council of India will closely bear on the fortunes of a large class of the labouring population of India—the Cotton Mills absorbing nearly two and a quarter crores of hands in 1907-08, besides a hundred thousand employed in cotton ginning and pressing mills, against one crore and twenty thousand in the year 1892-93. If these labouring classes in India are given education, if their condition is improved and they are happy, their needs must necessarily increase. Meanwhile, European countries placed as they are in the vanguard of progress all along the lines, must maintain their skill in the production of superior articles without the least fear of competition here in that respect. Such being the position India, less depressed, must continue to be the consumer on a much higher scale for years to come. On the contrary, if the position in India is reversed and ignorance

\* The late Dr. Bahadurji

and starvation be the lot of the teeming population, it needs not a prophet to predict that British products will not find a quick absorbing market and Lancashire workmen who are undoubtedly at the bottom of these Factory Labour agitations at recurring intervals—yes, the textile workers of Lancashire must in the long run suffer with their colored brethren in this country. Every effort, under any guise, to benefit British capital and labour at the cost of the voiceless Indians must recoil on the heads of the former imperceptibly but surely. What nourishment can the hungry bug suck from a bloodless skeleton? It has been well asked:—

IDENTICAL LAWS CAN BE APPLIED TO IDENTICAL CONDITIONS. ARE THE CONDITIONS IN INDIA AND ENGLAND IDENTICAL ?

Most emphatically not, replies a well-known authority quoted before. Already the factory laws have thrown out of employment the little operatives they tried to protect and benefit, and who are no more the well-fed, well-clad and well cared for little persons they were before the shadow of the factory act was cast upon them. Will the English factory

laws better, in any way, the condition of the women here who form only a small portion of say 25% of the operatives as against 75% in English Factories and who work comfortably in the cool, capacious and airy rooms of the Indian spinning mill, with special freedom both as regards the hours and conditions of their work and their attendance at the mills? Referring to the Berlin Congress discussions at the time, the same authority observed that however much the deliberations of that congress might apply to England, they could not apply equally to India, and indeed the Berlin Congress were anxious that their conclusions should not be so applied to India and other countries of which they had no knowledge. Even the Secretary of State then was anxious that, though the general principle of all factory legislation everywhere was that life and limb must be protected, and that the health of women and young persons and children must, so far as possible, be assured, yet as regards any additional factory legislation in India due regard must be had to the circumstances of that country which are in many respects different from those of any European nation. I would add to those circum-

tances the persistent famine, the plague and the chronic half-starved condition of the masses throughout India: these should not be forgotten.

**THE MANCHESTER CHAMBER OF COMMERCE AND THE EIGHT HOURS BILL.**

About this time last year the Chamber passed the following Resolution:— "That the meeting of the Executive of the Engineering Section of the Manchester Chamber of Commerce most strongly protests against the passing into law of the Coal Mines (eight hours) Bill on the following grounds:—

(a) That it is not necessary or admissible to legislate as to the working hours of adult male labour in any section of the community, but that it should be left to the parties directly concerned to determine. (b) That the bill if passed into law, will in their opinion, limit production and increase the price of coal, thereby seriously injuring the commerce of this country.

It may be observed by the way that in order to draw conclusions as above without any sort of pressure from either side, there is in vogue in England a system of collecting opinion by "ballot" among workmen as well as members of various associa-

tions. If Indians are not fit for political rights; if even the law of the land is often helpless to befriend the poor labourer to this day against the forced labour system of "begar" with what consistency can the beneficent labour laws of England be forced with such persistency in behalf of this backward race? How comes it that the altruistic Christian motives of Lancashire show themselves in the matter of the Indian labourer's working hours alone? Why cannot Parliament, rather the Lancashire electors, be equally altruistic and remove the hampering excise duties on cotton fabrics here and insist upon the Indian Government to make some small provision for the intellectual, moral and physical development of the labouring classes upon which depend their efficiency as workers? Why is the efficiency of mill machinery not helped by the cultivation on a systematic plan of long-staple cotton? Why one may ask, do not the Indian Government help the Cotton Industry financially without distinction of caste, creed or colour as do European nations and as does Japan? How comes it that whereas detailed information about Indian products, manufactures and industries are made available for the

British public whereby foreign nations benefit largely no similar minutæ about British and Foreign industries and manufactures are laid before the Indians? Surely, a Government that derives annually an income of over 111 crores of rupees is expected to make some return and to co-operate with the Indian captains of Industry. The good people of Lancashire should see to this instead of spending all their philanthropy upon rescuing the Indian operatives from so-called "sweating" alone. Out here the foreign merchants sweat not a little themselves for their bread. There is sweating here in many directions from the Viceroy down to the poorest coolie : and there is a growl in Anglo-Indian journals whenever the high placed slaves of work on the hot plains seek a little respite and relaxation on hill tops. Such respite the mill-hands too, contrive to obtain. No Royal Commission has yet attempted to regulate the working hours of those who sweat at the desk or in the shop, and no commission therefore need have been appointed for the Factory workers in tropical India. The poor know best where the shoe pinches them; they alone can best adjust their working hours to their most pressing wants; but the good people of Lancashire can, for the mutual advantage of both countries, do the tolling sons of India a good turn and earn their gratitude by getting a Royal Commission appointed for ameliorating the condition of their Indian brethren in the matter of their education, their proper feeding and their housing in crowded cities. Lord Curzon once observed at Simla that the "prosperity" of India was increasing because the annual earnings per head of the Indian population had increased from Rs. 18 to Rs. 20 during the years 1880 to 1900; but the distressing fact was some how not brought out that the purchasing value of the rupee had gone down fully 46 percent, whilst the price of food stuff, and cost of living generally, had mounted up to 50 percent and more during the same period. Any way prosperity is not in the path of the working classes of India in whose behalf I have ventured to pen these lines in the earnest hope that the authorities may yet see their way to abstain from legislative interference with individual freedom in the choice of working hours: this is urged in the true interests ultimately of the textile operatives of this poor country.

THE END.

## APPENDIX I.

The following letter appeared in the *Times of India* as a reply to an article in that influential journal, entitled "Bombay's Slaves: Hours of Mill Labour: 'Cold blooded inhumanity': A Plea for Government Intervention."

THE OTHER SIDE OF THE  
PICTURE.  
Mill Labour in Bombay.

To,

The Editor of the *Times of India*  
SIR,

I have read the powerful and sympathetic article in the *Times of India* in behalf of the Mill hands of Bombay in which Mr. Fraser feelingly pleads for a reduction in their present working hours. For a full and proper discussion of the subject, perhaps a few facts representing the other side of the question would not be amiss and I crave your indulgence for stating them. In doing so I wish I may not be misunderstood as advocating the cause of the employers beyond feeling that in fairness both sides should be heard. As carder and spinner I have now been in the textile line for over 18 years and have thus been in close touch with the mill hands of Bombay and have had some opportunities of comparing the strong and weak points of the Marathas from Konkan with those of the several races who make up the mill hands in Bengal. Nothing

would please me better than to see their condition ameliorated. I will touch upon the points briefly as they occur to me.

As regards their poor physique it is unfortunately true, and it has been so for years before the advent of the electric light in this city. It would be difficult to assign the precise degree of their further deterioration in health, if any, due to the two and half hours additional work they do in these days. They have never in the experience of the oldest inhabitant been a robust race as seen within the four walls of a cotton mill in Bombay. Whether the present extra labour they perform is at the bottom of the evil or whether other causes operate to account for it, or whether they would ever be better off in health in future, are questions worth inquiring into. As to physical or nervous strain, one thing should be borne in mind that the tension is never so continuous as is imagined, owing to the malingering habits of the workers. Throughout the day, at frequent intervals, may be seen processions of these hands leaving and returning to work from various exits. A casual visitor may perhaps not see it: an attentive and accustomed observer will easily mark how a number of them waste their employer's time while resorting to the necessaries, to the smoking shed or to the drinking water tanks. No amount of supervision or measures of discipline will avail in checking this inveterate habit, call it malingering or enforced needful rest, by which the services of nearly a third of the hands employed are practically

lost for the major part of the day. I am here understating the estimate. Extra hands have to be maintained regularly for the purpose of helping and relieving whilst a number of these workers are thus snatching spells of rest. Even men paid by piece-work thus derive benefit at the expense of their employers. A fair comparison in the matter of fatigue between Lancashire men and the Konkani mill hands is not possible: the superior power of endurance of the Asiatics is wellknown. The Lancashire operative, moreover, does not like his Indian brother fly to his "ganm" or village every year for purposes of rest and recuperation. If overpowering fatigue really knocked them down at the end of their day's labour they would not turn night into day by prolonged hours well up to midnight, spent in singing *bhajans*, ballads and opera songs to the accompaniment of the *tal* (cymbals) the *mridang* (drum) the *toontooni* (one-stringed guitar) and the *duff* (tambourine) which render night hideous to others.

This may be relaxation, but the *bhajan* as I know it, is no light task when a dozen or two form the concert. Again, it is a striking fact how these people without compulsion of any kind, direct or indirect, deliberately flock to mills working extra hours and in this way more than fill up the full complement of hands to the great detriment of concerns working the old normal time, wherein a marked falling of in attendance has been noticeable of late.

Mr. Fraser has drawn a true picture of the condition of a cotton

mill interior and its atmosphere: it is in all conscience bad for human beings to stay long therein and the surroundings are no less unhealthy; but much more than this are the "chawls", the homes of these workers. The chawl has been defined "a rookery with all the overcrowding of a rookery, aggravated by darkness, by the closing up of every possible aperture and by the presence in near contact with every living and sleeping room of perennial sanitary abominations." I have been often inside them and seen these poor creatures huddled up in crowded and foul-smelling cabins. I have read the *Times* realistic but withal true description of a chawl typical of its kind, in its issue of 1st. May 1905 under the head lines "Plague haunts: why the poor die" The account is harrowing but not overdrawn so far as confinement within four walls can be said to contribute towards the physical deterioration of human beings. It is my humble opinion that every minute a mill hand lingers longer in a cotton mill rather than in his "chawl" is a distinct hygienic gain to him. As a fact not a few millhands are known to attend mill premises much earlier than the starting hours simply for a short sleep denied them in their own homes. One indirect advantage, and that by no means a small gain to the mill hands at the present juncture, is their enforced immunity from the temptation of tavern and of gambling of which latter vice they are slaves: many have confessed this to me. It proves the truth of the adage that there is no evil but has some germ of good in it.



The protracted hours of work leave the operatives no more than about three quarters of an hour before the liquor shops close. This practically prevents their participating in the orgies, in roaming about places of ill report and in gambling. The police will bear testimony that the neighbourhood of mills working at night is now more or less free from rowdyism which formerly disgraced the localities and tried their patience.

The Bombay Mill hands may conveniently be grouped into five classes, viz:—I. The model hand steady, sober and regular in attendance. He is a family man to whom the smallest increase in wages is a boon. He is reliable and knows his duty to his employers. To him over-time work is welcome. II. The "Bud-livàlà" or substitute, who as a rule fights shy of fixed employment, and works only temporarily in lieu of others. III. The "Athavada" or seven-day-man, so nicknamed from his habit of working only seven days at a stretch every alternate week and taking a week's respite from labour thereafter. IV. The "Mowali" the easy going masher—the Bohemian class—working and resting as he lists,—a gay man given to vice. V. The "Dada," the vagabond,—the hooligan class—lazy like the "Mowali," but dangerous: for obvious reasons the number of these men is small in the mills. Great care is necessary in seeking correct information as to the real conditions and needs of the mill operatives and only men of known character from class I are to be relied upon for opinions.

6

The views of the other classes are of little value. These men would inveigh not only against the extra hours, but even against the ordinary hours if they saw a chance of realizing it. It is those mills generally which show poor results in which men from class I happen somehow to be in the minority. The "Athavada and the "Mowali" classes are every where the despair of the jobbers and of heads of departments. Outside the four last classes, there are the self-constituted leaders and well-wishers of the mill hands but who are not of them, know little of their real condition and wants and have never in their individual capacities been known to help the distressed or the needy among the operatives. These men get up and preside at public meetings of mill hands and pass resolutions. A few years ago (November 1902) the public witnessed the sad spectacle of some of these so-called leaders openly disowned by the men. The opinions of these men (generally clerks, schoolmasters, chawl-owners, tavern-keepers, actors and printers) and the views embodied in their "Resolutions" should be received with caution. There once was a man who from a mill-hand rose to be a journalist whom Government honoured, the late Rao Bahadur N. M. Lokbande J. P. In the passing of the Factory Act he had taken no inconsiderable part: he was President of the now defunct Mill Hands' Association: his place is vacant to this day. The work of interviewing and getting at the truth in the real interests of the men is no easy task to an outsider when

even the employer himself is often ill-posted up in the ways of the men by the sweat of whose brows he makes his pile. The reason is not far to seek. In the majority of cases, the managers and mill officers,—the source of his information,—are not Hindus and they depend for their ideas upon their assistants, the jobbers, who know which way the wind blows and say what is likely to please their superiors. The managers and heads of departments are, again, drawn chiefly from the high and the middle classes and these can hardly be expected to pronounce in favour of overtime unless they have personal interest in the mills. In any enquiry, therefore, that may be set on foot to afford relief to the mill-hands, the facts I have briefly touched upon are I submit worth taking into account. A reduction in the hours of labour alone will not be enough to permanently improve the condition of these men. Something more is needed and if any well-meant efforts in the cause of this backward and voiceless class, who help a great industry in the city, can lead men of means and influence to go to the root of the evil and in a small way to begin to improve their lot, they will have earned their eternal gratitude. I venture to mention a few directions in which some effort may be put forth. I will not dilate on the points for fear of encroaching too much upon your space:—1. Housing them in well-ventilated and sanitary quarters, at cheap rents, and seeing to it, that the rooms

are not crowded: this in the interests of the health and good morals of the occupants. I find that the editor of the *Times of India* has already in an article, not long since drawn the attention of our leading citizens to this matter. 2. Special arrangements for educating the operatives: children's classes, night-schools, publication of tracts on useful and wholesome topics and occasional lectures to wean them from vice. 3. The removal, where possible, of liquor shops from the immediate neighbourhood of workmen's chawls as well as from the proximity of cotton mills and regulating the hours for opening and closing the taverns with due regard to the starting and closing times of the mills. 4. Some measures of relief from the clutches of money lenders and petty dealers in supplies. 5. Provision of facilities in procuring necessaries of life at reasonable prices, if not exactly on co-operative principles. 6. Facilities for obtaining immediate medical help especially during accidents and emergencies. Perhaps there is nothing new in these suggestions for reforming this class of people, but it is as well to reiterate them on an occasion like the present.

Yours faithfully

V. A. TALCHERKAR,

25th Sept. 1905.

[ In the course of a long leader on " Mill Labour in Bombay", the *Times of India* of 28th Sept. 1905 thus commented on Mr. Talcherkar's letter given above:—

..... Finally we are glad to print such an able and moderate contribution to the discussion as is contained in the letter from Mr. Talcherkar, printed in another column. With much that he says we are in complete agreement but we cannot accept his statement that the Mill-hands flock to the mills working the longest hours. Our information leads us to an entirely contrary conclusion. We admit the insanitary condition of the chawls in which many of the mill hands live, and have done what in us lies to combat public apathy and indifference on this point, but we cannot admit that the mill-hands are any better off if they are toiling excessively in unwholesome mills rather than resting in insanitary chawls. Nor can we assent to the proposition, however guardedly made that in some respects it is better for the mill-hands that they should be kept to their task day and night because they are thus out of the way of temptation. From this argument to the compulsory confinement of mill-hands to save them for their own weaknesses, would be but a step. And against it we may place the statement of so eminent an authority as the *Indian Textile Journal*, that these unconscionable hours are leading to an increase of spirit drinking amongst the mill operatives, in the vain attempt to keep up their strength. "]

#### APPENDIX II.

The following suggestion appeared in the *Times of India* whilst the Factory Labour Commission was sitting in Bombay:—

#### FACTORY LABOUR COMMISSION.

WHAT EVIDENCE IS VALUABLE.

To

The Editor of the  
*Times of India.*

Sir,

It is easy to imagine the solicitude with which Members of the Factory Labour Commission now at work must be striving to get at the real,—the bed-rock,—facts upon which their ultimate recommendations are to be based—recommendations prompted by the best of motives in the interests of the operatives, but which, if resting on wrong or insufficient data may work harmfully in the long run. Their anxiety is naturally enhanced when it is considered how darkly ignorant the objects of their solicitude are, even where their own pressing wants are concerned. A literate among the working classes is a rare phenomenon. He has hardly any intelligent idea about his own prospects in life—let alone the world's labour problem today. Then, the innumerable castes and creeds of the work people, the scattered and distant districts from which they hail, their different manners, customs, prejudices and their superstitions, all this has to be borne in mind in view of the fact that a remedy considered beneficial for one caste may prove harmful to another.

The most elementary sanitary provision for them is universally regarded as a nuisance and infliction. In a word it is like questioning a sick babe about its symptoms.

and then diagnosing and prescribing a remedy perhaps to its grave detriment. This points to the necessity for great caution in recording their evidence and drawing conclusions from it. In this view I venture respectfully to submit for the consideration of the Commission a few hints which may prove helpful in minimising the record of doubtful data. To begin with, perhaps it may be useful to enumerate here the five broad divisions into which the Bombay mill hands are popularly classified. These were given in my letter of September 1905 in your columns. They are—

- (I) The model hand, steady, sober and regular in attendance. He is a family man, to whom the smallest increase in wages is a boon. He is reliable and knows his duty to his employers. To him over-time work is welcome.
- (II) The "Budliwala" or substitute, who as a rule fights shy of fixed employment and works only temporarily in lieu of others
- (III) The "Athawada", or seven day man, so nicknamed— from his habit of working only seven days at a stretch every alternate week and taking a week's respite from labour thereafter.
- (IV) The "Mowali", the easy going masher—the Bohemian class— working and resting as he likes, a gay man— given to vice.
- (V) The "Dada" the vagabond, the hooligan class, lazy like the "Mowali", but

dangerous: for obvious reasons the number of these men is small in the mills.

Great care is necessary in eliciting correct information as to the real conditions and needs of the mill operatives, and only men of known character from class I are to be relied upon for their opinions. It is those mills generally which show poor results wherein men from class I happen somehow to be scarce.

The personal character of the mill hand to be examined is of prime importance and only those, where possible, should be selected after test. A *mowali* a *dada* a *budliwala* or an *athawada* are unreliable as a class, and are everywhere the despair of jobbers and heads of departments, and should, for purposes of evidence, be avoided. Men, with families employed either in mills or staying at their villages, are preferable as a rule, instead of single men. Such men with good records could be made to affirm solemnly over a handful of rice or a few leaves of the *tulasi* (the sacred basil) if they own any small holdings in their native *gaums* and if so the annual yield; the number of persons solely dependent upon them; whether they are indebted to creditors at home or to grain dealers and *marwadi* money lenders in the city; the monthly or yearly instalment they pay them; the interest charged by their *sawkars*; the nature of sickness from which they or their families usually suffer; the money spent on their own marriage ceremonies as well as on

those of their sons, daughters, brothers or sisters; what they set apart as savings, monthly or yearly; the amount they spend monthly after liquor; and other kindred questions to ascertain the character and position of the individuals whose testimonies are going eventually to be the basis of action for ameliorating the condition of their class.

It is essential that the evidence tendered should not reflect the opinions of the employers and their officers. The views of employers are of great value from their own stand point and should stand apart. Where they do creep into men's evidence it is through the officious overzeal of the subordinates and of the so called "leaders" of mill hands. These latter, it should be remembered, are not in touch with and know personally nothing about, the real needs of the operatives. No 'leader' can today be pointed out who has risen from among the mill hands and can speak with authority in their behalf. These are the men who get up demonstrations and meetings in the "interests" of the mill hands to win a day's popularity. Getting up such meetings is no great task; it is easily managed by jobbers. Opposition meetings are similarly got up. It is at such places that the self appointed representatives make speeches. The audience, needless to add, understands little of what is spouted at these shows. The evidence of such men is of little value: if any such "experts" come forward to volunteer evidence or if invited on recommendations to do so, their credentials should in the first instance be closely looked

into. The honest, untinged, untutored, independent answers of the workmen alone should appear on the record. It is an open secret that a good deal of what comes out of the mill hands mouth at such examinations is not his own. Ways are easily suggested of counter-acting this as far as is possible. Witness could be selected personally on the spot without previous warning. One important point in this connection is that in all replies the reasons for witnesses holding the opinions they give should be ascertained: this is essential whether the witness be an operative, a mill-officer or the employer of labour himself. I note that reasons for opinions elicited have not been recorded by the Commission so far.

Next to the work people themselves, are the men actually exacting work from and are other wise closely connected with these classes, who are fit to tender evidence.

The work of selecting materials for evidence is a difficult one before the Commission. And after all it is on evidence recorded of the present day condition of life, manners and customs of the working classes that action will eventually be taken affecting their future lot. The true symptom has to be known before a correct diagnose can be made and proper remedies applied and how hard it is to get at the correct symptom. These few suggestions are submitted in view to provide, if possible, against wrong symptoms being accepted. Yours

VINAYAK A. TALCHERKAR  
Kolhapur,

16th Nov. 1907.

DEPARTMENT OF AGRICULTURE  
MYSORE STATE.

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Bulletin No. 13

NOTES ON ENTOMOLOGY

BY

A. LEHMANN, PH. D., LEIP.  
AGRICULTURAL CHEMIST

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English or Kanarese Bulletins or Reports of the Department of  
Agriculture will be sent free to Planters or Raiyats in the  
State who may apply for them.

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BANGALORE  
MYSORE GOVERNMENT CENTRAL PRESS  
1902

DEPARTMENT OF AGRICULTURE  
MYSORE STATE.

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Bulletin No. I

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BY

A. LEHMANN, PH. D., LEIP.  
AGRICULTURAL CHEMIST

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| Probationary Asst. Chemist | ... | A. K. Yegna Narayana Iyer, M.A. |



## NOTES ON ENTOMOLOGY.

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The object of the agriculturist in tilling and manuring his land is to reap a rich harvest. But in order to do so it is self-evident that he must not only assist the crops to grow, but must also protect them from the attack of diseases and from being eaten by animals; as otherwise these would carry away a portion of the crop which he might harvest himself. The larger kind of animals, such as the neighbors' bullocks, can be easily seen when they trespass on the cultivated fields and are generally driven off as soon as possible, and frequently fences or hedges are provided to keep them out. But practically nothing is done in India to prevent the smaller animals from attacking the crop or to drive them off or destroy them when the attack has taken place. In fact they very often escape being noticed at all. This is particularly true of the insect pests. As a rule these enemies of the agriculturist are only discovered when they have killed some of the larger trees or have almost totally destroyed the crop on a portion of a field. But when they have removed only a quarter or one-eighth of the crop on ten times or one hundred times this area, and have therefore done much greater damage, they remain unnoticed.

The injuries caused by insects are generally greatly under-estimated. But in countries in which these insect pests are more closely studied than in Mysore, or in India as a whole, energetic steps are taken to eradicate them or reduce their numbers. In some instances natural enemies of these pests are introduced, such as other insects feeding on them (ladybirds, ichneumon flies, etc.), or insectivorous

birds are imported; or contagious disease germs affecting the particular pest in question are cultivated and some of the insect pest inoculated with them. Sometimes measures are devised to prevent the insects laying their eggs in such places in which their young can live; as, for example, by preventing the canker moth from climbing the apple tree (the female has no wings). But the most frequent method to fight these insect foes is to kill them directly, either by clogging their breathing pores and thus choking them; or, even more frequently, by poisoning them. The energy with which all these operations are carried out would be surprising to the average Indian agriculturist. For example, to prevent a certain kind of insect killing apple trees in some parts of the United States of America from entering Canada, all the young apple trees imported to any part of Canada have to be fumigated with one of the most deadly poisons before being planted. In California large tents are erected over the trees in the orange groves to fumigate them with this same poisonous gas to kill another insect pest. In Massachusetts (one of the United States of America, less than one-third the size of Mysore and with less than half the population of our State) more than Rs. 50,00,000 have been spent by the State in fighting only one insect pest, the gypsy moth. Last year Rs. 3,00,000 were provided in the estimate for that year's campaign to fight this pest. Moreover, only a portion of the State, less than about one-fifth of the area of one of our average taluks, is infested with this insect. The Massachusetts Government in this case thought it necessary to fight this insect on the waste lands and the roads, because it affected plants growing on these as well as those growing on the cultivated fields, and could not be got under control unless these uncultivated parts were also rid of the pest. But as a general rule the fight with insect pests is left in the hands of the cultivator and planter, Government assisting them only with advice and

legislation. And doubtlessly, even in this State of Massachusetts, much more money has been spent by private individuals than by the Government in fighting insect pests. But of course no accurate figures can be given of the money spent privately for fighting insects in any particular country or state. But what has been said is sufficient to show that the sum is a very large one indeed, and as it pays these people to spend all this money to save their crops, and as we have in Mysore, I expect, as many insect pests as in most countries, it is evident that the cultivators here must loose large sums annually through insect.

The object of this bulletin is to draw attention to this fact and to induce the raiyats and others to make use of such assistance as the Government of Mysore and the experience of other countries can give them.

It is the common belief that many of the insects are killed by the rains, and that therefore little attention need be given them if the monsoon is expected shortly. But this is a mistaken idea. Some of the *poochi* may die; but the large majority of them are doubtlessly simply transformed into the resting stage through which they live during unfavourable seasons and re-appear when the conditions are again favourable for their more active forms of life. Insects have four stages of life, through which the majority of them pass. The caterpillars or grubs which attack our crops are hatched from eggs. At first these caterpillars are of course very small, but they have ravenous appetite, devour large quantities of food and grow rapidly. During this period of their existence they generally moult several times; that is, they cast off their old skins, something like the snakes do, and appear in new ones. After these caterpillars are full grown they usually creep to some hidden place and spin a cocoon like the silkworm or make a little place for themselves underground and are transformed into a *Pupa*

or *Chrysalis*, from which, after a time, the full grown insect, in the form of a butterfly or moth or beetle or bug, emerges. Of course in this full grown stage they do not grow and therefore as a rule do not eat very much and are generally not as injurious as in the larval stage. They fly about, however, and lay the eggs from which the larvæ or grubs or caterpillars or maggots, as the case may be, are again hatched.

The stages through which the insects usually pass are therefore :—

- (1) the Egg ;
- (2) the Larva ;
- (3) the Pupa ; and
- (4) the Imago or adult stage ;

Now by studying the various insects we find that in some one or other of these stages we can kill them most easily. Often this is in the stage in which they do most damage, *viz.* in the larval stage. If we let that stage pass they are often out of our reach till next year, when they naturally would appear in much larger numbers unless some disease or some other enemy has killed a large number of them. If for example we let a "kumbly hula" live in the expectation that the monsoon will kill it, hundreds may appear in its place next year. Fortunately nature often kills a large number of them by supplying natural enemies. But if we desire to have a more certain or more comfortable life than the beasts of the jungles or the insects of the field, we must assist nature by cultivating our crop. Why should we neglect helping her in killing the enemies of our crops? In order to do this we must fight them as soon as they appear. For such insects which eat the leaves of our crops without first spinning a net over themselves or in any other way concealing their attack, the very best method to kill them is to sprinkle a poison on the leaves of the plants on

which they live. The poisons which might be used are numerous. But in case there is no danger of poisoning either ourselves or such animals as we desire to live, the poison likely to give best results is some form of arsenic, and of these Paris Green is the favourite in America where it has been used upwards of twenty-five years. It is a green powder sold in Bangalore for about Re. 1-4-0 per pound. It was imported at the request of the Agricultural Chemist of Mysore, and cannot, so far as the writer knows, be had in any other town of India at present. But it is hoped that its use may soon become universal. It may be applied either suspended in water or diluted with sifted ashes, land plaster, flour, etc. Suspending it in water is generally the best method. One quarter of an ounce suspended in two gallons of water, or in other words about half a table-spoonful to a large pail of water, is the strength of mixture generally recommended.

Of course great care has to be taken in using this poison, and the spoon used for measuring the Paris Green and the pail in which it is mixed with water and any other thing touching this poison *must not be used for any other purpose*. After the Paris Green has been added to the water, the mixture must be thoroughly stirred with a stick, and is then sprinkled on the crops affected by insects with an old broom. Just enough should be applied to wet the leaves. Any larger quantity is useless. The water in the pail must be stirred well from time to time as the Paris Green would otherwise sink to the bottom of the pail and a part of the plants would get too little Paris Green and others a great excess of it. This water in which Paris Green is suspended may also be applied with a specially constructed spraying apparatus. In that case less Paris Green will be required and a much larger area of the crop can be treated in the same time. But these pumps would have to be imported from America or Europe.

birds are imported; or contagious disease germs affecting the particular pest in question are cultivated and some of the insect pest inoculated with them. Sometimes measures are devised to prevent the insects laying their eggs in such places in which their young can live; as, for example, by preventing the canker moth from climbing the apple tree (the female has no wings). But the most frequent method to fight these insect foes is to kill them directly, either by clogging their breathing pores and thus choking them; or, even more frequently, by poisoning them. The energy with which all these operations are carried out would be surprising to the average Indian agriculturist. For example, to prevent a certain kind of insect killing apple trees in some parts of the United States of America from entering Canada, all the young apple trees imported to any part of Canada have to be fumigated with one of the most deadly poisons before being planted. In California large tents are erected over the trees in the orange groves to fumigate them with this same poisonous gas to kill another insect pest. In Massachusetts (one of the United States of America, less than one-third the size of Mysore and with less than half the population of our State) more than Rs. 50,00,000 have been spent by the State in fighting only one insect pest, the gypsy moth. Last year Rs. 3,00,000 were provided in the estimate for that year's campaign to fight this pest. Moreover, only a portion of the State, less than about one-fifth of the area of one of our average taluks, is infested with this insect. The Massachusetts Government in this case thought it necessary to fight this insect on the waste lands and the roads, because it affected plants growing on these as well as those growing on the cultivated fields, and could not be got under control unless these uncultivated parts were also rid of the pest. But as a general rule the fight with insect pests is left in the hands of the cultivator and planter, Government assisting them only with advice and

legislation. And doubtlessly, even in this State of Massachusetts, much more money has been spent by private individuals than by the Government in fighting insect pests. But of course no accurate figures can be given of the money spent privately for fighting insects in any particular country or state. But what has been said is sufficient to show that the sum is a very large one indeed, and as it pays these people to spend all this money to save their crops, and as we have in Mysore, I expect, as many insect pests as in most countries, it is evident that the cultivators here must loose large sums annually through insect.

The object of this bulletin is to draw attention to this fact and to induce the raiyats and others to make use of such assistance as the Government of Mysore and the experience of other countries can give them.

It is the common belief that many of the insects are killed by the rains, and that therefore little attention need be given them if the monsoon is expected shortly. But this is a mistaken idea. Some of the *poochi* may die; but the large majority of them are doubtlessly simply transformed into the resting stage through which they live during unfavourable seasons and re-appear when the conditions are again favourable for their more active forms of life. Insects have four stages of life, through which the majority of them pass. The caterpillars or grubs which attack our crops are hatched from eggs. At first these caterpillars are of course very small, but they have ravenous appetite, devour large quantities of food and grow rapidly. During this period of their existence they generally moult several times; that is, they cast off their old skins, something like the snakes do, and appear in new ones. After these caterpillars are full grown they usually creep to some hidden place and spin a cocoon like the silkworm or make a little place for themselves underground and are transformed into a *Pupa*

ing the insects, such as, whether they appeared before on these fields, or adjoining fields, and if so, when, and for how long, will also be of value.

It will be the duty of the Amildars to promptly report any attack of insect pest or plant disease directly to the Agricultural Chemist at Bangalore and to forward the samples and information as directed above.

A. LEHMANN, Ph. D.,  
*Agricultural Chemist.*



# WALEN WEAVING FACTORY

ALFRED CHATTERTON.

*Contributed to the Industrial Commission by  
the author at a public hearing held in December 1904.*

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## THE SALEM WEAVING FACTORY.

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In the present paper I propose to give a brief account of the origin and objects of the Hand-loom Weaving Factory which was established early last year in Salem under the orders of the Government of Madras. This Factory has attracted a great deal of attention not only in the Madras Presidency but in all parts of India, unfortunately however its aims and objects have been misunderstood with the result that the work done there has not exercised that influence over the movement in favour of reform in the methods of the hand-weaver which we think it is entitled to and which in the interests of the Indian weavers themselves it should.

As far back as the year 1900 my attention was drawn to fly-shuttle looms as an improvement over native hand-loom by the then Deputy Superintendent of the Chingleput Reformatory and in the following year I set up about half a dozen fly-shuttle looms in a shed in the School of Arts, Madras, with the object of getting experience as to their working capacity and data regarding their possibilities. I was aware of the existence of the large weaving establishments on the West Coast belonging to the Basel Mission where fly-shuttle looms are exclusively used and as Inspector of Technical Schools in Madras I knew a number of mission institutions where weaving with fly-shuttle looms was taught. But in every case the work done on the looms was with comparatively coarse counts and the goods turned out were invariably copies of the Basel Mission work. So far as I was aware no attempt had ever been made to turn out purely indigenous cloths on fly-shuttle looms and it was to achieve this object that I

began the investigations. From enquiries in Madras I found that some attempts had been made by people interested in the piece-goods trade, but that nothing had come of them and a Muhammadan firm Messrs. Hajee Mahomed Badsha Sahib & Co. showed me the results of a very extensive series of experiments they were undertaking in the manufacture of Madras handkerchiefs with the domestic hand-loom manufactured by Messrs. Hattersley & Sons. As their experiments had ended in failure they lent me some of the looms with which to make further experiments and these looms may still be seen in the School of Arts, Madras, among the discarded relics of our various weaving experiments.

At the outset Madras handkerchiefs were taken up and for two or three years we made great efforts to improve the various details of their manufacture in the hope of being able to turn them out at a profit. At first the handkerchiefs fetched poor prices, but latterly we were able to command the highest rates paid for them. Attempts were also made to introduce the manufacture of these handkerchiefs into some of the Industrial Schools, but in every case the experiment ended in failure and at the end of 1905 after carrying on the work for nearly five years it was found impracticable to make the fly-shuttle loom a success on the lines along which we were working. We had, however, definitely ascertained that it was practicable to turn out a much larger percentage of cloth on a fly-shuttle loom than on the native loom, that a cloth of even better texture could be produced and that if the sizing processes could be improved there seemed to be some hope of the fly-shuttle loom coming into general use throughout the country. Our want of success was largely due to trying to do many things at one time and to the difficulty of getting good weavers to work regularly in the weaving shed.

In August and September 1905, I made a tour through Bombay, the United Provinces and Bengal and in passing orders on my report the Government of Madras expressed their willingness to establish a hand-loom weaving factory for experimental work either in Salem or Madura. For a variety of reasons the former town was selected and in February of last year the looms and apparatus with which we were working in Madras were transferred to Salem and a new start was made. Salem was selected, because according to the Census Reports there were over 8,000 hand-weavers in the town who were supposed to be in a more or less chronic state of poverty, because the climate was considered suitable, and finally because it was conveniently situated in regard to access from Madras—a matter of some importance in connection with the supervision of the factory. All the experience gained in running the looms in Madras was made use of in considering the lines upon which the Salem Weaving Factory was to work.

The weaving problem was obviously a much more complicated one than was dreamt of by Mr. Havell who since 1901 has persistently advocated the substitution of the fly-shuttle loom for the native hand-loom, claiming that if that was done all would be well with the weavers, that their output would be doubled, and that they would gradually regain the enormous volume of trade which has been surrendered to the power-loom weaving factories. Optimism is essential if one is to endeavour to raise the status of the hand-industries of India, but it must be based on a practical knowledge of the possibilities of each industry and not the result of ignorance. The dilettantism of the artist is a poor equipment with which to endeavour to solve the economic problems which the Indian manufacturer has to face, and the Weaving Factory at Salem was

started with a perfectly open mind as a centre for experimental work in the weaving industry and without the slightest idea of using it to furnish data to support previously formed conclusions.

In a report on the results of the first year's working of the factory which was submitted to the Government of Madras I have explained that it is an experiment to ascertain whether it is possible to improve the condition of the hand-weavers in Southern India

- (1) by substituting for the native hand-loom improved hand-loom which will enable the weaver to produce a greater length of cloth in a given time without in any way sacrificing the essential characteristics of native hand-woven goods;
- (2) by introducing the factory system among the weavers so that they may work under the management of men with commercial and manufacturing experience and so that capital and organisation may be introduced into the industry to render the hand labour more productive;
- (3) by introducing, if possible, improved preparatory processes to diminish the cost of the preliminary warping and sizing which the yarn undergoes before it is placed in the loom.

From this it will be seen that the Weaving Factory is not a school for imparting technical instruction in the trade, but is simply for solving certain problems which have been definitely formulated and the future action of Government in regard to the weaving industry will largely depend upon the kind of solution which is arrived at. With the first set of problems and the third set

no one, I think, will disagree, but a great deal of opposition has been raised to what is characterised as an attempt to introduce the factory system with all its squalor and ugliness into what has hitherto been an artistic handicraft. If the hand-weaving industry is to be materially improved, a great deal has to be done not merely in connection with the technical details of the weaving processes, but also in connection with the training and education of the weaver himself. In the design of woven fabrics there is immense scope for artistic skill, but the production of these fabrics in the loom is a purely mechanical operation and the hand-weaver is an artisan and not an artistic craftsman. The production of solid bordered cloths is still beyond the capabilities of the power-loom and for the very finest work the native hand-loom is still supreme; but for the bulk of the textile fabrics required by the people of India the power-loom represents one method of manufacture and the question which has yet to be answered is whether ultimately it will not represent the only method of manufacture.

Those who study the weaver in his house amid his ordinary everyday surroundings, often short of work and nearly always in the hands of the cloth merchants in the bazaar, see little of the independent artisan who is to be the industrial backbone of this country, but much of the misery and poverty of his lot. With the assistance of his women and children he ekes out a miserable existence and his seeming independence is merely indolence and aversion to regular work. The imagination of the artist casts a glamour over the wretched isolation of the weaver and would have us leave him to fight a losing battle against the products of one of the largest and best organised industries in the world telling him to work with tools which have been discarded in other countries

as inefficient. The purchasing power of money in India is steadily decreasing and in most of the other trades and industries the earning of the workers are increasing. In the weaving trade at best they are stationary and in many places are on the decline. Will the hand-weaver survive the stress of competition or will he be driven as in other countries to seek a livelihood at other work? The answer is doubtful. The fact that he has survived so long is in his favour and there is no doubt the transitional period can be prolonged, but it is still an open question as to whether he can be put in a position which will enable him to command the same wages for the same number of hours of work as the power-loom weaver, or the blacksmith and carpenter, whose industrial existence is not threatened by the prospect that ingenious machinery will be devised to supplant them. On all these questions, I have in respect to the weaving factory endeavoured to preserve an open mind and it has only been called it a factory and organised it on factory lines because it seemed to be the simplest way of testing the efficiency of new methods of working and of training a certain number of weavers to carry on industrial experiments to a definite commercial conclusion. As a Government institution one can hardly hope that it will be a great commercial success. Experimental factories cannot be run on purely commercial lines and there is no chance of establishing any sort of a monopoly which might enable us for a time to obtain unusually profitable work.

So far at Salem we have not had time to tackle any technical problems connected with the hand-weaving industry. All our time has been engaged in getting together a sufficient number of capable hand-weavers to really test the capacity of the various looms which have been brought to our

notice. We have found that the hand-weavers of Salem like the hand-weavers of Madras object to working in the hand-weaving factory, and although their wages are good their attendance is unsatisfactory. This is mainly because the weavers prefer to work in their own homes assisted by their women and children and dislike being subjected to the discipline and regular hours of working which must necessarily prevail in the factory. Although the men can earn considerably more than they do in their own houses and are ensured regular and continuous employment, they much prefer the old system and seem to find steady employment extremely irksome, but few of them are free agents and nearly all are in the hands of the cloth merchants who from time to time make them advances and receive the cloths they manufacture. Naturally these gentlemen view the experiments at the Weaving Factory with suspicion and their influence has all along been against us. So far, therefore, we have had to work mainly with waifs and strays of the weaving community, and the Assistant in charge of the Factory has had a long and tedious task in getting into it even some semblance of order. Private individuals however have watched our efforts, imitated our methods and met with a much greater degree of success and without any special advocacy on our part a considerable number of hand-weaving factories have been started in various parts of the Presidency, but with what degree of success I am not able to state. The interest in hand-weaving is mainly due to the Swadesi movement and most of these factories owe their existence to the enthusiasm engendered at the birth of a new political movement. Whether, in the long run, they will hold their own or not, and whether, in consequence, they will grow in size and multiply in number, remains to be seen.



Comparatively recently there has been a great development in the use of cotton checks for native clothing and it is largely to supply this demand that most of the factories were started. The pioneer work in this direction was done by the Basel Mission weaving establishments and it is not improbable that if the demand continues to grow to any great extent the power-loom weavers will try to cut into the business and possibly with success. In Madras, at any rate, there are two large hand-weaving factories in Tondiarpet, both of which are manufacturing mainly Madras handkerchiefs and in this direction the proprietors assure me that they are doing better than with native hand-loom, but as no accounts are available it is difficult at present to tell whether they have succeeded in placing these factories on a firm commercial basis, or whether they have achieved little or nothing more than has been done in the Government Weaving Factory. One result of our work at Salem during the last 18 months is to furnish fairly reliable data for the opinion that the weaver himself is not likely within any reasonable time to change his methods of working and take to the fly-shuttle loom and it seems almost certain that in this part of India the factory system will have to be introduced if anything is to be done. In the North of India, especially in the United Provinces, from enquiries which I have recently made it would seem that the weavers there are more likely to take to improved looms on their own initiative and it does not seem to be altogether hopeless that there the difficulties connected with the establishment of the hand-weaver in a sound economic position may be solved through the agency of Weavers Guilds or other forms of co-operative enterprise. It is not my intention now to discuss these questions and I have merely mentioned them to indicate that in different parts of India it is quite possible that the

weaving problem will be solved in different ways. A scheme which may be successful up north will prove a complete failure down here and *vice versa*.

I freely invite criticism of our methods of working and of the way we are tackling the weaving problem, but I deprecate all criticism which is based on ignorance of our local conditions. In Conjeeveram, a large weaving centre, at no great distance from Madras, the National Fund and Industrial Association have endeavoured to popularize the fly-shuttle loom and I have assisted their efforts in so far that I have with the consent of the Board of Revenue lent them six fly-shuttle hand-looms, but the experiment has not been productive of any satisfactory result and the National Fund and Industrial Association have failed to popularize the fly-shuttle loom notwithstanding the fact that they fully recognise its merits. Similarly in the town of Madura where the weavers are more enterprising than in most parts of the country numerous experiments have been made with fly-shuttle looms and I have seen the most improved types of European hand-loom such as the domestic loom of Messrs. Hattersley & Sons at work in the bazaar, but none of these looms have caught on and plain weaving to-day is done in Madura much in the same way as it was more than a hundred years ago. It is not the expense which a good fly-shuttle loom entails which stands in the way, for in places where looms have been lent there has been no eagerness on the part of the weavers to avail themselves of the loan. Finally our experience in Salem itself is dead against any idea that the fly-shuttle loom can be popularised among the weavers themselves. They are ignorant and conservative and in their eyes the doubtful merits of the fly-shuttle loom are insufficient to make them change their ways of working. As the result therefore of our work at Salem and of the observations which I have been

able to make whilst touring through other parts of the Madras Presidency, I am of opinion that the only hope of progress in this part of the country is that outsiders will put their money into the trade and that through their intelligence and energy it will be placed upon a new footing.

In connection with weaving in fly-shuttle looms the opinion has hitherto generally prevailed that fine cloths cannot be woven on looms fitted with the fly-shuttle attachment, because owing to the greater strain only comparatively coarse yarn which will not readily snap can be used for the warp. This opinion has absolutely no foundation in fact, as where the fly-shuttle looms are designed for working in fine counts no difficulty has been experienced. The great bulk of the work done in the Salem Weaving Factory is in counts between 60's and 100's and I should not have the least hesitation in undertaking work in higher counts if the orders were sufficiently large to make it worth while. The fly-shuttle loom, no matter what type, must be constructed to suit the work for which it is intended and a loom which may do very well for dungries or checks may be unsuited for fine counts and it is mainly owing to the neglect of this point that fly-shuttle weaving has made so little real progress among the Indian weavers.

From the time when these experiments in weaving were first started a great deal of attention has been paid to the various forms of loom which have been placed on the market and any pattern which offered the least promise of success has been thoroughly and carefully tried and I propose briefly to state the results of the observations. Work was started on hand-looms of the pattern generally found in mission schools in the south of India and it was found in such looms that although fly-shuttle enabled the rate of picking to be greatly

increased yet the increased time spent in mending broken threads in the warp almost entirely nullified its advantages. One by one the defects of this loom were remedied, the proportions were changed, the warp beam mounted on springs, an automatic take-up motion was introduced and the picking string carried over a guide pulley with the result that at the present time it can hold its own in fairly fine weaving against any loom which has so far been brought to my notice. In this loom there is nothing absolutely novel. It has simply been proportioned in its various parts to suit the work to be done and care has been taken to prevent it becoming complicated. For instance whilst we were engaged in making Madras handkerchiefs in which several colours are used in the weft it was thought that possibly the English drop box might prove a convenient addition to the slay but in practice it was found to be no great advantage and the use of the drop box was discontinued. In the English hand-loom, as in the native hand-loom, the picking motion is independent of the treadles which control the shedding motion and the weaver must learn to jerk the picking string with his hand when he has opened the sheds sufficiently through the levers controlled by his feet. The loom is in no sense automatic, but it is possible when the picking strings are carefully adjusted to make from 80 to 100 picks per minute through a warp 54" wide. At the present time at the Salem Factory where we use nothing but country warps sized by hand and provided with a lease and lease rods, to avoid frequent stoppages to shift the lease rods a fairly long spread of warp between the warping beam and the healds is necessary, and this is the most serious objection to this form of loom inasmuch as it makes it very bulky.

It became obvious at a very early stage in the experiments that the fly-shuttle slay could be used

in the native hand-loom, and that we could improve the rate of picking. I am not now certain to whom the credit of first making this suggestion is due, but it is a very important one, as it places in the hands of the native weaver a very great improvement in his loom, and one which can be obtained at a very small expense. This modification has been largely tried and with considerable success, but it does not secure all the advantages of the frame loom pattern and is to be regarded rather as an intermediate stage between the Native and the English loom. Experience has taught us that the greatest defect of this loom is the number of broken ends which occur in the process of weaving, and these have been much reduced by putting the warp on an elastic frame and by using brass reeds and healds with metallic eyes. The healds and reeds we employ are obtained from Messrs. Jones Brothers of Blackburn, England, through their agents Messrs. Hutheesing & Co. of Bombay. They are considerably more expensive than native healds and reeds, but those who have given them a fair trial consider that they are worth the money. It is not an uncommon custom for native weavers to vary the closeness of the texture of their cloths by using reeds set much closer together near the edge of the cloth than in the middle. The practice, if not actually fraudulent, is not to be recommended, as it is calculated to deceive the unwary, but it is widely in vogue and is likely to render English reeds unpopular unless they are made to conform to this practice. The automatic take-up motion is not an essential feature of the loom, nor is it a very popular one with native weavers, but it enables the weaver to produce cloth of a perfectly uniform texture and I am quite certain is fully appreciated by the weavers of such cloths who find them more durable. The cost of this loom complete varies with the amount of timber put into it, the quality

of the timber and the general style and finish. Complete with English healds and reeds it will not cost more than Rs. 100 and in large numbers can be produced for a somewhat smaller figure. In our experimental workshops we have made a good number of these looms and we sell them, exclusive of healds and reeds, for Rs. 85 each. These looms are purchased more as patterns to be copied than as actual working looms and our price is perhaps somewhat high.

I do not propose to furnish a dissertation on weaving mechanisms, but before discussing the results obtained with other types of loom it may well to explain that in all the improved hand-loom mechanism is provided whereby the picking and shedding motions are combined, and the weaver is reduced to a pure automaton who either works the loom through a pair of pedals or sets the mechanism in motion by causing the slay to swing in pendulum fashion by one or both hands. The weaver is a mere automaton so long as everything works well, but if anything goes wrong or if the driving force he supplies is insufficient a break down always occurs and his skill as a weaver will be called into play in repairing the damage done.

During the last few years the discussions about the hand-loom weaving in India have led many people, competent or otherwise, to attempt the improvement of the hand-loom, and many worthless patents have been taken up. During the last six years I have had under observation every loom that I have heard of which seemed to offer the least prospect of turning out successful, and the following is, I think, a complete list of the looms which have been tried :—

- (1) The Domestic hand-loom of Messrs. Hattersley & Sons.

- (2) The Domestic loom of Messrs. Raphael Brothers.
- (3) The Japanese hand-loom.
- (4) Mr. Churchill's loom (Ahmednagar).
- (5) Captain Maxwell's loom (Salvation Army).

I had the Hattersley's looms at work for a long time on a great variety of fabrics made from yarn of counts up to 40's, but the output was never satisfactory, as the work of driving the loom was far too heavy for the native weaver. For a time I tried them putting two weavers for each loom so that when one worked the other rested and this naturally increased the output but not to the extent that was to be expected. When the loom is driven at a perfectly uniform rate, it works very satisfactorily, but when the source of supply of power is an Indian weaver the supply is very irregular and the result unsatisfactory.

The Raphael loom was never actually at work in either the Madras or the Salem Weaving Shed and my knowledge and experience of its working is gained by observations made on the loom purchased by Mr. Theagaraya Chetty of Tondiarpet. This loom suffers from the same defects as the Hattersley's loom and is much too hard work for the undeveloped legs of the Indian weaver. To all intents and purposes both these looms are power-looms and unquestionably better work will be got from them if the treadles or pedals are done away with and an arrangement made to drive them off a line of shafting. The looms are made of cast iron and it is astonishing how easily the castings are broken and how helpless the Indian weaver is in face of even a simple fracture. These looms are totally unsuited for individual weavers working on their own account, and I fail to see what advantage

there is if they are gathered in large numbers in a factory and human labour is employed to drive them. Thirty or forty such looms can be driven by a small oil engine costing not more than Rs. 4 or 5 a day to run and there is not the least doubt that the output of these looms will be three or four times as much as when worked by hand-labour. I am inclined to think that small power-loom factories of this type might be worked with great success in this country and would afford an admirable training ground for the development of indigenous manufacturing genius. I am now dealing with hand-weaving and it will be out of place to discuss this suggestion any further, but I think that small power-loom factories of this kind would prove very successful if properly designed and worked on the right lines.

With the Japanese handloom my experience was very unsatisfactory. It was obtained from Mr. Shafi through the Ludhiana Loom Manufacturing Company and was found to be a crude and ill designed loom and no warp ever put into the loom was woven into a satisfactory cloth. Why the loom was brought from Japan to India I do not know and the sooner it sinks into the obscurity from which it was dragged the better. I have been told by Japanese connected with the weaving trade that the loom is not used in Japan and I am not surprised as at the best it is only suitable for very coarse work.

*Mr. Churchill's loom.*—When I visited the American Mission Industrial School at Ahmednagar in 1905, Mr. Churchill showed me a number of his looms at work on a kind of dungri, and I was much struck with the results obtained when weaving this kind of cloth. Subsequently Mr. Churchill built 6 looms for the Salem Weaving Factory to weave fine cloths from 45" to 54" wide. On such work the



loom has not been a success and the Salem weavers object to being put to work on it. The mechanism for timing the throw of the shuttle is defective and the shuttle is very liable to be caught in the warp when it is more than a yard wide. To make the shuttle travel properly the slay has to be moved forward with increasing rapidity and then suddenly brought to rest, and on the finer warps the percentage of broken threads renders the output of the loom much smaller than would be anticipated from the rate at which picking can be done when the warp is not too wide.

The last loom with which we are still experimenting at Salem is that invented by Captain Maxwell of the Salvation Army and known as the "Triumph" loom. I have only one of them at work at Salem with which fairly satisfactory results have been obtained and a second loom has been ordered with some slight modifications which it is hoped will improve its outturn. If this anticipation is realised, it is proposed to put down six more looms and to thoroughly test them on the same class of work against six looms of the English pattern already described.

In the looms of both Churchill and Maxwell the driving force is applied to the slay and I am inclined to think that, whilst this will work satisfactorily on coarse warps, the necessarily somewhat jerking motion of the slay is not conducive to a good output when the warp is fine. Personally I hold the opinion based on nearly seven years' experience with different types of hand-loom that, when the power-loom is converted into a hand-loom, it becomes an unsatisfactory machine owing to the irregularities in the driving force and that the hand-loom must be a simple piece of mechanism in which the irregularities of the weaver are compensated for by the gentleness of the action of the loom.

A power-loom will make from 200 to 250 picks a minute, and from careful observations which I have made of the outturn of hand-loom I find that the daily average has only in one instance exceeded 30 picks per minute and when weaving fine cloths an average of from 20 to 25 picks a minute may be considered very good work.\* Mr. Churchill at Ahmednagar was able to weave 30 yards of dungri in  $8\frac{1}{2}$  hours, the warp and weft being of 10's counts and the number of picks per inch 28. This is equivalent to an average rate of picking of 60 per minute and is an extraordinarily good result. I have often observed my weavers at Salem and I find that they can easily do from 80 to 100 picks per minute whilst actually weaving, but their daily out-turn under favourable circumstances shows that at this rate of picking less than 25 per cent. of their time is spent in plying the shuttle and that the rest is frittered away. Weaving is a very monotonous occupation and the weaver is certainly unable to go on picking for any length of time without a change of some kind. The changing of pirns, the repair of broken threads, the shifting of the lease rods and other little incidents break the monotony of the work, but they greatly impair the efficiency of the loom.

I am convinced that, if the fly-shuttle hand-loom is to be largely used in making the finer classes of native goods, the direction in which improvement should be sought for is not so much in increasing the rate of picking which is already quite fast enough but in improving the details of the shedding and the

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\* These facts are substantiated by the recently issued report of the weaving competition which took place at Calcutta at the exhibition associated with the Indian Industrial Conference of 1906. The Salvation Army loom, which was awarded the gold medal, was worked at the rate of 37.3 picks per minute for  $7\frac{1}{2}$  hours, but at the end of that time the weaver showed signs of distress as did all the other competitors and it was, obvious that the result depended as much upon the endurance of the weaver as upon his skill or the merits of the loom.

working of the slay so that the operation of weaving subjects the comparatively delicate threads to the minimum amount of strain. The idiosyncracies of the weaver however remain and I doubt if, under any circumstance, the average rate of picking throughout a day will ever rise to as much as 40 or 50 per cent. of what may be termed the normal rate at which picking can be done. Even in a weaving factory it is very difficult to collect reliable data regarding the working of looms and their output. The conditions vary so much from time to time and the human element plays so important a part that some exceptional motive must be brought into play to obtain anything like uniform conditions. For this reason I attach considerable importance to the results obtained in weaving competitions when a powerful stimulus is supplied to each weaver to do the best he can under the circumstances. Under the auspices of Local Associations in the Madras Presidency one or two such competitions have already been held, and in February next a competition is to be held which is being organized on much more elaborate lines than any of those already mentioned. The main object of the competition is to ascertain the working capacity of the various hand-looms on the market under favourable conditions, but under as far as possible conditions which could be reproduced in a weaving factory. Each competition will last for six days and each weaver will have to work for 7 hours a day and the results will be judged by the week's outturn. In this way it is hoped we shall obtain reliable data regarding the output of the various types of loom when working on different kinds of cloth. A considerable number of competitions have been arranged for and the Government of Madras have contributed very largely to the prize fund which it is hoped will induce the makers of every practical type of loom to enter them in the competitions.

*Details of the cost of Production.*

|                                         | Cost in<br>Rs. | Percent-<br>age of<br>Total<br>cost. | Cost in<br>Rs. | Percent-<br>age of<br>Total<br>cost. | Cost in<br>Rs. | Percent-<br>age of<br>Total<br>cost. | Cost in<br>Rs.   | Percent-<br>age of<br>Total<br>cost. | Cost in<br>Rs.  | Percent-<br>age of<br>Total<br>cost. |
|-----------------------------------------|----------------|--------------------------------------|----------------|--------------------------------------|----------------|--------------------------------------|------------------|--------------------------------------|-----------------|--------------------------------------|
| Warp ... ..                             | 2 0 0          | 23.3                                 | 1 6 0          | 19.5                                 | 14 0 0         | 33.3                                 | 11 4 0           | 34.7                                 | 2 0 0           | 58.2                                 |
| Weft ... ..                             | 1 4 0          | 14.2                                 | 1 0 0          | 14.2                                 | 9 13 0         | 23.2                                 | 7 8 0            | 23.1                                 |                 |                                      |
| Warping and sizing ... ..               | 1 8 0          | 17.2                                 | 1 2 0          | 15.9                                 | 4 7 0          | 10.5                                 | 2 9 0            | 7.9                                  | 0 10 0          | 17.6                                 |
| Beaming warps ... ..                    | 0 8 0          | 8.7                                  | 0 4 0          | 3.6                                  | 0 14 0         | 3.1                                  | 0 14 0           | 3.7                                  |                 |                                      |
| Pirn winding ... ..                     | 0 4 0          | 2.8                                  | 0 4 0          | 3.6                                  | 0 8 0          | 1.2                                  | 0 13 0           | 3.5                                  | 0 15 0          | 23.2                                 |
| Weaving ... ..                          | 8 4 0          | 37.2                                 | 2 0 0          | 43.2                                 | 12 8 0         | 29.8                                 | 9 8 0            | 29.1                                 |                 |                                      |
| <b>Total Cost ...</b>                   | <b>8 12 0</b>  | <b>100</b>                           | <b>7 0 0</b>   | <b>100</b>                           | <b>42 2 0</b>  | <b>100</b>                           | <b>32 8 0</b>    | <b>100.0</b>                         | <b>8 9 0</b>    | <b>100.0</b>                         |
| Cloth ... ..                            | Turbans.       |                                      | Angavastrams.  |                                      | Dhoties.       |                                      | Women's cloth. * |                                      | Country towels. |                                      |
| Counts in warp and weft.                | 100 x 100      |                                      | 100 x 100      |                                      | 60 x 60        |                                      | 60 x 60          |                                      | 20 x 20         |                                      |
| Length ... ..                           | 24 yards.      |                                      | 12 yards.      |                                      | 100 yards.     |                                      | 54 yards.        |                                      | 20 yards.       |                                      |
| Breadth ... ..                          | 28 inches.     |                                      | 45 inches.     |                                      | 54 inches.     |                                      | 45 inches.       |                                      | 36 inches.      |                                      |
| Ends per inch width ... ..              | 90             |                                      | 88             |                                      | 80             |                                      | 80               |                                      | 40              |                                      |
| Picks per inch ... ..                   | 68             |                                      | 72             |                                      | 70             |                                      | 60               |                                      | 40              |                                      |
| Rate of picking at Salem<br>per minute. | 18             |                                      | 16             |                                      | 23             |                                      | 12               |                                      | .....           |                                      |

\* Turkey red yarn dyed with indigo.

From data collected at the Weaving Factory at Salem a tabular statement has been prepared giving details of the cost of production of several kinds of goods most largely manufactured there and I would draw attention to the columns in which the cost of each item is given as a percentage of the total cost. These figures are very interesting and it would be well if similar figures could be produced from other weaving establishments and the various items discussed. It will be seen that in the very fine cloths like angavastrams and turbans the cost of the raw material is but little more than a third of the cost of the finished articles, whilst in the goods made in the lower counts the percentage varies between 56 and 60. At Salem the warping and sizing is done outside the factory by men who do nothing else but this sort of work and they use fairly efficient warping mills and from the figures for warping and sizing it is obvious that there is not a great amount of room for improvement. The cost of the actual weaving work is probably the main item in which improvement can be effected and this is emphasized by the figures given regarding the rate of picking which varies from 12 to 23 picks per minute excluding country towels, the figures for which are not given as they are usually made on native looms with a simple fly-shuttle attachment. The item 'warping and sizing' varies considerably with different kinds of cloths and the figures given are probably lower than would be obtained in many other places owing to the fact that in Salem the preparation of warps is to a large extent a special business and is carried out in a much more efficient manner than I have seen elsewhere.

Whilst the experimental plant was in Madras a great many experiments were carried out in different methods of sizing and various forms of hand-warping mill were tried. The problem of

preparing warps suitable for use on native handlooms was laid before the makers of warping machinery at home and after a great deal of discussion a plant was ordered from Messrs. Butterworth and Dickinson. It was set up and tried in Mr. Theagoraya Chetty's factory at Tondiarpet, but the results were anything but satisfactory and on account of other and more important work the experiments are at present in abeyance. The main idea was to employ hank-sizing and a sectional warping machine capable of turning out cheeses of warp of 500 ends. To make up a warp containing 3,000 or 4,000 ends the requisite number of cheeses were put on a spindle and the required warp run off on to the weaver's beam. The principal defect is in the sizing which proved inferior to that which is done by the native method where the warp is stretched out on a frame and carefully brushed. It is my intention as soon as possible to set up this warping mill again and prepare warps of unsized yarn and then to expose the warp in sheet form and size it according to the ordinary native method. I cannot say that I am very sanguine that this will be a success, but it seems worth trying and should effect a considerable economy in the cost of warping. Recently Messrs. Hattersley & Sons have brought out a hand slasher sizing machine, which will probably give good results with low counts where the handlooms may be expected to turn out from 20 to 30 yards of cloth a day, but with much finer class of goods which we are weaving at Salem, where the outturn is seldom more than 5 yards a day, the use of very long warps is not recommended as they remain in the loom much too long a time and the sizing deteriorates so much that the warps have to be re-sized on the loom and, when this is done, it greatly diminishes the outturn.

Before concluding this paper it may be of interest to give some details regarding the factory

itself. For the present the factory is located in a rather large straggling bungalow in the middle of the town of Salem for which we pay a rent of Rs. 60 a month. It was intended originally to instal about 100 looms, but owing to the difficulty of getting weavers nothing like that number has yet been reached and we find it difficult to keep more than about 35 looms in full work. The cost of running the factory last year was about Rs. 300 a month in addition to the sale-proceeds which amounted to about Rs. 350 a month. A steady improvement is however going on and with between 40 and 50 looms installed and an average of 35 at work the sale-proceeds amount now to over Rs. 1,000 a month and the cost of running the factory to about Rs. 200 a month. Ultimately it is hoped that the factory will pay its own expenses and it can probably be made to do so now were commercial considerations of paramount importance.

To the capitalist who puts his money into a hand-weaving factory it is essential that a profit should be earned and as that is not done at Salem it may be well to indicate briefly why such a desirable result has not been attained. In the first place the factory is a Government institution, and it is generally recognised that commercial work cannot be carried on under Government with the same degree of economy as is possible when the control is vested in the hands of private individuals who are keenly interested in making it pay. In the factory we have arrived at some conclusions regarding looms which have already been stated, and if money-making was the object in view, we ought to at once discard all other types of loom and confine ourselves to those classes of work which pay best. New experiments are always being tried, looms are always being altered, the weavers have to accustom themselves to the new conditions, frequently a good deal of cloth is spoiled and

generally the efficiency of the institution as a factory is greatly impaired. It is for these reasons mainly then that the factory does not pay and those who examine the accounts must take these facts into consideration. If some of the gentlemen who have interested themselves in hand-weaving and have started hand-weaving factories could be induced to furnish accurate manufacturing accounts, they would be of great value, but it is hardly fair to expect business men to give away the results of their experience and those who would like to find out whether the investment of money in hand-weaving factories is likely to be a success, must examine the published accounts of the Salem Weaving Factory in the light of my remarks.





DEPARTMENT OF STATISTICS, INDIA

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P7a

MONTHLY STATISTICS  
OF  
Cotton Spinning and Weaving  
in Indian Mills

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[Published by Order of the Governor-General in Council]

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CALCUTTA

SUPERINTENDENT GOVERNMENT PRINTING, INDIA

1919

## Publications of the Department of Statistics, India.

These Publications are obtainable from the Superintendent, Government Printing, India, Calcutta. Remittances should be made by postal or money order and should include forwarding charges as indicated in brackets opposite each publication.

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2. Accounts relating to the Sea-borne Trade of British India for the Calendar year. As. 8. (2a.)
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### HALF-YEARLY.

24. Increase or decrease in the Capital of Companies incorporated in India and registered under the Indian Companies Act. Half anna.

### QUARTERLY.

25. Inland Trade (Rail and River-borne) of India. As. 8. (2a.)
26. Rate List (of stores purchased in England for Government Departments in India). As. 8. (1a.)

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28. Review of the Sea-borne Trade and Navigation of British India. As. 4.
29. Accounts relating to the Trade by land of British India with foreign countries. As. 8. (2a.)
30. Statistics of Cotton Spinning and Weaving in Indian Mills. As. 2. (1a.)
31. Trade fluctuations in selected articles. Anna 1 and pies 6.
32. Calcutta Trade fluctuations. As. 2.
33. Customs Revenue Statement. Half anna.
34. Joint Stock Companies Registered in British India and Mysore. Half anna.

### FORTNIGHTLY.

35. Wholesale and Retail Prices of Cereals, Pulses, Oil-seeds, Sugar, Salt, etc., in India. As. 6.
36. Wholesale and Retail Prices of Wheat in India. Anna 1 and pies 6.
37. Cotton Press Returns. Half anna.

### WEEKLY.

38. Weekly Imports and Exports from Chief Ports of Wheat, Jute and Cotton. Half anna.

[Notes.—Those marked with an asterisk (\*) to be obtained from the Officer-in-charge, Bengal Secretariat Book Depot.]

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DEPARTMENT OF STATISTICS, INDIA

## MONTHLY STATISTICS

OF

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SUPERINTENDENT GOVERNMENT PRINTING, INDIA

1919

## INTRODUCTORY NOTE

These figures are compiled in the Department of Statistics, India, from accounts rendered by millowners under the terms of the Cotton Duties Act, II of 1894. The returns are furnished by the Collector of Customs, Calcutta, the Collector of Bombay, the Boards of Revenue, Madras and the United Provinces, the Director of Agriculture, Punjab, the Chief Customs Authority in the Central Provinces and Berar, the Deputy Commissioner of Delhi, the Commissioner of Ajmer-Merwara, the Political Officers in Indian States, and the French Government at Pondicherry.

The result of the spinning and weaving in cotton mills in October, 1918, may be briefly summarised as follows (in thousands of pounds):—

TABLES  
Nos. 1 and  
2

|                                    | OCTOBER<br>1918 | SEPTEMBER<br>1918 | OCTOBER<br>1917 | INCREASE (+) OR<br>DECREASE (-) AS COMPARED<br>WITH |                                             |
|------------------------------------|-----------------|-------------------|-----------------|-----------------------------------------------------|---------------------------------------------|
|                                    |                 |                   |                 | PREVIOUS MONTH                                      | CORRESPONDING<br>MONTH OF<br>PRECEDING YEAR |
|                                    |                 |                   |                 | PER CENT                                            | PER CENT                                    |
| Yarn spun . . . . .                | 48,653          | 54,778            | 53,807          | -11.3                                               | -9.6                                        |
| Woven goods manufactured . . . . . | 19,591          | 27,725            | 33,585          | -28                                                 | -48                                         |

The total quantity of yarn spun during the month under review amounted to about 49 million lbs and that of woven goods about 20 million lbs, as compared with 54 million and 34 million lbs, respectively, in the corresponding month of the preceding year, or a decrease of about 9.6 per cent in the case of yarn, and 48 per cent in the case of woven goods. The figures for October, 1918, however, exclude those for Baroda and Gwalior, from which returns were not received in time; excluding Baroda and Gwalior figures from the totals for the corresponding month of the preceding year, the decrease in the case of yarn would amount to 9 per cent and that in the case of woven goods to 40 per cent.

In the two months, September and October, 1918, i.e., from the beginning of the cotton year 1918-19, the quantity of yarn spun amounted to 103 million lbs and that of woven goods to 48 million lbs, as against 105 and 68 million lbs, respectively, in the corresponding months of the preceding year.

In the seven months, April to October, 1918, the quantities were 373 million lbs of yarn and 210 million lbs of woven goods. These figures are compared in the statement below with those for the corresponding periods of the two preceding years:—

|                                    | SEVEN MONTHS, APRIL TO OCTOBER |          |          | INCREASE (+) OR<br>DECREASE (-) IN<br>1918, AS<br>COMPARED WITH<br>CORRESPONDING<br>MONTHS OF 1917 |
|------------------------------------|--------------------------------|----------|----------|----------------------------------------------------------------------------------------------------|
|                                    | 1918                           | 1917     | 1916     |                                                                                                    |
|                                    | 1000 lbs                       | 1000 lbs | 1000 lbs |                                                                                                    |
| Yarn spun . . . . .                | 373,928                        | 363,359  | 400,691  | -20,380                                                                                            |
| Woven goods manufactured . . . . . | 210,184                        | 235,778  | 229,322  | -25,614                                                                                            |

There was thus a decrease in the production of both yarn and woven goods by Indian mills as compared with the seven months of 1916 and 1917.

The exports of cotton twist and yarn in the seven months, April to October, 1918, were about 27 million lbs, as compared with 82 and 96 million lbs in the corresponding periods of the preceding two years.

The quantity of coarse, medium, and fine yarns produced in Indian mills is compared below with the quantity imported by sea from foreign countries during October and the seven months, April to October, 1917 and 1918. The production of coarse yarn (Nos. 1 to 25) in the month of October was 43 million lbs, and the imports of the same counts were nearly 2 million lbs only; the production of medium counts (Nos. 26 to 40) was 6 million lbs, and of fine counts (above No. 40) 893,000 lbs, as against nearly 2 million lbs, and 830,000 lbs, respectively, of imported yarn of the same counts, as will be seen from the table below (in thousands of lbs). The large increase in the imports of yarn in 1918 is noticeable.

|              | FOR THE MONTH OF OCTOBER |          |            |          | Increase (+) or Decrease (-) in 1918, as compared with 1917 |          |
|--------------|--------------------------|----------|------------|----------|-------------------------------------------------------------|----------|
|              | 1918                     |          | 1917       |          | Production                                                  | Imports  |
|              | Production               | Imports  | Production | Imports  |                                                             |          |
|              | 1000 lbs                 | 1000 lbs | 1000 lbs   | 1000 lbs | 1000 lbs                                                    | 1000 lbs |
| Nov. 1 to 25 | 42,548                   | 1,877    | 47,804     | 88       | -4,761                                                      | +1,841   |
| 26 to 40     | 8,701                    | 1,852    | 6,068      | 728      | -984                                                        | +1,111   |
| Above No. 40 | 298                      | 850      | 428        | 353      | -35                                                         | +569     |

|              | SEVEN MONTHS, APRIL TO OCTOBER |          |            |          | Increase (+) or Decrease (-) in 1918, as compared with 1917 |          |
|--------------|--------------------------------|----------|------------|----------|-------------------------------------------------------------|----------|
|              | 1918                           |          | 1917       |          | Production                                                  | Imports  |
|              | Production                     | Imports  | Production | Imports  |                                                             |          |
|              | 1000 lbs                       | 1000 lbs | 1000 lbs   | 1000 lbs | 1000 lbs                                                    | 1000 lbs |
| Nov. 1 to 25 | 233,899                        | 4,070    | 242,987    | 459      | -19,368                                                     | +3,917   |
| 26 to 40     | 46,259                         | 11,466   | 46,661     | 6,514    | -392                                                        | +4,971   |
| Above No. 40 | 2,835                          | 4,220    | 2,459      | 1,467    | -628                                                        | +2,733   |

The imports of foreign yarn increased, while the production of Indian yarn, as already stated, decreased.

The production of Indian weaving mills consists chiefly of the descriptions of goods stated below with the quantity (in thousands of pounds and their equivalents in yards).

TABLE No. 8.

|                                   | MONTH OF OCTOBER |          |          |          |                                                             |          | Percent |
|-----------------------------------|------------------|----------|----------|----------|-------------------------------------------------------------|----------|---------|
|                                   | 1918             |          | 1917     |          | Increase (+) or Decrease (-) in 1917, as compared with 1916 |          |         |
|                                   | 1000 lbs         | 1000 yds | 1000 lbs | 1000 yds | 1000 lbs                                                    | 1000 yds |         |
| Grey and bleached piecegoods—     | 3,743            | 17,150   | 8,451    | 39,300   | -4,709                                                      | -21,210  | -66     |
| Shirts and longcloth              |                  |          |          |          |                                                             |          |         |
| T-cloths, domestic, and sheetings | 1,334            | 5,706    | 2,466    | 10,888   | -1,134                                                      | -5,182   | -46     |
| Dhusties                          | 3,277            | 16,309   | 5,415    | 26,509   | -3,138                                                      | -9,200   | -39     |
| Chadars                           | 499              | 1,400    | 1,813    | 5,441    | -1,314                                                      | -3,941   | -71     |
| Coloured piecegoods               | 6,246            | 24,717   | 10,827   | 48,081   | -4,584                                                      | -23,364  | -43     |

|                                   | SEVEN MONTHS, APRIL TO OCTOBER |          |          |          |          |          | Percent |
|-----------------------------------|--------------------------------|----------|----------|----------|----------|----------|---------|
|                                   | 1918                           |          | 1917     |          | 1916     |          |         |
|                                   | 1000 lbs                       | 1000 yds | 1000 lbs | 1000 yds | 1000 lbs | 1000 yds |         |
| Grey and bleached piecegoods—     | 48,887                         | 222,615  | 61,149   | 279,611  | -12,763  | -56,996  | -21     |
| Shirts and longcloth              |                                |          |          |          |          |          |         |
| T-cloths, domestic, and sheetings | 15,199                         | 67,991   | 19,590   | 85,799   | -4,391   | -17,799  | -22     |
| Dhusties                          | 47,159                         | 225,188  | 44,763   | 197,294  | +4,397   | +4,794   | +10     |
| Chadars                           | 6,264                          | 17,975   | 11,561   | 35,916   | -5,297   | -17,941  | -45     |
| Coloured piecegoods               | 54,039                         | 233,067  | 67,701   | 296,869  | -13,662  | -68,913  | -20     |

The following statement compares the production of piecegoods woven in Indian mills with the imports of such goods from foreign countries:—

|                              | MONTH OF OCTOBER |          |            |          | SEVEN MONTHS, APRIL TO OCTOBER |          |            |          |
|------------------------------|------------------|----------|------------|----------|--------------------------------|----------|------------|----------|
|                              | 1918             |          | 1917       |          | 1918                           |          | 1917       |          |
|                              | Production       | Imports  | Production | Imports  | Production                     | Imports  | Production | Imports  |
|                              | 1000 yds         | 1000 yds | 1000 yds   | 1000 yds | 1000 yds                       | 1000 yds | 1000 yds   | 1000 yds |
| Grey and bleached piecegoods | 50,314           | 75,779   | 94,384     | 113,898  | 634,413                        | 535,651  | 699,541    | 696,539  |
| Coloured piecegoods          | 24,717           | 19,973   | 46,081     | 86,901   | 233,067                        | 160,577  | 298,989    | 262,561  |

TABLE No. 9.

The value of goods woven in Indian mills, as far as reported, was R2,51,29,000 in October, 1918, and R26,31,99,000 in the seven months, April to October, 1918, as compared with R2,26,97,000 and R15,82,02,000, respectively, in the corresponding periods of 1917. The value of cotton goods imported from foreign countries in October, 1918, was R4,92,15,000, and that in the seven months, April to October, 1918, R3,18,31,000, as compared with R5,14,54,000 and R30,36,38,000, respectively, in the corresponding periods of 1917.

TABLE No. 10.

The excise duty of 3½ per cent *ad valorem* realised on woven goods in October, 1918, amounted to R7,54,000, and in the seven months, April to October, 1918, R69,18,000, as compared with R5,04,000 and R33,34,000, respectively, in the corresponding periods of 1917.

G. FINDLAY SHIRRAS,

Department of Statistics, India,  
December 19, 1918.

Director of Statistics.

**No. 1.— ABSTRACT STATEMENT of the QUANTITY (in pounds)  
of YARN Spun**

[NOTE.— The statistics of yarn represent the quantities of all yarn actually spun in the mills whether they are subsequently woven in the mills or not]

|                                                                                                                        | MONTHS OF OCTOBER |                   |                   | SEVEN MONTHS, APRIL TO OCTOBER |                    |                    |
|------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|-------------------|--------------------------------|--------------------|--------------------|
|                                                                                                                        | 1916              | 1917              | 1918              | 1916                           | 1917               | 1918               |
| <b>British India</b>                                                                                                   |                   |                   |                   |                                |                    |                    |
| Bombay . . . . .                                                                                                       | 87,572,220        | 87,945,771        | 84,175,517        | 284,008,971                    | 280,807,034        | 264,219,832        |
| Madras . . . . .                                                                                                       | 3,734,777         | 3,594,813         | 3,631,673         | 25,820,898                     | 25,541,674         | 25,808,341         |
| Bengal . . . . .                                                                                                       | 2,005,463         | 2,900,916         | 2,347,501         | 15,428,928                     | 18,420,722         | 18,705,741         |
| United Provinces . . . . .                                                                                             | 3,777,086         | 3,472,848         | 2,652,333         | 26,732,849                     | 22,909,091         | 18,915,284         |
| Ajmer-Merwara . . . . .                                                                                                | 188,642           | 98,829            | 176,372           | 1,615,369                      | 1,101,740          | 1,220,626          |
| Punjab . . . . .                                                                                                       | 231,206           | 287,383           | 331,702           | 2,396,597                      | 2,111,456          | 2,442,083          |
| Delhi . . . . .                                                                                                        | 203,265           | 183,417           | 237,495           | 1,576,046                      | 2,036,586          | 1,697,779          |
| Central Provinces and Berar . . . . .                                                                                  | 2,448,837         | 2,609,925         | 2,813,123         | 20,743,598                     | 20,183,316         | 20,131,136         |
| <b>TOTAL</b>                                                                                                           | <b>50,161,446</b> | <b>51,092,901</b> | <b>43,365,716</b> | <b>378,323,256</b>             | <b>373,111,619</b> | <b>353,140,829</b> |
| <b>Foreign Territory</b>                                                                                               |                   |                   |                   |                                |                    |                    |
| Indian States of Indore, Mysore, Baroda, Nandgaon, Bhavnagar, Hyderabad, Wadhwan, Uwalior (Ujjain), and Pondichery (a) | 2,866,956         | 2,714,547         | 2,286,199*        | 22,557,275                     | 20,146,985         | 19,788,069         |
| <b>GRAND TOTAL</b>                                                                                                     | <b>53,027,802</b> | <b>53,807,448</b> | <b>48,651,915</b> | <b>400,880,531</b>             | <b>393,258,604</b> | <b>372,928,898</b> |

(2) Including the production of one mill only

\* Excluding Baroda

**No. 2.—ABSTRACT STATEMENT of the QUANTITY of WOVEN GOODS  
Produced**

[NOTE.—The weight in pounds represents the weight of all woven goods; the measure in yards relates only to grey and coloured piecegoods and is estimated from the poundage on a conventional basis; the figures in dozens relate to grey and coloured goods other than piecegoods, and to hosiery, the weight of these being estimated mainly on a conventional basis and included in the poundage]

|                                                                                                                         | MONTH OF OCTOBER |             |             | SEVEN MONTHS, APRIL TO OCTOBER |             |             |             |
|-------------------------------------------------------------------------------------------------------------------------|------------------|-------------|-------------|--------------------------------|-------------|-------------|-------------|
|                                                                                                                         | 1916             | 1917        | 1918        | 1916                           | 1917        | 1918        |             |
| <b>British India</b>                                                                                                    |                  |             |             |                                |             |             |             |
| Bombay                                                                                                                  | pounds           | 22,627,527  | 27,298,189  | 14,664,139                     | 185,444,480 | 191,779,809 | 166,739,274 |
|                                                                                                                         | yards            | 97,615,692  | 120,884,046 | 58,641,344                     | 798,778,012 | 843,814,358 | 722,135,069 |
|                                                                                                                         | dozens           | 77,976      | 65,916      | 80,858                         | 417,209     | 485,453     | 494,841     |
| Madras                                                                                                                  | pounds           | 1,199,656   | 1,428,061   | 1,564,330                      | 8,122,950   | 9,578,291   | 10,548,700  |
|                                                                                                                         | yards            | 3,168,452   | 3,558,500   | 3,556,582                      | 22,317,613  | 23,850,959  | 26,112,288  |
|                                                                                                                         | dozens           | 6,872       | 8,660       | 8,658                          | 50,557      | 49,560      | 25,841      |
| Bengal                                                                                                                  | pounds           | 318,718     | 378,236     | 380,970                        | 2,166,427   | 2,973,863   | 3,047,071   |
|                                                                                                                         | yards            | 1,562,206   | 1,939,903   | 1,980,360                      | 11,094,272  | 15,719,848  | 15,693,271  |
| United Provinces                                                                                                        | pounds           | 985,674     | 1,169,437   | 886,829                        | 7,100,170   | 7,286,095   | 6,289,100   |
|                                                                                                                         | yards            | 3,201,082   | 3,227,898   | 2,227,952                      | 22,232,987  | 21,569,676  | 16,405,881  |
|                                                                                                                         | dozens           | 2,166       | 1,915       | 2,549                          | 27,604      | 20,311      | 12,531      |
| Ajmer-Merwara                                                                                                           | pounds           | 107,828     | 62,219      | 96,751                         | 998,459     | 785,434     | 893,861     |
|                                                                                                                         | yards            | 377,404     | 222,835     | 340,099                        | 4,266,864   | 2,944,818   | 3,309,541   |
|                                                                                                                         | dozens           | 48          | 10          | ...                            | 154         | 821         | ...         |
| Panjab                                                                                                                  | pounds           | 79,385      | 78,669      | 15,566                         | 790,758     | 639,353     | 418,951     |
|                                                                                                                         | yards            | 294,393     | 261,402     | 50,710                         | 2,738,730   | 2,097,139   | 1,400,531   |
|                                                                                                                         | dozens           | 2           | 6           | ...                            | 614         | 242         | 2           |
| Delhi                                                                                                                   | pounds           | 1,268       | 49,639      | 80,711                         | 24,664      | 417,023     | 515,451     |
|                                                                                                                         | yards            | 2,510       | 80,064      | 110,288                        | 51,769      | 651,952     | 778,901     |
|                                                                                                                         | dozens           | 235         | ...         | ...                            | 725         | 82          | 18          |
| Central Provinces and Berar                                                                                             | pounds           | 1,042,897   | 1,445,989   | 955,266                        | 9,751,624   | 9,034,145   | 8,802,391   |
|                                                                                                                         | yards            | 4,015,801   | 5,539,773   | 3,595,356                      | 37,953,416  | 35,381,484  | 35,381,761  |
|                                                                                                                         | dozens           | 1,066       | 1,104       | 669                            | 8,658       | 9,373       | 5,541       |
| TOTAL                                                                                                                   | pounds           | 26,362,953  | 31,850,839  | 18,644,562                     | 214,399,532 | 222,499,013 | 197,204,811 |
|                                                                                                                         | yards            | 110,237,540 | 135,764,426 | 70,802,671                     | 899,433,663 | 946,034,033 | 820,197,261 |
|                                                                                                                         | dozens           | 88,365      | 77,630      | 87,734                         | 505,521     | 565,312     | 538,971     |
| <b>Foreign Territory</b>                                                                                                |                  |             |             |                                |             |             |             |
| Indian States of Indore, Mysore, Baroda, Nandgaon, Bhavnagar, Hyderabad, Wadhwan, Gwalior (Ujjain), and Pondicherry (a) | pounds           | 1,722,776   | 1,734,689   | 1,246,174*                     | 13,992,539  | 13,278,513  | 12,959,521  |
|                                                                                                                         | yards            | 6,613,311   | 6,700,468   | 4,327,903                      | 53,290,455  | 50,476,485  | 47,272,641  |
|                                                                                                                         | dozens           | 3,678       | 4,206       | 1,365                          | 29,192      | 22,787      | 26,141      |
| GRAND TOTAL                                                                                                             | pounds           | 28,085,729  | 33,585,528  | 19,890,736                     | 228,392,071 | 235,777,526 | 210,164,341 |
|                                                                                                                         | yards            | 116,850,851 | 142,464,894 | 74,930,574                     | 952,724,118 | 996,510,518 | 867,469,911 |
|                                                                                                                         | dozens           | 92,043      | 81,836      | 89,099                         | 634,713     | 588,099     | 565,111     |

(a) Including the production of one mill only  
\* Excluding Baroda and Gwalior (Ujjain)

No. 3.—*DETAILED STATEMENT of the QUANTITY (in pounds) and the COUNTS (or numbers) of YARN Spun*

**BOMBAY PRESIDENCY**

| Count or Number             | MONTH OF OCTOBER  |                   |                   | SEVEN MONTHS, APRIL TO OCTOBER |                    |                    |
|-----------------------------|-------------------|-------------------|-------------------|--------------------------------|--------------------|--------------------|
|                             | 1916              | 1917              | 1918              | 1916                           | 1917               | 1918               |
| 1                           | 4,497             | 59,439            | 175,559           | 48,815                         | 1,056,457          | 1,094,704          |
| 2                           | 218,331           | 231,880           | 306,248           | 1,135,951                      | 1,867,398          | 2,488,920          |
| 3                           | 189,716           | 135,777           | 76,490            | 1,105,396                      | 624,647            | 686,926            |
| 4                           | 123,650           | 158,072           | 273,147           | 1,184,203                      | 1,540,779          | 1,961,994          |
| 5                           | 111,323           | ...               | 5,478             | 150,472                        | 51,228             | 173,759            |
| 6                           | 623,458           | 572,072           | 572,270           | 4,978,739                      | 4,174,541          | 4,192,825          |
| 7                           | 608,879           | 701,763           | 803,864           | 4,393,908                      | 4,708,154          | 5,323,073          |
| 8                           | 230,849           | 238,185           | 357,954           | 2,189,088                      | 2,072,310          | 3,395,132          |
| 9                           | 339,028           | 588,824           | 495,831           | 2,721,363                      | 3,109,207          | 3,708,922          |
| 10                          | 4,169,867         | 2,545,447         | 2,041,415         | 27,930,371                     | 28,986,364         | 14,524,321         |
| <b>TOTAL, Nos. 1 to 10</b>  | <b>6,564,618</b>  | <b>5,231,259</b>  | <b>5,107,658</b>  | <b>45,838,306</b>              | <b>48,191,085</b>  | <b>37,549,576</b>  |
| 11                          | 2,209,397         | 3,564,479         | 1,661,010         | 18,269,882                     | 22,376,959         | 10,163,794         |
| 12                          | 3,456,125         | 3,348,824         | 2,631,796         | 29,540,837                     | 21,732,856         | 14,524,130         |
| 13                          | 874,719           | 596,829           | 841,635           | 6,543,926                      | 3,755,188          | 8,434,290          |
| 14                          | 1,103,115         | 1,203,341         | 814,251           | 7,737,217                      | 8,450,826          | 6,661,304          |
| 15                          | 223,133           | 494,355           | 516,870           | 2,097,073                      | 3,318,089          | 4,668,338          |
| 16                          | 1,868,820         | 1,491,765         | 1,553,638         | 13,374,033                     | 10,622,983         | 13,579,968         |
| 17                          | 505,843           | 341,481           | 428,848           | 3,804,827                      | 2,058,579          | 2,691,832          |
| 18                          | 1,157,896         | 885,441           | 643,228           | 7,741,575                      | 6,343,403          | 5,335,429          |
| 19                          | 151,159           | 85,582            | 119,007           | 958,683                        | 821,201            | 330,132            |
| 20                          | 7,781,091         | 7,357,513         | 6,580,898         | 56,243,623                     | 52,369,914         | 51,173,250         |
| <b>TOTAL, Nos. 11 to 20</b> | <b>19,131,288</b> | <b>19,369,510</b> | <b>15,795,579</b> | <b>145,311,736</b>             | <b>131,849,980</b> | <b>117,962,517</b> |
| 21                          | 2,655,182         | 2,829,189         | 2,739,910         | 19,797,602                     | 19,021,943         | 20,900,361         |
| 22                          | 2,485,432         | 2,578,553         | 2,420,734         | 19,650,028                     | 20,896,910         | 22,893,743         |
| 23                          | 232,222           | 284,026           | 163,420           | 1,486,465                      | 1,714,226          | 1,777,922          |
| 24                          | 2,081,208         | 2,624,949         | 2,929,961         | 17,589,331                     | 19,647,233         | 23,432,348         |
| 25                          | 135,842           | 105,507           | 43,880            | 1,227,359                      | 905,494            | 613,082            |
| 26                          | 494,220           | 611,166           | 550,108           | 3,393,431                      | 3,996,603          | 4,680,301          |
| 27                          | 271,764           | 251,510           | 275,008           | 1,403,236                      | 1,845,422          | 1,998,663          |
| 28                          | 329,590           | 553,249           | 412,581           | 3,004,975                      | 4,004,363          | 3,614,422          |
| 29                          | 23,570            | 48,175            | 34,212            | 196,619                        | 253,899            | 189,543            |
| 30                          | 1,235,734         | 1,713,465         | 2,136,562         | 11,107,938                     | 13,236,569         | 16,443,407         |
| <b>TOTAL, Nos. 21 to 30</b> | <b>9,944,812</b>  | <b>11,509,799</b> | <b>11,711,376</b> | <b>78,858,984</b>              | <b>85,522,665</b>  | <b>96,048,791</b>  |
| 31                          | 362,281           | 108,287           | 136,507           | 1,399,560                      | 1,071,243          | 1,023,668          |
| 32                          | 670,774           | 568,396           | 553,101           | 4,644,891                      | 4,991,864          | 4,840,676          |
| 33                          | 280,187           | 73,177            | ...               | 1,262,299                      | 756,109            | 105,380            |
| 34                          | 370,173           | 238,266           | 218,867           | 2,411,189                      | 2,680,303          | 1,728,167          |
| 35                          | 26                | 14,117            | 16,812            | 63,236                         | 123,003            | 87,256             |
| 36                          | 42,818            | 92,269            | 29,784            | 625,525                        | 507,416            | 383,018            |
| 37                          | 2,301             | ...               | ...               | 54,885                         | ...                | 1,268              |
| 38                          | 1,768             | 25,553            | 23,763            | 132,271                        | 117,572            | 170,029            |
| 39                          | ...               | ...               | ...               | ...                            | 840                | ...                |
| 40                          | 230,258           | 333,755           | 352,439           | 2,032,117                      | 2,559,630          | 2,545,929          |
| <b>TOTAL, Nos. 31 to 40</b> | <b>1,760,565</b>  | <b>1,458,259</b>  | <b>1,331,323</b>  | <b>12,645,973</b>              | <b>12,907,980</b>  | <b>10,985,390</b>  |
| <b>Above 40</b>             | <b>166,340</b>    | <b>276,894</b>    | <b>222,809</b>    | <b>1,250,862</b>               | <b>2,281,740</b>   | <b>1,664,105</b>   |
| <b>Wastes, etc.</b>         | <b>4,597</b>      | <b>9,450</b>      | <b>6,774</b>      | <b>73,110</b>                  | <b>53,584</b>      | <b>109,469</b>     |
| <b>GRAND TOTAL</b>          | <b>37,572,220</b> | <b>37,945,771</b> | <b>34,175,517</b> | <b>284,008,971</b>             | <b>280,807,034</b> | <b>264,219,839</b> |



No. 3.—*DETAILED STATEMENT of the QUANTITY (in pounds) and the COUNTS (or numbers) of YARN Spun—continued*

**BOMBAY ISLAND**

| Count or Number             | MONTH OF OCTOBER  |                   |                   | SEVEN MONTHS, APRIL TO OCTOBER |                    |                    |
|-----------------------------|-------------------|-------------------|-------------------|--------------------------------|--------------------|--------------------|
|                             | 1916.             | 1917              | 1918              | 1916                           | 1917               | 1918               |
| 1                           | 4,297             | 59,439            | 171,710           | 43,568                         | 988,810            | 1,068,526          |
| 2                           | 218,831           | 231,680           | 304,041           | 1,124,180                      | 1,858,261          | 2,467,754          |
| 3                           | 139,716           | 112,251           | 76,480            | 1,073,876                      | 590,505            | 663,521            |
| 4                           | 95,771            | 148,872           | 260,149           | 1,125,848                      | 1,883,504          | 1,834,194          |
| 5                           | 108,514           | ...               | 4,860             | 145,669                        | 51,228             | 171,124            |
| 6                           | 586,167           | 557,608           | 513,102           | 4,635,733                      | 4,036,219          | 3,682,312          |
| 7                           | 561,295           | 682,728           | 761,261           | 3,964,510                      | 4,413,041          | 5,015,219          |
| 8                           | 224,656           | 235,463           | 357,354           | 2,008,217                      | 1,951,834          | 3,304,905          |
| 9                           | 235,856           | 549,563           | 384,005           | 1,937,041                      | 2,752,222          | 3,100,203          |
| 10                          | 3,957,726         | 2,448,591         | 1,972,613         | 26,071,848                     | 23,414,870         | 13,685,141         |
| <b>TOTAL, Nos. 1 to 10</b>  | <b>6,130,329</b>  | <b>5,020,989</b>  | <b>4,405,555</b>  | <b>43,130,429</b>              | <b>46,428,294</b>  | <b>34,982,909</b>  |
| 11                          | 2,187,546         | 3,484,207         | 1,638,892         | 17,897,424                     | 21,718,272         | 9,936,884          |
| 12                          | 3,238,902         | 3,219,148         | 2,536,246         | 27,787,536                     | 30,781,411         | 13,893,304         |
| 13                          | 627,426           | 528,321           | 772,191           | 5,151,394                      | 3,153,043          | 7,866,791          |
| 14                          | 995,944           | 1,152,273         | 710,585           | 6,659,899                      | 7,841,606          | 6,118,366          |
| 15                          | 193,088           | 449,074           | 475,241           | 1,811,142                      | 2,737,597          | 4,297,894          |
| 16                          | 1,514,326         | 1,260,373         | 1,388,703         | 10,920,562                     | 8,476,290          | 11,090,848         |
| 17                          | 429,044           | 283,682           | 254,269           | 3,012,824                      | 1,637,358          | 1,994,330          |
| 18                          | 1,018,385         | 823,679           | 522,505           | 6,746,223                      | 5,559,525          | 4,521,980          |
| 19                          | 51,914            | 43,267            | 10,483            | 408,302                        | 301,007            | 94,886             |
| 20                          | 4,982,975         | 5,252,955         | 3,679,928         | 36,485,786                     | 35,452,706         | 31,199,498         |
| <b>TOTAL, Nos. 11 to 20</b> | <b>15,239,500</b> | <b>16,487,004</b> | <b>12,189,043</b> | <b>116,881,092</b>             | <b>107,665,814</b> | <b>91,014,781</b>  |
| 21                          | 1,754,194         | 2,232,168         | 1,997,871         | 12,198,647                     | 13,926,826         | 15,826,335         |
| 22                          | 1,413,299         | 1,634,280         | 1,481,543         | 11,363,846                     | 12,127,533         | 14,329,439         |
| 23                          | 89,907            | 249,324           | 146,673           | 723,810                        | 1,229,886          | 1,366,897          |
| 24                          | 1,444,004         | 1,992,565         | 2,346,833         | 10,995,662                     | 14,263,378         | 17,496,500         |
| 25                          | 34,670            | 46,248            | 36,007            | 441,057                        | 303,668            | 351,031            |
| 26                          | 243,533           | 408,351           | 311,859           | 2,130,479                      | 2,764,593          | 2,890,461          |
| 27                          | 179,929           | 237,862           | 183,978           | 974,863                        | 1,732,476          | 1,613,273          |
| 28                          | 212,487           | 371,099           | 233,271           | 1,838,037                      | 2,480,410          | 2,076,143          |
| 29                          | 6,274             | 8,088             | 13,903            | 6,274                          | 27,863             | 73,031             |
| 30                          | 413,153           | 650,842           | 595,653           | 3,535,964                      | 4,305,701          | 4,665,724          |
| <b>TOTAL, Nos. 21 to 30</b> | <b>5,791,450</b>  | <b>7,330,737</b>  | <b>7,352,591</b>  | <b>44,208,139</b>              | <b>53,152,384</b>  | <b>60,687,833</b>  |
| 31                          | 5,729             | 6,571             | 3,607             | 9,812                          | 74,597             | 90,277             |
| 32                          | 125,862           | 275,854           | 249,663           | 1,128,472                      | 2,049,723          | 2,295,694          |
| 33                          | ...               | ...               | ...               | ...                            | ...                | ...                |
| 34                          | 74,954            | 70,556            | 101,595           | 466,582                        | 491,561            | 740,713            |
| 35                          | ...               | 1,326             | ...               | 407                            | 1,326              | ...                |
| 36                          | 36,809            | 67,100            | 29,235            | 273,150                        | 384,642            | 336,894            |
| 37                          | ...               | ...               | ...               | ...                            | ...                | ...                |
| 38                          | ...               | 3,416             | 3,572             | 2,732                          | 23,175             | 25,165             |
| 39                          | ...               | ...               | ...               | ...                            | ...                | ...                |
| 40                          | 110,921           | 166,503           | 136,787           | 830,493                        | 1,325,121          | 1,051,413          |
| <b>TOTAL, Nos. 31 to 40</b> | <b>353,775</b>    | <b>591,826</b>    | <b>524,449</b>    | <b>2,711,668</b>               | <b>4,350,145</b>   | <b>4,540,056</b>   |
| <b>Above 40</b>             | <b>90,070</b>     | <b>166,827</b>    | <b>125,967</b>    | <b>585,790</b>                 | <b>1,055,293</b>   | <b>899,012</b>     |
| <b>Wastes, etc.</b>         | <b>2,243</b>      | <b>3,046</b>      | <b>1,024</b>      | <b>45,967</b>                  | <b>18,240</b>      | <b>56,977</b>      |
| <b>GRAND TOTAL</b>          | <b>27,607,367</b> | <b>30,099,979</b> | <b>24,998,659</b> | <b>206,563,085</b>             | <b>212,670,170</b> | <b>192,181,568</b> |

NOTE.—The suburb of Coorla, in the Thana district, is treated for statistical purposes as part of the Island of Bombay

**No. 3.—DETAILED STATEMENT of the QUANTITY (in pounds) and the COUNTS (or numbers) of YARN Spun—continued**

**AHMEDABAD**

| Count or Number             | MONTHS OF OCTOBER |                  |                  | SEVEN MONTHS, APRIL TO OCTOBER |                   |                   |
|-----------------------------|-------------------|------------------|------------------|--------------------------------|-------------------|-------------------|
|                             | 1916              | 1917             | 1918             | 1916                           | 1917              | 1918              |
| 1                           | ...               | ...              | ...              | ...                            | ...               | ...               |
| 2                           | ...               | ...              | ...              | ...                            | ...               | ...               |
| 3                           | ...               | ...              | ...              | ...                            | ...               | ...               |
| 4                           | 12,538            | 2,100            | ...              | 26,578                         | 19,774            | 375               |
| 5                           | 4,809             | ...              | 618              | 4,809                          | ...               | 1,835             |
| 6                           | ...               | ...              | ...              | ...                            | ...               | 1,301             |
| 7                           | 40,473            | 15,875           | 42,603           | 389,007                        | 289,455           | 301,479           |
| 8                           | 3,618             | ...              | ...              | 34,845                         | 7,782             | 1,036             |
| 9                           | 54,078            | 17,198           | 66,362           | 521,408                        | 280,671           | 438,141           |
| 10                          | 12,873            | 18,528           | 380              | 42,949                         | 28,536            | 7,586             |
| <b>TOTAL, Nos. 1 to 10</b>  | <b>128,889</b>    | <b>51,699</b>    | <b>109,983</b>   | <b>1,019,596</b>               | <b>626,218</b>    | <b>752,063</b>    |
| 11                          | 7,304             | 15,677           | 9,430            | 235,972                        | 221,597           | 116,624           |
| 12                          | 1,950             | ...              | 416              | 167,576                        | 40,036            | 66,804            |
| 13                          | 44,240            | 6,930            | 9,287            | 893,674                        | 218,554           | 135,042           |
| 14                          | 39,502            | 5,037            | 3,280            | 516,587                        | 234,176           | 71,106            |
| 15                          | 5,824             | ...              | 1,756            | 67,392                         | 1,184             | 27,189            |
| 16                          | 114,506           | 39,234           | 7,316            | 718,184                        | 530,546           | 193,615           |
| 17                          | 56,849            | 16,990           | 26,697           | 461,248                        | 264,515           | 182,778           |
| 18                          | 2,717             | 4,951            | 56,343           | 115,557                        | 201,999           | 207,134           |
| 19                          | 88,051            | 41,927           | 107,765          | 490,106                        | 437,551           | 119,855           |
| 20                          | 921,550           | 598,399          | 1,269,144        | 7,380,369                      | 7,312,508         | 9,887,310         |
| <b>TOTAL, Nos. 11 to 20</b> | <b>1,382,193</b>  | <b>729,145</b>   | <b>1,491,434</b> | <b>10,215,545</b>              | <b>9,462,666</b>  | <b>11,007,557</b> |
| 21                          | 763,821           | 469,868          | 681,258          | 6,804,551                      | 4,327,132         | 4,273,119         |
| 22                          | 974,391           | 607,607          | 868,337          | 6,376,840                      | 6,551,231         | 6,843,558         |
| 23                          | 142,315           | 12,392           | 5,614            | 755,031                        | 389,708           | 335,340           |
| 24                          | 458,260           | 294,983          | 332,834          | 5,081,029                      | 2,990,109         | 2,990,753         |
| 25                          | 83,665            | 36,327           | 10,418           | 470,565                        | 531,459           | 93,268            |
| 26                          | 188,175           | 58,867           | 159,774          | 891,906                        | 343,963           | 1,065,955         |
| 27                          | 91,835            | 6,881            | 69,125           | 409,102                        | 83,311            | 303,170           |
| 28                          | 106,468           | 129,120          | 151,948          | 1,087,537                      | 1,270,344         | 1,346,077         |
| 29                          | 15,033            | ...              | ...              | 123,039                        | 12,534            | 445               |
| 30                          | 624,503           | 683,950          | 1,390,458        | 5,368,869                      | 6,074,267         | 8,923,107         |
| <b>TOTAL, Nos. 21 to 30</b> | <b>3,448,556</b>  | <b>2,308,995</b> | <b>3,549,766</b> | <b>27,368,469</b>              | <b>22,574,048</b> | <b>25,974,732</b> |
| 31                          | 178,349           | 101,716          | 118,806          | 1,216,652                      | 903,159           | 900,329           |
| 32                          | 540,504           | 271,357          | 295,339          | 3,473,759                      | 2,363,438         | 2,415,684         |
| 33                          | 280,187           | 77,879           | ...              | 1,268,508                      | 755,811           | 104,762           |
| 34                          | 144,198           | 138,387          | 89,220           | 1,667,658                      | 1,939,711         | 828,958           |
| 35                          | 26                | 9,423            | 16,812           | 76,650                         | 111,416           | 72,833            |
| 36                          | 6,009             | 22,698           | 549              | 318,796                        | 107,492           | 38,920            |
| 37                          | 2,301             | ...              | ...              | 49,149                         | ...               | ...               |
| 38                          | 1,768             | 2,633            | 7,146            | 78,471                         | 22,276            | 43,242            |
| 39                          | ...               | ...              | ...              | ...                            | 840               | ...               |
| 40                          | 76,865            | 77,820           | 162,181          | 803,164                        | 861,501           | 957,435           |
| <b>TOTAL, Nos. 31 to 40</b> | <b>1,230,207</b>  | <b>701,913</b>   | <b>690,033</b>   | <b>8,942,802</b>               | <b>7,565,844</b>  | <b>5,360,173</b>  |
| Above 40                    | 49,175            | 56,034           | 68,849           | 475,258                        | 671,877           | 525,576           |
| Wastes, etc.                | ...               | ...              | ...              | 4,399                          | ...               | ...               |
| <b>GRAND TOTAL</b>          | <b>6,138,520</b>  | <b>3,848,786</b> | <b>5,910,045</b> | <b>48,026,069</b>              | <b>40,900,253</b> | <b>43,620,041</b> |

No. 3.—DETAILED STATEMENT of the QUANTITY (in pounds) and the COUNTS (or numbers) of YARN Spun—continued

MADRAS

| Count or Number             | MONTH OF OCTOBER |                  |                  | SEVEN MONTHS, APRIL TO OCTOBER |                   |                   |
|-----------------------------|------------------|------------------|------------------|--------------------------------|-------------------|-------------------|
|                             | 1916             | 1917             | 1918             | 1916                           | 1917              | 1918              |
| 1                           | ...              | 2,300            | ...              | ...                            | 9,277             | ...               |
| 2                           | 11,214           | 13,293           | 16,046           | 86,185                         | 108,295           | 124,847           |
| 3                           | ...              | ...              | ...              | ...                            | 209               | ...               |
| 4                           | 12,748           | ...              | 25,544           | 196,459                        | 123,538           | 140,458           |
| 5                           | ...              | ...              | ...              | ...                            | ...               | 1,142             |
| 6                           | 25,639           | 56,920           | 60,608           | 273,519                        | 310,563           | 387,322           |
| 7                           | ...              | ...              | 5,716            | 3,974                          | ...               | 13,807            |
| 8                           | 253,471          | 366,200          | 397,576          | 2,177,788                      | 2,883,728         | 2,679,547         |
| 9                           | 22,069           | 18,639           | 13,144           | 65,249                         | 70,734            | 58,939            |
| 10                          | 41,847           | 83,206           | 82,577           | 358,444                        | 322,956           | 173,690           |
| <b>TOTAL, Nos. 1 to 10</b>  | <b>867,088</b>   | <b>490,558</b>   | <b>551,211</b>   | <b>3,161,618</b>               | <b>3,829,302</b>  | <b>3,779,752</b>  |
| 11                          | 968              | 440              | 8,450            | 194,591                        | 19,834            | 53,933            |
| 12                          | 315,689          | 383,434          | 450,065          | 2,608,855                      | 3,135,094         | 3,486,067         |
| 13                          | 20,313           | 7,033            | 16,269           | 182,467                        | 80,912            | 109,186           |
| 14                          | 140,461          | 126,544          | 101,188          | 1,047,480                      | 1,263,879         | 1,046,891         |
| 15                          | 106,856          | 48,468           | 130,559          | 501,876                        | 242,605           | 700,848           |
| 16                          | 50,992           | 24,220           | 15,683           | 445,636                        | 298,202           | 291,868           |
| 17                          | 39,408           | 72,158           | 32,493           | 375,356                        | 344,204           | 333,919           |
| 18                          | 230,189          | 114,875          | 80,941           | 1,229,904                      | 1,181,956         | 783,195           |
| 19                          | 311,436          | 227,720          | 125,723          | 2,238,955                      | 1,596,810         | 962,274           |
| 20                          | 1,000,852        | 398,031          | 621,753          | 5,053,290                      | 3,091,473         | 3,664,027         |
| <b>TOTAL, Nos. 11 to 20</b> | <b>2,217,154</b> | <b>1,402,931</b> | <b>1,583,074</b> | <b>13,927,910</b>              | <b>11,254,669</b> | <b>11,432,208</b> |
| 21                          | 178,301          | 238,937          | 198,530          | 1,067,676                      | 1,343,525         | 1,170,183         |
| 22                          | 92,666           | 146,498          | 223,569          | 679,565                        | 761,736           | 1,044,115         |
| 23                          | 53,714           | 54,619           | 126,461          | 287,775                        | 383,871           | 790,828           |
| 24                          | 163,384          | 356,962          | 391,230          | 975,200                        | 1,564,998         | 3,070,903         |
| 25                          | ...              | ...              | ...              | ...                            | 3,527             | ...               |
| 26                          | 252,675          | 249,197          | 58,798           | 1,231,745                      | 1,690,304         | 719,775           |
| 27                          | 9,107            | 58,232           | 43,444           | 18,148                         | 218,575           | 246,774           |
| 28                          | 59,186           | 162,490          | 82,544           | 404,154                        | 1,154,848         | 927,193           |
| 29                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 30                          | 223,490          | 197,211          | 187,935          | 1,332,067                      | 1,432,142         | 1,923,341         |
| <b>TOTAL, Nos. 21 to 30</b> | <b>1,032,523</b> | <b>1,464,146</b> | <b>1,312,511</b> | <b>6,886,327</b>               | <b>8,803,536</b>  | <b>9,293,111</b>  |
| 31                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 32                          | 1,533            | 62,620           | 23,360           | 64,334                         | 239,672           | 199,504           |
| 33                          | ...              | ...              | ...              | ...                            | 2,507             | ...               |
| 34                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 35                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 36                          | ...              | ...              | ...              | ...                            | 15,710            | ...               |
| 37                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 38                          | ...              | ...              | ...              | ...                            | 1,688             | ...               |
| 39                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 40                          | 50,426           | 35,657           | 13,044           | 573,841                        | 518,063           | 127,270           |
| <b>TOTAL, Nos. 31 to 40</b> | <b>61,959</b>    | <b>98,277</b>    | <b>36,404</b>    | <b>638,175</b>                 | <b>777,640</b>    | <b>326,774</b>    |
| <b>Above 40</b>             | <b>66,053</b>    | <b>138,901</b>   | <b>148,473</b>   | <b>1,206,868</b>               | <b>1,076,537</b>  | <b>976,496</b>    |
| <b>GRAND TOTAL</b>          | <b>3,734,777</b> | <b>3,594,813</b> | <b>3,631,673</b> | <b>25,820,898</b>              | <b>25,541,674</b> | <b>25,808,341</b> |

No. 3.—*DETAILED STATEMENT of the QUANTITY (in pounds) and the COUNTS (or numbers) of YARN Spun—continued*

## BENGAL

| Count or Number             | MONTH OF OCTOBER |                  |                  | SEVEN MONTHS, APRIL TO OCTOBER |                   |                   |
|-----------------------------|------------------|------------------|------------------|--------------------------------|-------------------|-------------------|
|                             | 1916             | 1917             | 1918             | 1916                           | 1917              | 1918              |
| 1                           | ...              | ...              | ...              | ...                            | ...               | 48,170            |
| 2                           | 28,166           | 27,653           | 37,854           | 162,863                        | 232,535           | 291,118           |
| 3                           | ...              | 4,508            | ...              | 17,664                         | 16,879            | 72,202            |
| 4                           | ...              | ...              | ...              | 26,605                         | 12,156            | 7,261             |
| 5                           | ...              | ...              | ...              | ...                            | ...               | ...               |
| 6                           | 16,729           | 31,657           | 5,334            | 299,325                        | 117,232           | 113,225           |
| 7                           | 62,137           | 81,536           | 2,640            | 237,519                        | 170,832           | 66,705            |
| 8                           | 15,380           | 21,899           | 16,317           | 133,994                        | 124,253           | 160,028           |
| 9                           | 89,117           | 68,479           | 25,780           | 156,115                        | 264,004           | 282,930           |
| 10                          | 21,859           | 145,892          | 41,140           | 544,556                        | 980,366           | 626,880           |
| <b>TOTAL, Nos. 1 to 10</b>  | <b>173,388</b>   | <b>321,622</b>   | <b>128,965</b>   | <b>1,578,641</b>               | <b>1,918,257</b>  | <b>1,538,519</b>  |
| 11                          | 78,181           | 159,519          | 259,213          | 850,915                        | 1,184,166         | 1,478,211         |
| 12                          | 112,855          | 168,079          | 193,446          | 965,902                        | 1,018,779         | 1,474,367         |
| 13                          | 61,996           | 185,283          | 144,131          | 455,529                        | 654,401           | 1,060,956         |
| 14                          | 286,372          | 326,147          | 150,714          | 1,103,821                      | 966,771           | 2,056,983         |
| 15                          | 164,084          | 158,810          | 156,729          | 711,002                        | 921,180           | 1,013,306         |
| 16                          | 258,361          | 427,079          | 204,407          | 2,113,677                      | 3,324,204         | 1,243,453         |
| 17                          | 92,752           | 213,161          | 268,893          | 1,003,122                      | 1,312,871         | 1,998,184         |
| 18                          | 32,560           | 14,801           | 18,321           | 473,741                        | 804,405           | 667,754           |
| 19                          | 73,457           | 130,400          | 85,151           | 514,930                        | 957,191           | 934,473           |
| 20                          | 67,227           | 70,327           | 24,664           | 483,914                        | 333,044           | 267,878           |
| <b>TOTAL, Nos. 11 to 20</b> | <b>1,222,844</b> | <b>1,833,506</b> | <b>1,507,609</b> | <b>8,681,553</b>               | <b>11,037,011</b> | <b>12,194,563</b> |
| 21                          | 103,291          | 232,377          | 147,147          | 1,114,219                      | 1,189,682         | 1,011,187         |
| 22                          | 164,267          | 101,360          | 160,877          | 1,326,115                      | 1,311,621         | 823,047           |
| 23                          | 80,360           | 81,106           | 93,074           | 482,500                        | 655,455           | 691,024           |
| 24                          | 79,030           | 147,315          | 140,271          | 832,929                        | 948,018           | 1,163,153         |
| 25                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 26                          | 20,820           | 27,229           | 8,742            | 270,399                        | 127,547           | 94,842            |
| 27                          | 99,222           | 71,627           | 86,024           | 504,058                        | 604,971           | 673,049           |
| 28                          | 9,759            | ...              | ...              | 78,585                         | ...               | 2,272             |
| 29                          | ...              | ...              | ...              | ...                            | 85,788            | ...               |
| 30                          | 18,891           | 21,902           | 21,708           | 149,403                        | 129,303           | 98,003            |
| <b>TOTAL, Nos. 21 to 30</b> | <b>565,640</b>   | <b>682,916</b>   | <b>657,844</b>   | <b>4,758,368</b>               | <b>5,052,385</b>  | <b>4,556,577</b>  |
| 31                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 32                          | 13,513           | 11,281           | 4,621            | 63,703                         | 69,101            | 32,779            |
| 33                          | ...              | ...              | ...              | 5,030                          | ...               | ...               |
| 34                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 35                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 36                          | ...              | ...              | ...              | 13                             | ...               | ...               |
| 37                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 38                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 39                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 40                          | 30,078           | 51,591           | 40,591           | 336,620                        | 343,969           | 306,702           |
| <b>TOTAL, Nos. 31 to 40</b> | <b>43,591</b>    | <b>62,872</b>    | <b>45,412</b>    | <b>410,366</b>                 | <b>413,069</b>    | <b>339,481</b>    |
| Above 40                    | ...              | ...              | 7,671            | ...                            | ...               | 76,601            |
| Wastes, etc.                | ...              | ...              | ...              | ...                            | ...               | ...               |
| <b>GRAND TOTAL</b>          | <b>2,005,463</b> | <b>2,900,916</b> | <b>2,347,501</b> | <b>15,428,928</b>              | <b>18,420,722</b> | <b>18,705,741</b> |

No. 3.—DETAILED STATEMENT of the QUANTITY (in pounds) and the COUNTS  
(or numbers) of YARN Spun—continued

## UNITED PROVINCES

| Count or Number      | MONTHS OF OCTOBER |           |           | SEVEN MONTHS, APRIL TO OCTOBER. |            |            |
|----------------------|-------------------|-----------|-----------|---------------------------------|------------|------------|
|                      | 1916              | 1917      | 1918      | 1916                            | 1917       | 1918       |
| 1                    | ...               | ...       | ...       | ...                             | ...        | ...        |
| 2                    | ...               | ...       | ...       | ...                             | ...        | ...        |
| 3                    | ...               | ...       | ...       | ...                             | 113,212    | ...        |
| 4                    | 82,028            | 67,144    | 68,914    | 541,992                         | 483,215    | 478,714    |
| 5                    | ...               | 47,710    | 88,681    | ...                             | 47,710     | 291,265    |
| 6                    | 117,732           | 81,435    | 79,884    | 669,189                         | 439,513    | 639,484    |
| 7                    | 79,966            | 37,708    | 34,470    | 420,658                         | 354,153    | 340,587    |
| 8                    | ...               | ...       | 10,640    | 25,152                          | 16,051     | 87,775     |
| 9                    | ...               | ...       | 64,289    | 25,239                          | 25,490     | 691,497    |
| 10                   | 752,538           | 582,844   | 499,389   | 5,497,786                       | 3,482,153  | 3,434,531  |
| TOTAL, Nos. 1 to 10  | 1,082,264         | 816,841   | 786,317   | 7,180,016                       | 4,960,497  | 5,210,833  |
| 11                   | 115,793           | 210,607   | 63,698    | 1,408,997                       | 1,042,515  | 453,912    |
| 12                   | 438,534           | 193,342   | 67,088    | 2,244,344                       | 1,875,274  | 667,378    |
| 13                   | 189,121           | 125,016   | ...       | 1,076,223                       | 1,234,349  | 540,969    |
| 14                   | 320,623           | 438,132   | 439,010   | 2,744,949                       | 2,236,331  | 2,583,200  |
| 15                   | 232,518           | 251,828   | 1,801     | 1,689,129                       | 2,192,719  | 293,511    |
| 16                   | 792,197           | 1,015,320 | 929,057   | 2,760,287                       | 4,322,105  | 5,474,168  |
| 17                   | 250,061           | 73,179    | 43,924    | 2,170,666                       | 1,550,456  | 1,581,916  |
| 18                   | 251,101           | 210,865   | 89,808    | 2,036,323                       | 1,406,610  | 681,176    |
| 19                   | ...               | ...       | ...       | 97,256                          | 332,044    | 381,542    |
| 20                   | 141,435           | 108,272   | 82,370    | 859,181                         | 1,003,142  | 489,911    |
| TOTAL, Nos. 11 to 20 | 2,681,373         | 2,625,559 | 1,666,756 | 19,087,895                      | 17,590,545 | 13,047,700 |
| 21                   | ...               | ...       | 140,325   | ...                             | ...        | 180,262    |
| 22                   | 34,630            | 15,981    | 27,969    | 197,335                         | 149,772    | 247,093    |
| 23                   | ...               | ...       | ...       | ...                             | ...        | 16,861     |
| 24                   | 9,258             | 14,447    | 17,943    | 45,780                          | 65,964     | 86,209     |
| 25                   | ...               | ...       | ...       | ...                             | ...        | ...        |
| 26                   | ...               | ...       | 2,161     | ...                             | ...        | 2,261      |
| 27                   | ...               | ...       | ...       | ...                             | ...        | 3,369      |
| 28                   | ...               | ...       | 525       | 28                              | 2,207      | 4,694      |
| 29                   | ...               | ...       | ...       | ...                             | ...        | ...        |
| 30                   | ...               | ...       | 1,085     | ...                             | ...        | 13,543     |
| TOTAL, Nos. 21 to 30 | 43,888            | 30,443    | 190,108   | 243,143                         | 218,943    | 629,292    |
| 31                   | ...               | ...       | ...       | ...                             | ...        | ...        |
| 32                   | ...               | ...       | ...       | ...                             | ...        | ...        |
| 33                   | ...               | ...       | ...       | ...                             | ...        | ...        |
| 34                   | ...               | ...       | ...       | ...                             | ...        | ...        |
| 35                   | ...               | ...       | ...       | ...                             | ...        | ...        |
| 36                   | 618               | ...       | ...       | 20,042                          | 12,637     | ...        |
| 37                   | ...               | ...       | ...       | ...                             | ...        | ...        |
| 38                   | ...               | ...       | ...       | ...                             | ...        | ...        |
| 39                   | ...               | ...       | ...       | ...                             | ...        | ...        |
| 40                   | ...               | ...       | ...       | ...                             | ...        | ...        |
| TOTAL, Nos. 31 to 40 | 618               | ...       | ...       | 20,042                          | 12,637     | ...        |
| Above 40             | ...               | ...       | ...       | ...                             | ...        | ...        |
| Waste, etc.          | 18,893            | ...       | 9,252     | 202,253                         | 126,469    | 27,459     |
| GRAND TOTAL          | 3,777,036         | 3,472,848 | 2,852,333 | 26,732,849                      | 22,009,091 | 18,915,284 |

No. 3.—DETAILED STATEMENT of the QUANTITY (in pounds) and the COUNTS (or numbers) of YARN Spun—continued

## AJMER-MERWARA

| Count or Number             | MONTH OF OCTOBER |               |                | SEVEN MONTHS, APRIL TO OCTOBER |                  |                  |
|-----------------------------|------------------|---------------|----------------|--------------------------------|------------------|------------------|
|                             | 1916             | 1917          | 1919           | 1916                           | 1917             | 1918             |
| 1                           | ...              | ...           | ...            | ...                            | ...              | ...              |
| 2                           | ...              | ...           | ...            | ...                            | ...              | ...              |
| 3                           | ...              | ...           | ...            | ...                            | ...              | ...              |
| 4                           | ...              | ...           | ...            | ...                            | ...              | ...              |
| 5                           | ...              | ...           | ...            | ...                            | ...              | ...              |
| 6                           | ...              | ...           | ...            | 35,836                         | 17,762           | ...              |
| 7                           | ...              | ...           | ...            | ...                            | ...              | ...              |
| 8                           | 9,306            | ...           | 3,689          | 221,153                        | 63,567           | 32,094           |
| 9                           | ...              | ...           | ...            | 53,812                         | ...              | ...              |
| 10                          | 30,247           | 2,039         | 37,600         | 289,554                        | 81,027           | 146,833          |
| <b>TOTAL, Nos. 1 to 10</b>  | <b>39,553</b>    | <b>2,039</b>  | <b>41,289</b>  | <b>680,355</b>                 | <b>162,356</b>   | <b>178,927</b>   |
| 11                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 12                          | 20,716           | 1,251         | 5,544          | 222,876                        | 30,308           | 61,835           |
| 13                          | 29,886           | 3,574         | 26,244         | 174,903                        | 141,876          | 160,048          |
| 14                          | 14,979           | 16,176        | ...            | 71,761                         | 101,651          | 74,824           |
| 15                          | 2,057            | 9,999         | ...            | 50,193                         | 89,856           | 34,333           |
| 16                          | 36,318           | 24,335        | 15,738         | 133,249                        | 165,801          | 56,086           |
| 17                          | ...              | ...           | 18,014         | ...                            | ...              | 19,014           |
| 18                          | ...              | ...           | ...            | 9,817                          | ...              | 169,226          |
| 19                          | ...              | ...           | ...            | ...                            | ...              | 282              |
| 20                          | 41,379           | 23,801        | 31,687         | 245,087                        | 288,168          | 212,029          |
| <b>TOTAL, Nos. 11 to 20</b> | <b>135,834</b>   | <b>78,156</b> | <b>98,228</b>  | <b>907,886</b>                 | <b>767,660</b>   | <b>789,727</b>   |
| 21                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 22                          | ...              | ...           | 6,655          | 1,249                          | ...              | 6,655            |
| 23                          | ...              | ...           | ...            | 3,936                          | ...              | ...              |
| 24                          | ...              | 5,765         | 8,976          | 9,954                          | 49,678           | 82,579           |
| 25                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 26                          | 1,713            | ...           | ...            | 21,390                         | ...              | ...              |
| 27                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 28                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 29                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 30                          | 12,042           | 12,888        | 21,224         | 90,599                         | 122,046          | 161,263          |
| <b>TOTAL, Nos. 21 to 30</b> | <b>13,755</b>    | <b>18,653</b> | <b>36,855</b>  | <b>127,128</b>                 | <b>171,724</b>   | <b>250,497</b>   |
| 31                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 32                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 33                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 34                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 35                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 36                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 37                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 38                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 39                          | ...              | ...           | ...            | ...                            | ...              | ...              |
| 40                          | ...              | ...           | ...            | ...                            | ...              | 1,475            |
| <b>TOTAL, Nos. 31 to 40</b> | ...              | ...           | ...            | ...                            | ...              | <b>1,475</b>     |
| <b>Above 40</b>             | ...              | ...           | ...            | ...                            | ...              | ...              |
| <b>Wastes, etc.</b>         | ...              | ...           | ...            | ...                            | ...              | ...              |
| <b>GRAND TOTAL</b>          | <b>188,642</b>   | <b>98,828</b> | <b>176,872</b> | <b>1,615,369</b>               | <b>1,101,740</b> | <b>1,220,626</b> |

No. 3.—DETAILED STATEMENT of the QUANTITY (in pounds) and the COUNTS  
(or numbers) of YARN Spun—continued

## PUNJAB.

| Count or Number      | MONTH OF OCTOBER. |         |         | SEVEN MONTHS, APRIL TO<br>OCTOBER |           |           |
|----------------------|-------------------|---------|---------|-----------------------------------|-----------|-----------|
|                      | 1916              | 1917    | 1918    | 1916                              | 1917      | 1918      |
| 1                    | ...               | ...     | ...     | ...                               | 17,022    | ...       |
| 2                    | ...               | ...     | ...     | ...                               | ...       | ...       |
| 3                    | ...               | ...     | ...     | ...                               | ...       | ...       |
| 4                    | ...               | ...     | ...     | ...                               | ...       | ...       |
| 5                    | ...               | ...     | ...     | ...                               | ...       | ...       |
| 6                    | ...               | ...     | ...     | 2,687                             | ...       | ...       |
| 7                    | ...               | ...     | ...     | ...                               | ...       | 448       |
| 8                    | ...               | ...     | 43,461  | 80,104                            | 80,718    | 118,348   |
| 9                    | ...               | ...     | ...     | 28,675                            | 61,187    | 16,774    |
| 10                   | 4,710             | 39,866  | 9,810   | 414,032                           | 89,566    | 67,176    |
| TOTAL, Nos. 1 to 10  | 4,710             | 39,866  | 52,781  | 525,498                           | 198,473   | 189,746   |
| 11                   | 70,466            | 53,051  | 73,483  | 377,831                           | 387,018   | 752,441   |
| 12                   | ...               | 16,857  | 25,915  | 89,177                            | 58,373    | 82,175    |
| 13                   | 3,762             | 12,247  | 958     | 347,543                           | 178,846   | 320,555   |
| 14                   | 56,301            | 68,521  | 73,525  | 365,340                           | 457,174   | 402,927   |
| 15                   | ...               | 1,331   | 39,853  | 6,640                             | 141,923   | 166,326   |
| 16                   | 43,372            | 61,117  | 37,992  | 337,554                           | 380,658   | 268,313   |
| 17                   | 5,253             | ...     | 10,272  | 41,432                            | 6,396     | 48,745    |
| 18                   | 931               | ...     | ...     | 16,028                            | 12,129    | 1,099     |
| 19                   | ...               | ...     | ...     | ...                               | ...       | ...       |
| 20                   | 1,332             | 11,472  | 11,002  | 84,303                            | 36,406    | 84,357    |
| TOTAL, Nos. 11 to 20 | 181,417           | 224,596 | 273,000 | 1,615,848                         | 1,658,723 | 2,076,988 |
| 21                   | ...               | ...     | ...     | ...                               | ...       | 27,407    |
| 22                   | 24,781            | 13,503  | ...     | 135,178                           | 146,687   | 58,926    |
| 23                   | ...               | ...     | ...     | ...                               | ...       | ...       |
| 24                   | ...               | ...     | ...     | 4,553                             | 36        | ...       |
| 25                   | ...               | ...     | ...     | ...                               | ...       | ...       |
| 26                   | ...               | ...     | 5,921   | ...                               | ...       | 41,694    |
| 27                   | ...               | ...     | ...     | ...                               | 860       | ...       |
| 28                   | ...               | ...     | ...     | ...                               | 360       | ...       |
| 29                   | ...               | ...     | ...     | ...                               | ...       | ...       |
| 30                   | 7,155             | 9,418   | ...     | 90,131                            | 103,745   | 47,322    |
| TOTAL, Nos. 21 to 30 | 31,916            | 22,921  | 5,921   | 229,832                           | 251,188   | 175,349   |
| 31                   | ...               | ...     | ...     | ...                               | ...       | ...       |
| 32                   | 12,945            | ...     | ...     | 21,183                            | 162       | ...       |
| 33                   | ...               | ...     | ...     | ...                               | ...       | ...       |
| 34                   | ...               | ...     | ...     | ...                               | ...       | ...       |
| 35                   | ...               | ...     | ...     | ...                               | ...       | ...       |
| 36                   | 218               | ...     | ...     | 3,920                             | ...       | ...       |
| 37                   | ...               | ...     | ...     | ...                               | ...       | ...       |
| 38                   | ...               | ...     | ...     | ...                               | ...       | ...       |
| 39                   | ...               | ...     | ...     | ...                               | ...       | ...       |
| 40                   | ...               | ...     | ...     | 286                               | 2,910     | ...       |
| TOTAL, Nos. 31 to 40 | 13,163            | ...     | ...     | 25,389                            | 3,072     | ...       |
| Above 40             | ...               | ...     | ...     | ...                               | ...       | ...       |
| Wastes, etc.         | ...               | ...     | ...     | ...                               | ...       | ...       |
| GRAND TOTAL          | 231,206           | 287,383 | 351,702 | 2,396,597                         | 2,111,456 | 2,442,083 |

No. 3.—DETAILED STATEMENT of the QUANTITY (in pounds) and the COUNTS  
(or numbers) of YARN Spun—continued

## DELHI

| Count or Number      | MONTH OF OCTOBER |         |         | SEVEN MONTHS, APRIL TO<br>OCTOBER |           |           |
|----------------------|------------------|---------|---------|-----------------------------------|-----------|-----------|
|                      | 1916             | 1917    | 1918    | 1916                              | 1917      | 1918      |
| 1                    | ...              | ...     | ...     | ...                               | ...       | ...       |
| 2                    | ...              | ...     | ...     | ...                               | ...       | 670       |
| 3                    | ...              | ...     | ...     | ...                               | ...       | ...       |
| 4                    | ...              | 1,662   | ...     | ...                               | 12,759    | 29,482    |
| 5                    | ...              | ...     | ...     | ...                               | ...       | ...       |
| 6                    | ...              | ...     | ...     | ...                               | ...       | ...       |
| 7                    | ...              | ...     | ...     | ...                               | ...       | ...       |
| 8                    | ...              | 1       | ...     | ...                               | ...       | ...       |
| 9                    | ...              | 2,308   | ...     | 12,957                            | 219,897   | 29,480    |
| 10                   | ...              | 1,957   | 88,404  | ...                               | 87,037    | 406,184   |
| TOTAL, Nos. 1 to 10  | ...              | 5,927   | 88,404  | 12,957                            | 319,693   | 465,716   |
| 11                   | 153,830          | 58,949  | 71,965  | 1,101,971                         | 573,439   | 651,873   |
| 12                   | ...              | ...     | ...     | 14,641                            | ...       | ...       |
| 13                   | ...              | ...     | ...     | 57,838                            | 42,763    | ...       |
| 14                   | 1,201            | 90,810  | ...     | 145,921                           | 653,700   | 38,412    |
| 15                   | ...              | 11,718  | 21,956  | 55,387                            | 19,988    | 120,837   |
| 16                   | 48,234           | ...     | ...     | 151,476                           | 533,711   | ...       |
| 17                   | ...              | 4,113   | ...     | 35,855                            | 62,691    | 29,563    |
| 18                   | ...              | ...     | 55,170  | ...                               | ...       | 391,378   |
| 19                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 20                   | ...              | 8,080   | ...     | ...                               | 8,080     | ...       |
| TOTAL, Nos. 11 to 20 | 203,265          | 171,470 | 149,091 | 1,563,069                         | 1,694,372 | 1,232,063 |
| 21                   | ...              | ...     | ...     | ...                               | 17,501    | ...       |
| 22                   | ...              | 5,020   | ...     | ...                               | 5,020     | ...       |
| 23                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 24                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 25                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 26                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 27                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 28                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 29                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 30                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| TOTAL, Nos. 21 to 30 | ...              | 5,020   | ...     | ...                               | 22,521    | ...       |
| 31                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 32                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 33                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 34                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 35                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 36                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 37                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 38                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 39                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| 40                   | ...              | ...     | ...     | ...                               | ...       | ...       |
| TOTAL, Nos. 31 to 40 | ...              | ...     | ...     | ...                               | ...       | ...       |
| Above 40             | ...              | ...     | ...     | ...                               | ...       | ...       |
| Wastes, etc.         | ...              | ...     | ...     | ...                               | ...       | ...       |
| GRAND TOTAL          | 203,265          | 182,417 | 237,495 | 1,576,046                         | 2,036,586 | 1,697,779 |



No. 3.—*DETAILED STATEMENT of the QUANTITY (in pounds) and the COUNTS (of numbers) of YARN Spun—continued*  
**CENTRAL PROVINCES and BERAR**

| Count or Number             | MONTH OF OCTOBER |                  |                  | SEVEN MONTHS, APRIL TO OCTOBER |                   |                   |
|-----------------------------|------------------|------------------|------------------|--------------------------------|-------------------|-------------------|
|                             | 1916             | 1917             | 1918             | 1916                           | 1917              | 1918              |
| 1                           | ...              | 6,877            | 11,162           | 83,664                         | 19,329            | 81,544            |
| 2                           | ...              | ...              | 33,292           | 12,708                         | ...               | 154,516           |
| 3                           | ...              | ...              | ...              | 2,344                          | ...               | 73                |
| 4                           | 21,072           | 280              | 5,491            | 174,300                        | 77,253            | 81,146            |
| 5                           | ...              | ...              | ...              | ...                            | ...               | ...               |
| 6                           | 16,772           | 8,170            | 28,433           | 323,890                        | 227,001           | 381,023           |
| 7                           | 50,677           | 75,500           | 111,873          | 785,510                        | 663,236           | 833,887           |
| 8                           | 809              | 17,997           | 30,080           | 81,884                         | 90,924            | 79,575            |
| 9                           | 56,702           | 11,733           | 39,456           | 442,941                        | 407,892           | 597,531           |
| 10                          | 312,622          | 308,912          | 58,895           | 2,655,844                      | 2,490,877         | 460,752           |
| <b>TOTAL, Nos. 1 to 10.</b> | <b>458,654</b>   | <b>429,449</b>   | <b>318,781</b>   | <b>4,513,087</b>               | <b>3,976,012</b>  | <b>2,660,047</b>  |
| 11                          | 139,195          | 169,307          | 117,639          | 2,101,165                      | 1,338,180         | 954,447           |
| 12                          | 325,904          | 252,443          | 362,959          | 2,206,789                      | 1,939,238         | 2,645,320         |
| 13                          | 53,614           | 159,915          | 76,897           | 500,891                        | 962,813           | 962,819           |
| 14                          | 187,727          | 231,835          | 324,911          | 1,580,716                      | 1,881,293         | 1,760,940         |
| 15                          | 63,195           | 63,992           | 95,809           | 719,355                        | 677,076           | 677,774           |
| 16                          | 240,639          | 318,535          | 428,831          | 1,535,187                      | 2,012,390         | 2,861,066         |
| 17                          | 117,174          | 51,651           | 44,171           | 766,174                        | 867,493           | 861,894           |
| 18                          | 98,803           | 67,088           | 53,077           | 467,923                        | 525,603           | 554,561           |
| 19                          | ...              | 1,769            | ...              | 107,543                        | 30,604            | 13,063            |
| 20                          | 341,353          | 251,981          | 312,401          | 2,454,747                      | 2,557,726         | 2,116,215         |
| <b>TOTAL, Nos. 11 to 20</b> | <b>1,567,609</b> | <b>1,567,996</b> | <b>1,816,435</b> | <b>12,442,509</b>              | <b>12,292,416</b> | <b>12,908,158</b> |
| 21                          | 64,068           | 118,633          | 80,916           | 713,518                        | 423,194           | 371,540           |
| 22                          | 37,450           | 74,610           | 86,281           | 318,262                        | 595,919           | 769,206           |
| 23                          | ...              | 1,004            | ...              | 70,092                         | 7,617             | ...               |
| 24                          | 188,028          | 275,858          | 374,423          | 1,600,370                      | 1,818,677         | 2,325,203         |
| 25                          | 1,460            | ...              | ...              | 13,597                         | 4,722             | ...               |
| 26                          | 7,040            | 14,672           | 12,192           | 65,318                         | 154,689           | 111,165           |
| 27                          | 12,429           | 127              | ...              | 78,713                         | 36,951            | 4,098             |
| 28                          | 1,186            | 3,863            | 13,636           | 11,086                         | 36,153            | 132,605           |
| 29                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 30                          | 9,369            | 13,662           | 16,476           | 121,127                        | 127,375           | 133,230           |
| <b>TOTAL, Nos. 21 to 30</b> | <b>321,030</b>   | <b>502,429</b>   | <b>583,924</b>   | <b>2,992,083</b>               | <b>3,204,297</b>  | <b>3,847,047</b>  |
| 31                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 32                          | 49,536           | 30,096           | 31,944           | 362,241                        | 221,024           | 212,360           |
| 33                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 34                          | 33,935           | 64,957           | 51,669           | 233,976                        | 361,607           | 408,368           |
| 35                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 36                          | ...              | ...              | ...              | 3,298                          | ...               | ...               |
| 37                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 38                          | ...              | 4,720            | ...              | 6,818                          | 10,564            | 4,986             |
| 39                          | ...              | ...              | ...              | ...                            | ...               | ...               |
| 40                          | 10,387           | 3,042            | 3,341            | 60,016                         | 37,330            | 20,829            |
| <b>TOTAL, Nos. 31 to 40</b> | <b>93,859</b>    | <b>102,815</b>   | <b>85,954</b>    | <b>716,349</b>                 | <b>630,525</b>    | <b>646,543</b>    |
| <b>Above 40</b>             | <b>7,686</b>     | <b>7,236</b>     | <b>8,029</b>     | <b>60,570</b>                  | <b>80,066</b>     | <b>69,341</b>     |
| <b>GRAND TOTAL</b>          | <b>2,448,837</b> | <b>2,609,925</b> | <b>2,813,123</b> | <b>20,743,598</b>              | <b>20,183,316</b> | <b>20,131,136</b> |

No. 3.—DETAILED STATEMENT of the QUANTITY (in pounds) and the COUNTS (or numbers) of YARN Spun—concluded

TOTAL OF BRITISH INDIA

| Count or Number             | MONTH OF OCTOBER  |                   |                   | SEVEN MONTHS, APRIL TO OCTOBER |                    |                    |
|-----------------------------|-------------------|-------------------|-------------------|--------------------------------|--------------------|--------------------|
|                             | 1916              | 1917              | 1918              | 1916                           | 1917               | 1918               |
| 1                           | 4,497             | 68,616            | 186,721           | 82,481                         | 1,102,065          | 1,224,419          |
| 2                           | 257,711           | 272,626           | 393,440           | 1,397,707                      | 2,318,228          | 2,029,971          |
| 3                           | 139,716           | 140,293           | 76,490            | 1,125,404                      | 754,947            | 759,201            |
| 4                           | 239,498           | 227,138           | 373,096           | 2,123,559                      | 2,249,700          | 2,696,055          |
| 5                           | 111,829           | 47,710            | 44,159            | 150,472                        | 98,938             | 465,166            |
| 6                           | 800,830           | 740,254           | 746,529           | 6,582,185                      | 5,284,612          | 5,913,879          |
| 7                           | 786,659           | 846,507           | 948,562           | 5,841,569                      | 5,896,375          | 6,578,487          |
| 8                           | 509,815           | 644,281           | 659,017           | 4,909,163                      | 5,280,551          | 6,740,499          |
| 9                           | 456,916           | 689,983           | 638,500           | 3,506,351                      | 4,158,391          | 5,386,073          |
| 10                          | 5,333,810         | 3,660,163         | 2,808,740         | 37,670,587                     | 36,519,848         | 18,780,367         |
| <b>TOTAL, Nos. 1 to 10</b>  | <b>8,640,275</b>  | <b>7,337,561</b>  | <b>7,075,254</b>  | <b>68,389,478</b>              | <b>63,555,675</b>  | <b>51,573,116</b>  |
| 11                          | 2,767,810         | 4,214,352         | 2,255,448         | 24,305,372                     | 26,721,611         | 14,508,651         |
| 12                          | 4,669,823         | 4,363,232         | 3,736,813         | 37,844,921                     | 29,289,921         | 23,291,270         |
| 13                          | 983,410           | 1,089,897         | 1,105,334         | 8,339,380                      | 7,040,928          | 11,588,843         |
| 14                          | 2,110,778         | 2,499,806         | 1,903,549         | 14,802,205                     | 17,011,625         | 14,626,480         |
| 15                          | 191,843           | 1,020,399         | 965,577           | 5,330,655                      | 7,613,636          | 7,875,323          |
| 16                          | 3,323,923         | 3,362,371         | 3,185,345         | 21,901,099                     | 21,560,054         | 23,774,942         |
| 17                          | 1,010,491         | 735,743           | 847,555           | 9,197,432                      | 5,702,690          | 7,065,166          |
| 18                          | 1,771,480         | 1,293,070         | 945,545           | 11,975,310                     | 9,774,108          | 8,493,818          |
| 19                          | 536,052           | 445,477           | 329,881           | 3,917,407                      | 3,737,850          | 2,621,764          |
| 20                          | 9,374,674         | 8,229,357         | 7,614,775         | 65,424,145                     | 59,692,953         | 58,007,667         |
| <b>TOTAL, Nos. 11 to 20</b> | <b>27,340,284</b> | <b>27,273,704</b> | <b>22,989,822</b> | <b>209,537,926</b>             | <b>188,145,376</b> | <b>171,643,924</b> |
| 21                          | 3,000,842         | 3,419,146         | 1,306,828         | 23,583,095                     | 21,995,845         | 23,660,939         |
| 22                          | 2,829,256         | 2,935,525         | 2,926,065         | 22,307,812                     | 23,867,665         | 25,347,795         |
| 23                          | 566,296           | 420,755           | 382,955           | 2,330,768                      | 2,761,169          | 3,346,635          |
| 24                          | 2,520,906         | 3,425,316         | 3,862,804         | 21,058,117                     | 24,094,607         | 30,160,395         |
| 25                          | 137,302           | 105,507           | 48,880            | 1,240,956                      | 913,743            | 613,082            |
| 26                          | 776,468           | 902,364           | 638,023           | 4,982,283                      | 5,989,143          | 5,650,038          |
| 27                          | 392,522           | 381,496           | 404,476           | 2,004,152                      | 2,706,279          | 2,930,953          |
| 28                          | 399,721           | 719,602           | 508,286           | 3,500,828                      | 5,197,931          | 4,681,186          |
| 29                          | 23,570            | 48,175            | 84,212            | 196,819                        | 339,687            | 189,543            |
| 30                          | 1,506,681         | 1,968,546         | 2,384,990         | 12,891,265                     | 15,201,180         | 18,220,109         |
| <b>TOTAL, Nos. 21 to 30</b> | <b>11,953,564</b> | <b>14,326,332</b> | <b>14,498,539</b> | <b>94,095,895</b>              | <b>103,047,249</b> | <b>114,800,665</b> |
| 31                          | 262,261           | 108,287           | 136,507           | 1,399,560                      | 1,071,243          | 1,023,668          |
| 32                          | 748,301           | 672,393           | 613,226           | 5,161,352                      | 5,521,223          | 5,256,319          |
| 33                          | 280,187           | 78,177            | ...               | 1,267,329                      | 758,616            | 106,360            |
| 34                          | 304,107           | 303,242           | 270,536           | 2,695,165                      | 3,041,910          | 2,136,535          |
| 35                          | 28                | 14,117            | 16,812            | 83,236                         | 123,003            | 87,256             |
| 36                          | 43,654            | 92,239            | 29,784            | 652,798                        | 535,763            | 383,018            |
| 37                          | 2,301             | ...               | ...               | 54,885                         | ...                | 1,268              |
| 38                          | 1,768             | 30,273            | 23,763            | 139,089                        | 129,824            | 175,015            |
| 39                          | ...               | ...               | ...               | ...                            | 840                | ...                |
| 40                          | 321,149           | 424,045           | 408,465           | 3,002,880                      | 3,561,901          | 3,002,204          |
| <b>TOTAL, Nos. 31 to 40</b> | <b>1,963,754</b>  | <b>1,722,823</b>  | <b>1,499,093</b>  | <b>14,456,294</b>              | <b>14,744,923</b>  | <b>12,199,633</b>  |
| Above 40                    | 240,079           | 423,031           | 386,982           | 2,568,300                      | 3,438,343          | 2,786,543          |
| Wastes, etc.                | 23,490            | 9,450             | 16,026            | 275,363                        | 180,059            | 136,918            |
| <b>GRAND TOTAL</b>          | <b>50,161,446</b> | <b>51,092,901</b> | <b>46,365,716</b> | <b>378,323,256</b>             | <b>373,111,619</b> | <b>353,140,829</b> |

No. 4.—DETAILED STATEMENT of the QUANTITY (in pounds) and the COUNTS  
(or numbers) of YARN Spun

INDIAN STATES (a)

| Count or Number              | MONTH OF OCTOBER |                  |                  | SEVEN MONTHS, APRIL TO OCTOBER |                   |                   |
|------------------------------|------------------|------------------|------------------|--------------------------------|-------------------|-------------------|
|                              | 1916             | 1917             | 1918             | 1916                           | 1917              | 1918              |
| 1                            | ...              | ...              | 9,848            | ...                            | ...               | 12,907            |
| 2                            | ...              | ...              | ...              | ...                            | 26,575            | 6,153             |
| 3                            | 35,733           | ...              | 60,100           | 170,796                        | 130,599           | 241,380           |
| 4                            | 2,156            | 19,488           | 8,371            | 50,117                         | 114,169           | 197,047           |
| 5                            | ...              | ...              | 2,393            | 2,901                          | 10,032            | 19,350            |
| 6                            | 56,618           | 8,908            | 15,502           | 474,374                        | 114,616           | 138,867           |
| 7                            | 31,735           | 22,664           | 50,318           | 453,969                        | 254,083           | 250,718           |
| 8                            | 9,747            | 45,404           | 19,802           | 184,849                        | 120,216           | 111,904           |
| 9                            | 15,530           | 23,967           | 16,725           | 149,836                        | 87,856            | 115,430           |
| 10                           | 148,688          | 73,472           | 50,355           | 749,984                        | 473,171           | 350,314           |
| <b>TOTAL, Nos. 1 to 10.</b>  | <b>295,207</b>   | <b>192,493</b>   | <b>233,414</b>   | <b>2,236,675</b>               | <b>1,836,317</b>  | <b>1,444,075</b>  |
| 11                           | 72,587           | 104,917          | 77,019           | 406,500                        | 506,481           | 461,883           |
| 12                           | 128,615          | 104,753          | 162,079          | 814,585                        | 624,356           | 1,151,514         |
| 13                           | 35,564           | 60,416           | 19,277           | 281,324                        | 254,467           | 141,209           |
| 14                           | 293,298          | 264,180          | 208,330          | 2,501,047                      | 2,548,956         | 2,198,278         |
| 15                           | 65,020           | 46,125           | 68,206           | 375,720                        | 182,595           | 410,345           |
| 16                           | 164,680          | 217,512          | 212,217          | 1,597,839                      | 1,684,100         | 2,017,109         |
| 17                           | 53,430           | 26,095           | 14,008           | 172,516                        | 263,666           | 212,625           |
| 18                           | 281,116          | 264,251          | 189,314          | 2,489,524                      | 1,975,296         | 1,973,260         |
| 19                           | 64,773           | 32,219           | 59,795           | 520,967                        | 252,593           | 298,158           |
| 20                           | 516,598          | 527,397          | 412,773          | 4,589,714                      | 4,016,868         | 3,552,066         |
| <b>TOTAL, Nos. 11 to 20.</b> | <b>1,675,681</b> | <b>1,647,865</b> | <b>1,560,118</b> | <b>13,749,136</b>              | <b>12,308,387</b> | <b>12,429,467</b> |
| 21                           | 149,217          | 136,840          | 86,441           | 1,016,100                      | 784,638           | 696,813           |
| 22                           | 226,352          | 281,648          | 154,317          | 2,040,206                      | 2,220,458         | 1,709,046         |
| 23                           | 80,377           | 12,645           | 58,182           | 884,998                        | 145,899           | 897,464           |
| 24                           | 129,521          | 100,095          | 57,908           | 792,774                        | 759,593           | 767,459           |
| 25                           | 32,457           | 15,428           | ...              | 88,142                         | 38,074            | 9,272             |
| 26                           | 61,844           | 98,128           | 57,265           | 569,096                        | 542,117           | 614,795           |
| 27                           | 45,888           | 43,467           | 35,588           | 167,449                        | 501,335           | 378,744           |
| 28                           | 24,751           | 85,991           | 39,567           | 254,729                        | 62,925            | 386,968           |
| 29                           | 33,048           | 4,374            | ...              | 75,060                         | 13,577            | 2,228             |
| 30                           | 41,470           | 40,381           | 75,667           | 568,385                        | 343,537           | 625,415           |
| <b>TOTAL, Nos. 21 to 30.</b> | <b>824,425</b>   | <b>819,997</b>   | <b>514,935</b>   | <b>5,956,931</b>               | <b>5,992,133</b>  | <b>5,488,204</b>  |
| 31                           | 981              | 13,644           | 12,547           | 41,957                         | 54,601            | 70,022            |
| 32                           | 18,308           | 22,167           | ...              | 188,614                        | 232,126           | 161,256           |
| 33                           | ...              | ...              | ...              | 2,870                          | ...               | ...               |
| 34                           | 22,594           | 6,276            | ...              | 101,768                        | 103,794           | 29,352            |
| 35                           | 912              | ...              | ...              | 4,861                          | 25,063            | ...               |
| 36                           | 10,803           | ...              | ...              | 16,511                         | ...               | ...               |
| 37                           | ...              | ...              | ...              | ...                            | ...               | ...               |
| 38                           | ...              | ...              | 1,720            | 2,215                          | 46                | 3,514             |
| 39                           | ...              | ...              | ...              | ...                            | ...               | ...               |
| 40                           | 10,574           | 8,125            | 7,317            | 155,584                        | 73,080            | 115,372           |
| <b>TOTAL, Nos. 31 to 40.</b> | <b>64,172</b>    | <b>50,202</b>    | <b>21,584</b>    | <b>514,880</b>                 | <b>488,710</b>    | <b>379,516</b>    |
| <b>Above 40</b>              | <b>6,871</b>     | <b>4,990</b>     | <b>6,148</b>     | <b>99,353</b>                  | <b>21,438</b>     | <b>46,807</b>     |
| <b>GRAND TOTAL.</b>          | <b>2,868,356</b> | <b>2,714,547</b> | <b>2,286,199</b> | <b>22,557,275</b>              | <b>20,146,985</b> | <b>19,788,069</b> |

(a) See notes at foot of Table No. 1

No. 5.—DETAILED STATEMENT of the QUANTITY (in pounds) and the COUNTS  
(or numbers) of YARN Spun—concluded.

GRAND TOTAL, INDIA (British India and Indian States)

| Count or Number              | MONTH OF OCTOBER  |                   |                   | SEVEN MONTHS, APRIL TO OCTOBER |                    |                    |
|------------------------------|-------------------|-------------------|-------------------|--------------------------------|--------------------|--------------------|
|                              | 1916              | 1917              | 1918              | 1916                           | 1917               | 1918               |
| 1                            | 4,497             | 68,616            | 196,669           | 62,481                         | 1,102,065          | 1,237,325          |
| 2                            | 257,711           | 272,628           | 393,440           | 1,397,707                      | 2,234,803          | 3,036,129          |
| 3                            | 175,449           | 140,293           | 136,590           | 1,296,200                      | 885,546            | 1,000,581          |
| 4                            | 241,654           | 240,626           | 381,467           | 2,173,676                      | 2,368,869          | 2,893,102          |
| 5                            | 111,323           | 47,710            | 46,552            | 153,373                        | 108,970            | 484,516            |
| 6                            | 856,948           | 748,962           | 762,031           | 7,056,559                      | 5,401,228          | 6,062,746          |
| 7                            | 818,394           | 589,161           | 998,880           | 6,295,538                      | 6,150,458          | 6,829,205          |
| 8                            | 519,562           | 689,885           | 878,819           | 5,094,061                      | 5,400,767          | 6,862,403          |
| 9                            | 472,448           | 718,850           | 655,225           | 3,656,187                      | 4,246,247          | 5,600,503          |
| 10                           | 5,477,498         | 3,733,635         | 2,859,095         | 38,420,571                     | 36,993,019         | 19,130,681         |
| <b>TOTAL, Nos. 1 to 10</b>   | <b>8,935,482</b>  | <b>7,530,054</b>  | <b>7,308,668</b>  | <b>65,626,353</b>              | <b>64,891,992</b>  | <b>53,017,191</b>  |
| 11                           | 2,840,397         | 4,819,269         | 2,332,467         | 24,711,872                     | 27,228,092         | 14,970,534         |
| 12                           | 4,798,438         | 4,467,965         | 3,898,892         | 38,659,606                     | 29,914,277         | 24,442,784         |
| 13                           | 1,018,974         | 1,150,313         | 1,124,611         | 8,620,704                      | 7,295,395          | 11,733,062         |
| 14                           | 2,404,076         | 2,763,986         | 2,201,979         | 17,308,252                     | 19,560,581         | 16,824,758         |
| 15                           | 856,863           | 1,068,524         | 1,030,783         | 6,206,376                      | 7,796,231          | 8,065,668          |
| 16                           | 3,488,603         | 3,579,883         | 3,397,563         | 23,498,938                     | 23,244,154         | 25,792,051         |
| 17                           | 1,063,921         | 781,838           | 661,563           | 9,369,948                      | 5,966,376          | 7,277,791          |
| 18                           | 2,052,596         | 1,557,321         | 1,134,859         | 14,464,834                     | 11,749,394         | 10,457,076         |
| 19                           | 600,825           | 477,696           | 389,876           | 4,438,374                      | 3,990,443          | 2,919,922          |
| 20                           | 9,891,272         | 8,756,754         | 8,027,548         | 70,013,859                     | 63,708,821         | 61,569,753         |
| <b>TOTAL, Nos. 11 to 20.</b> | <b>29,815,965</b> | <b>28,921,569</b> | <b>24,399,940</b> | <b>217,287,662</b>             | <b>200,453,763</b> | <b>184,073,391</b> |
| 21                           | 3,150,059         | 3,555,956         | 3,343,269         | 24,599,195                     | 22,780,483         | 24,257,752         |
| 22                           | 3,055,608         | 3,217,173         | 3,080,402         | 24,348,020                     | 26,128,103         | 27,066,831         |
| 23                           | 446,673           | 433,400           | 441,137           | 2,716,756                      | 2,907,068          | 3,744,099          |
| 24                           | 2,650,427         | 3,525,411         | 3,920,712         | 21,850,891                     | 24,854,200         | 30,527,854         |
| 25                           | 169,759           | 120,935           | 48,880            | 1,329,098                      | 951,817            | 622,354            |
| 26                           | 838,312           | 1,000,392         | 695,288           | 5,551,379                      | 6,511,260          | 6,264,633          |
| 27                           | 437,910           | 424,963           | 440,064           | 3,171,601                      | 3,207,614          | 3,309,697          |
| 28                           | 424,472           | 805,593           | 548,353           | 3,755,557                      | 5,800,856          | 5,068,154          |
| 29                           | 56,618            | 52,549            | 34,212            | 271,679                        | 353,264            | 191,771            |
| 30                           | 1,548,161         | 2,008,927         | 2,460,657         | 13,459,650                     | 15,544,717         | 18,845,524         |
| <b>TOTAL, Nos. 21 to 30</b>  | <b>12,777,989</b> | <b>16,145,329</b> | <b>15,013,474</b> | <b>100,052,826</b>             | <b>109,039,382</b> | <b>120,288,869</b> |
| 31                           | 268,242           | 121,931           | 149,054           | 1,441,517                      | 1,125,844          | 1,093,690          |
| 32                           | 766,609           | 694,550           | 613,226           | 5,349,966                      | 5,753,949          | 5,446,575          |
| 33                           | 280,187           | 78,177            | ...               | 1,270,219                      | 758,616            | 105,380            |
| 34                           | 326,701           | 309,518           | 270,536           | 2,796,935                      | 3,145,704          | 2,165,887          |
| 35                           | 938               | 14,117            | 16,812            | 86,077                         | 148,066            | 87,266             |
| 36                           | 54,457            | 92,269            | 29,784            | 669,309                        | 535,763            | 383,018            |
| 37                           | 2,301             | ...               | ...               | 54,885                         | ...                | 1,268              |
| 38                           | 1,768             | 30,373            | 25,483            | 141,304                        | 129,870            | 175,529            |
| 39                           | ...               | ...               | ...               | ...                            | 840                | ...                |
| 40                           | 331,723           | 432,170           | 415,782           | 3,158,464                      | 3,634,981          | 3,117,576          |
| <b>TOTAL, Nos. 31 to 40</b>  | <b>1,027,926</b>  | <b>1,773,025</b>  | <b>1,520,677</b>  | <b>14,970,674</b>              | <b>15,233,633</b>  | <b>12,579,179</b>  |
| <b>Above 40</b>              | <b>246,950</b>    | <b>428,021</b>    | <b>393,130</b>    | <b>2,667,653</b>               | <b>3,459,781</b>   | <b>2,833,350</b>   |
| <b>Wastes, etc.</b>          | <b>23,490</b>     | <b>9,450</b>      | <b>16,026</b>     | <b>275,363</b>                 | <b>160,053</b>     | <b>136,918</b>     |
| <b>GRAND TOTAL</b>           | <b>53,027,802</b> | <b>53,807,448</b> | <b>48,651,915</b> | <b>400,890,531</b>             | <b>393,258,604</b> | <b>372,928,898</b> |

No. 6.—**DETAILED STATEMENT** of the **QUANTITY** (in pounds and their equivalent in yards) and **DESCRIPTION** of **WOVEN GOODS** Produced

**BOMBAY PRESIDENCY**

| Description                                            | MONTH OF OCTOBER |            |             | SEVEN MONTHS, APRIL TO OCTOBER |             |             |             |
|--------------------------------------------------------|------------------|------------|-------------|--------------------------------|-------------|-------------|-------------|
|                                                        | 1916             | 1917       | 1918        | 1916                           | 1917        | 1918        |             |
| <b>Grey and bleached piece-goods—</b>                  |                  |            |             |                                |             |             |             |
| Chadars                                                | { pounds         | 1,442,699  | 1,575,695   | 865,391                        | 11,471,383  | 9,902,714   | 5,112,661   |
|                                                        | { yards          | 4,038,961  | 4,856,697   | 1,052,848                      | 34,804,880  | 31,197,667  | 14,853,200  |
| Dhuths                                                 | { pounds         | 3,044,602  | 4,282,883   | 2,586,817                      | 34,751,286  | 35,072,624  | 39,074,400  |
|                                                        | { yards          | 13,434,932 | 20,351,049  | 13,018,063                     | 159,413,477 | 163,150,961 | 189,420,600 |
| Drills and jeans                                       | { pounds         | 700,077    | 1,332,696   | 370,062                        | 5,688,587   | 9,597,447   | 5,813,200   |
|                                                        | { yards          | 2,724,210  | 5,378,722   | 1,413,400                      | 22,185,371  | 35,456,402  | 22,518,500  |
| Cambrics and lawns                                     | { pounds         | 42,111     | 120,382     | 36,540                         | 664,146     | 719,785     | 393,800     |
|                                                        | { yards          | 255,747    | 707,969     | 215,449                        | 3,967,885   | 4,094,614   | 2,362,400   |
| Printers                                               | { pounds         | 506,339    | 201,235     | 28,920                         | 3,534,123   | 2,610,597   | 2,063,400   |
|                                                        | { yards          | 2,069,324  | 932,971     | 132,883                        | 15,457,601  | 11,700,849  | 9,305,400   |
| Shirtings and longcloth                                | { pounds         | 6,209,498  | 7,560,471   | 3,269,244                      | 50,340,544  | 54,288,366  | 43,967,400  |
|                                                        | { yards          | 27,514,547 | 34,879,026  | 15,118,929                     | 218,349,639 | 250,911,096 | 203,562,400 |
| T-cloth, domestics, and sheetings                      | { pounds         | 3,136,952  | 1,727,232   | 645,100                        | 22,289,406  | 14,589,414  | 9,660,400   |
|                                                        | { yards          | 13,474,896 | 8,308,777   | 3,301,949                      | 96,111,398  | 67,193,981  | 43,377,400  |
| Tent cloth                                             | { pounds         | 145,785    | 410,071     | 1,665,364                      | 2,596,619   | 2,659,468   | 10,625,400  |
|                                                        | { yards          | 283,615    | 762,425     | 3,969,024                      | 4,900,763   | 5,256,643   | 18,879,400  |
| Other sorts                                            | { pounds         | 361,157    | 424,522     | 584,959                        | 2,682,552   | 2,936,703   | 3,578,400   |
|                                                        | { yards          | 1,449,557  | 1,789,303   | 1,068,380                      | 10,133,954  | 11,802,210  | 10,984,400  |
| <b>TOTAL</b>                                           | { pounds         | 15,582,320 | 17,663,187  | 9,552,397                      | 134,018,646 | 132,377,138 | 120,289,400 |
|                                                        | { yards          | 65,195,678 | 77,766,939  | 39,290,925                     | 565,324,968 | 580,763,823 | 519,254,400 |
| <b>Coloured piece-goods</b>                            | { pounds         | 6,698,603  | 9,226,318   | 4,556,077                      | 49,504,318  | 56,660,137  | 43,473,400  |
|                                                        | { yards          | 32,420,014 | 43,117,107  | 20,850,419                     | 238,453,044 | 263,054,535 | 202,880,400 |
| <b>Grey and coloured goods, other than piece-goods</b> | { pounds         | 257,376    | 262,643     | 458,987                        | 1,407,506   | 1,968,994   | 2,142,400   |
|                                                        | { dozens         | 49,649     | 53,231      | 77,185                         | 304,964     | 379,466     | 428,400     |
| <b>Rotary</b>                                          | { pounds         | 35,623     | 18,714      | 7,308                          | 145,138     | 151,610     | 93,400      |
|                                                        | { dozens         | 28,327     | 12,685      | 3,673                          | 112,245     | 165,988     | 66,400      |
| <b>Miscellaneous</b>                                   | { pounds         | 52,705     | 119,840     | 72,920                         | 368,875     | 559,146     | 675,400     |
| <b>Cotton goods mixed with silk or wool (a)</b>        |                  | ...        | 7,487       | 16,450                         | ...         | 62,784      | 65,400      |
| <b>GRAND TOTAL</b>                                     | { pounds         | 22,627,527 | 27,298,189  | 14,664,139                     | 185,444,480 | 191,779,809 | 166,739,400 |
|                                                        | { yards          | 97,615,692 | 120,884,046 | 58,641,344                     | 798,778,012 | 843,818,358 | 722,135,400 |
|                                                        | { dozens         | 77,276     | 65,916      | 80,858                         | 417,309     | 485,453     | 494,400     |

(a) Separately specified with effect from April, 1917

No. 6.—DETAILED STATEMENT of the QUANTITY (in pounds and their equivalent in yards) and DESCRIPTION of WOVEN GOODS Produced—continued.

## BOMBAY ISLAND

| Description                                                  | MONTH OF OCTOBER |            |            | SEVEN MONTHS, APRIL TO OCTOBER |             |             |             |
|--------------------------------------------------------------|------------------|------------|------------|--------------------------------|-------------|-------------|-------------|
|                                                              | 1916             | 1917       | 1918       | 1916                           | 1917        | 1918        |             |
| <i>Grey and bleached piece-goods—</i>                        |                  |            |            |                                |             |             |             |
| Chadars . . .                                                | { pounds         | 1,019,625  | 1,254,662  | 302,270                        | 5,404,667   | 6,720,839   | 3,097,201   |
|                                                              | { yards          | 2,684,984  | 3,716,081  | 823,708                        | 17,696,257  | 18,333,860  | 8,380,666   |
| Dhatis . . .                                                 | { pounds         | 874,961    | 1,378,959  | 1,449,556                      | 7,193,808   | 7,377,476   | 11,300,979  |
|                                                              | { yards          | 2,973,278  | 6,681,240  | 7,498,922                      | 32,008,856  | 35,260,131  | 57,980,936  |
| Drills and Jeans .                                           | { pounds         | 678,010    | 1,274,672  | 357,112                        | 5,237,415   | 9,004,086   | 5,543,753   |
|                                                              | { yards          | 2,640,278  | 5,140,948  | 1,371,146                      | 20,368,131  | 33,040,365  | 21,418,319  |
| Cambries and lawns . . .                                     | { pounds         | 27,589     | 104,257    | 28,772                         | 378,955     | 401,430     | 255,371     |
|                                                              | { yards          | 196,759    | 625,048    | 178,395                        | 2,715,715   | 2,770,431   | 1,674,213   |
| Printers . . .                                               | { pounds         | ...        | ...        | ...                            | 163         | 436         | 39,528      |
|                                                              | { yards          | ...        | ...        | ...                            | 1,244       | 1,521       | 204,178     |
| Shirts and longcloth .                                       | { pounds         | 3,834,732  | 5,909,786  | 2,642,099                      | 30,966,144  | 38,297,882  | 30,467,991  |
|                                                              | { yards          | 17,082,614 | 27,357,858 | 12,302,757                     | 137,026,938 | 130,484,841 | 142,677,519 |
| T-cloth, domestic and sheetings .                            | { pounds         | 2,909,204  | 1,535,842  | 605,717                        | 20,147,809  | 12,684,460  | 8,212,680   |
|                                                              | { yards          | 12,519,743 | 7,411,408  | 3,022,943                      | 66,987,222  | 58,344,003  | 40,613,890  |
| Tent cloth . . .                                             | { pounds         | 139,630    | 362,505    | 1,372,192                      | 2,482,617   | 2,202,557   | 9,154,663   |
|                                                              | { yards          | 267,543    | 671,185    | 2,370,684                      | 4,594,691   | 4,181,076   | 18,095,663  |
| Other sorts . . .                                            | { pounds         | 123,099    | 230,545    | 483,982                        | 987,234     | 1,382,694   | 2,426,042   |
|                                                              | { yards          | 459,130    | 967,318    | 783,251                        | 4,032,499   | 5,121,901   | 6,433,195   |
| TOTAL . . .                                                  | { pounds         | 9,406,750  | 12,051,228 | 7,241,700                      | 73,798,730  | 78,071,854  | 70,498,209  |
|                                                              | { yards          | 38,824,277 | 52,571,116 | 28,351,808                     | 307,431,553 | 337,608,119 | 295,479,079 |
| Coloured piece-goods .                                       | { pounds         | 5,669,844  | 2,365,385  | 4,358,745                      | 40,792,507  | 49,199,430  | 39,371,683  |
| Grey and coloured goods, other than piece-goods .            | { pounds         | 27,046,287 | 39,023,479 | 19,383,372                     | 192,966,395 | 228,196,725 | 183,398,906 |
| Hosiery . . .                                                | { pounds         | 254,717    | 361,666    | 456,634                        | 1,385,632   | 1,958,149   | 2,112,183   |
| Miscellaneous Cotton goods mixed with silk or wool (a) . . . | { dozens         | 49,117     | 53,038     | 76,551                         | 300,325     | 376,770     | 414,312     |
|                                                              | { pounds         | 23,685     | 10,726     | 4,473                          | 94,806      | 101,175     | 77,895      |
|                                                              | { dozens         | 22,335     | 8,885      | 2,944                          | 83,962      | 85,103      | 60,798      |
|                                                              | { pounds         | 52,705     | 119,840    | 72,919                         | 368,878     | 559,145     | 675,325     |
|                                                              | { yards          | ...        | 5,280      | 14,777                         | ...         | 57,294      | 60,465      |
| GRAND TOTAL . . .                                            | { pounds         | 15,407,701 | 20,814,125 | 12,149,248                     | 116,440,551 | 128,947,047 | 112,795,259 |
|                                                              | { yards          | 65,870,564 | 91,694,595 | 47,735,076                     | 500,397,948 | 565,804,844 | 478,677,965 |
|                                                              | { dozens         | 71,452     | 61,923     | 79,395                         | 384,287     | 461,873     | 475,110     |

NOTE.—The suburb of Coorla, in the Thana district, is treated for statistical purposes as part of the Island of Bombay.

(a) Separately specified with effect from April, 1917

No. 6.—*DETAILED STATEMENT of the QUANTITY (in pounds and their equivalent in yards) and DESCRIPTION of WOVEN GOODS Produced*

**BOMBAY PRESIDENCY**

| Description                                                   | MONTH OF OCTOBER |            |             | SEVEN MONTHS, APRIL TO OCTOBER |             |             |             |
|---------------------------------------------------------------|------------------|------------|-------------|--------------------------------|-------------|-------------|-------------|
|                                                               | 1916             | 1917       | 1918        | 1916                           | 1917        | 1918        |             |
| <i>Grey and bleached piece-goods—</i>                         |                  |            |             |                                |             |             |             |
| Chadars                                                       | { pounds         | 1,442,699  | 1,575,695   | 865,391                        | 11,471,383  | 9,902,714   | 5,112,634   |
|                                                               | { yards          | 4,038,961  | 4,856,697   | 1,052,848                      | 34,804,880  | 31,197,667  | 14,853,203  |
| Dhuths                                                        | { pounds         | 3,044,802  | 4,222,883   | 2,586,817                      | 34,751,286  | 35,072,624  | 39,074,444  |
|                                                               | { yards          | 13,434,932 | 20,351,049  | 13,018,063                     | 159,413,477 | 163,150,961 | 188,420,515 |
| Drills and jeans                                              | { pounds         | 700,077    | 1,332,698   | 370,062                        | 5,688,587   | 9,597,447   | 5,613,384   |
|                                                               | { yards          | 2,724,210  | 5,378,722   | 1,413,400                      | 22,185,371  | 35,456,402  | 22,518,861  |
| Cambrics and lawns                                            | { pounds         | 42,111     | 120,382     | 36,540                         | 664,146     | 719,785     | 393,627     |
|                                                               | { yards          | 255,747    | 707,969     | 216,449                        | 3,967,885   | 4,094,614   | 2,362,444   |
| Printers                                                      | { pounds         | 506,339    | 201,235     | 28,920                         | 3,534,123   | 2,610,597   | 2,063,465   |
|                                                               | { yards          | 2,059,224  | 932,971     | 132,883                        | 15,457,601  | 11,700,849  | 9,305,010   |
| Shirtings and longcloth                                       | { pounds         | 6,209,498  | 7,580,471   | 3,269,244                      | 50,340,544  | 54,283,388  | 43,967,651  |
|                                                               | { yards          | 27,514,547 | 34,679,026  | 15,118,929                     | 218,349,639 | 250,911,096 | 203,552,991 |
| T-cloth, domestic and sheetings                               | { pounds         | 3,136,952  | 1,727,282   | 645,100                        | 22,289,408  | 14,589,414  | 9,660,625   |
|                                                               | { yards          | 13,474,895 | 8,509,777   | 3,301,949                      | 96,111,898  | 67,193,981  | 48,377,261  |
| Tent cloth                                                    | { pounds         | 145,785    | 410,071     | 1,668,364                      | 2,598,619   | 2,659,468   | 10,825,033  |
|                                                               | { yards          | 283,615    | 762,425     | 2,969,024                      | 4,900,763   | 5,256,643   | 18,879,101  |
| Other sorts                                                   | { pounds         | 361,157    | 424,522     | 584,959                        | 2,682,552   | 2,936,703   | 3,578,843   |
|                                                               | { yards          | 1,449,557  | 1,789,309   | 1,068,380                      | 10,133,954  | 11,802,210  | 10,984,751  |
| TOTAL                                                         | { pounds         | 15,683,320 | 17,663,187  | 9,552,397                      | 134,018,646 | 132,377,138 | 120,289,771 |
|                                                               | { yards          | 65,195,678 | 77,766,939  | 38,230,925                     | 665,324,968 | 580,763,823 | 519,254,171 |
| <i>Coloured piece-goods</i>                                   | { pounds         | 6,698,603  | 9,226,318   | 4,556,077                      | 49,504,316  | 56,660,137  | 43,473,317  |
|                                                               | { yards          | 32,420,014 | 43,117,107  | 20,350,419                     | 233,453,044 | 263,054,535 | 202,890,894 |
| <i>Grey and coloured goods, other than piece-goods</i>        | { pounds         | 257,376    | 282,643     | 458,987                        | 1,407,605   | 1,988,994   | 2,142,141   |
|                                                               | { dozens         | 49,649     | 53,231      | 77,185                         | 304,964     | 379,465     | 428,471     |
| <i>Hosiery</i>                                                | { pounds         | 85,623     | 18,714      | 7,308                          | 145,138     | 151,610     | 93,327      |
|                                                               | { dozens         | 28,327     | 12,685      | 3,673                          | 112,245     | 105,988     | 66,361      |
| <i>Miscellaneous Cotton goods mixed with silk or wool (a)</i> | { pounds         | 52,705     | 119,840     | 72,920                         | 368,875     | 559,148     | 675,321     |
|                                                               | { dozens         | ...        | 7,487       | 18,450                         | ...         | 62,784      | 65,381      |
| GRAND TOTAL                                                   | { pounds         | 22,027,527 | 27,298,189  | 14,664,139                     | 185,444,480 | 191,779,809 | 166,739,271 |
|                                                               | { yards          | 97,615,692 | 120,884,048 | 58,641,344                     | 798,778,012 | 843,818,358 | 722,135,061 |
|                                                               | { dozens         | 77,976     | 65,918      | 80,858                         | 417,309     | 485,453     | 494,841     |

(a) Separately specified with effect from April, 1917

No. 6.—DETAILED STATEMENT of the QUANTITY (in pounds and their equivalent in yards) and DESCRIPTION of WOVEN GOODS Produced—continued.

BOMBAY ISLAND

| Description                                                                      | MONTH OF OCTOBER |            |            | SEVEN MONTHS, APRIL TO OCTOBER |             |             |
|----------------------------------------------------------------------------------|------------------|------------|------------|--------------------------------|-------------|-------------|
|                                                                                  | 1916             | 1917       | 1918       | 1916                           | 1917        | 1918        |
| <i>Grey and bleached piece-goods—</i>                                            |                  |            |            |                                |             |             |
| Chadars . . . { pounds                                                           | 1,019,525        | 1,254,662  | 302,270    | 6,404,667                      | 6,720,833   | 5,097,201   |
| { yards                                                                          | 2,684,984        | 3,716,081  | 823,708    | 17,096,257                     | 18,333,850  | 8,380,666   |
| Dhatis . . . . . { pounds                                                        | 374,961          | 1,378,959  | 1,449,556  | 7,192,806                      | 7,377,476   | 11,300,979  |
| { yards                                                                          | 2,973,278        | 6,661,240  | 7,498,922  | 32,008,856                     | 35,260,131  | 57,980,936  |
| Drills and Jeans { pounds                                                        | 678,010          | 1,274,672  | 357,112    | 5,237,415                      | 9,004,086   | 5,543,753   |
| { yards                                                                          | 2,640,278        | 5,140,948  | 1,371,146  | 20,368,131                     | 33,040,365  | 21,418,819  |
| Cambrios and lawns . . . { pounds                                                | 27,589           | 104,257    | 28,772     | 378,955                        | 401,430     | 255,371     |
| { yards                                                                          | 196,759          | 626,048    | 178,395    | 2,715,715                      | 2,770,431   | 1,674,213   |
| Printers . . . . . { pounds                                                      | ...              | ...        | ...        | 183                            | 438         | 39,528      |
| { yards                                                                          | ...              | ...        | ...        | 1,244                          | 1,521       | 204,178     |
| Shirtings and longcloth { pounds                                                 | 3,824,732        | 5,903,736  | 2,642,099  | 30,966,144                     | 38,297,882  | 30,467,991  |
| { yards                                                                          | 17,082,614       | 27,357,868 | 12,302,757 | 137,026,938                    | 180,484,841 | 142,677,519 |
| T-cloth, domestic and sheetings { pounds                                         | 2,909,204        | 1,535,842  | 605,717    | 20,147,609                     | 12,684,460  | 8,212,680   |
| { yards                                                                          | 12,519,743       | 7,411,408  | 3,022,943  | 88,987,222                     | 58,344,003  | 40,613,890  |
| Tent cloth . . . . . { pounds                                                    | 299,630          | 362,505    | 1,372,192  | 2,482,617                      | 2,202,557   | 9,154,663   |
| { yards                                                                          | 267,543          | 671,185    | 2,370,684  | 4,594,691                      | 4,181,076   | 18,095,663  |
| Other sorts . . . . . { pounds                                                   | 123,099          | 230,545    | 483,982    | 987,234                        | 1,382,694   | 2,426,042   |
| { yards                                                                          | 459,130          | 967,318    | 783,251    | 4,032,499                      | 5,191,901   | 6,433,195   |
| <b>TOTAL</b> . . . . . { pounds                                                  | 9,406,750        | 12,051,228 | 7,241,700  | 73,798,730                     | 78,071,854  | 70,498,209  |
| { yards                                                                          | 38,824,277       | 52,671,116 | 28,351,806 | 307,431,553                    | 337,608,119 | 295,479,079 |
| <i>Coloured piece-goods</i> { pounds                                             | 5,669,844        | 2,365,385  | 4,358,745  | 40,792,607                     | 49,199,430  | 39,371,682  |
| { yards                                                                          | 27,046,287       | 39,023,479 | 19,383,272 | 192,966,395                    | 228,196,725 | 183,398,906 |
| <i>Grey and coloured goods, other than piece-goods</i> { pounds                  | 254,717          | 261,666    | 456,634    | 1,386,632                      | 1,958,149   | 2,112,183   |
| { dozens                                                                         | 49,117           | 53,038     | 76,551     | 300,325                        | 378,770     | 414,812     |
| <i>Hosiery</i> . . . . . { pounds                                                | 23,685           | 10,726     | 4,473      | 94,806                         | 101,175     | 77,895      |
| { dozens                                                                         | 22,335           | 8,885      | 2,844      | 83,962                         | 85,103      | 60,798      |
| <i>Miscellaneous Cotton goods mixed with silk or wool (a)</i> . . . . . { pounds | 52,705           | 119,840    | 72,919     | 368,878                        | 559,145     | 675,325     |
| { dozens                                                                         | ...              | 5,280      | 14,777     | ...                            | 57,294      | 60,465      |
| <b>GRAND TOTAL</b> . . . . . { pounds                                            | 15,407,701       | 20,814,125 | 12,149,248 | 116,440,551                    | 129,947,047 | 112,795,259 |
| { yards                                                                          | 65,870,564       | 91,694,595 | 47,735,078 | 500,397,948                    | 565,804,841 | 478,677,985 |
| { dozens                                                                         | 71,452           | 61,923     | 79,395     | 384,287                        | 461,873     | 475,110     |

NOTE.—The suburb of Coorla, in the Thana district, is treated for statistical purposes as part of the Island of Bombay.

(a) Separately specified with effect from April, 1917.



No. 6.—DETAILED STATEMENT of the QUANTITY (in pounds and their equivalent in yards) and DESCRIPTION of WOVEN GOODS Produced—continued

## AHMEDABAD

| Description                                                  | MONTH OF OCTOBER |            |            | SEVEN MONTHS, APRIL TO OCTOBER |             |             |             |
|--------------------------------------------------------------|------------------|------------|------------|--------------------------------|-------------|-------------|-------------|
|                                                              | 1916             | 1917       | 1918       | 1916                           | 1917        | 1918        |             |
| <i>Grey and bleached piece-goods—</i>                        |                  |            |            |                                |             |             |             |
| Chadars . . .                                                | { pounds         | 369,036    | 276,861    | 62,736                         | 4,686,428   | 2,820,638   | 1,710,048   |
|                                                              | { yards          | 1,164,590  | 1,011,290  | 151,678                        | 15,806,683  | 11,741,453  | 5,487,389   |
| Dhutis . . .                                                 | { pounds         | 1,971,660  | 2,143,883  | 854,414                        | 23,449,740  | 23,796,330  | 22,286,700  |
|                                                              | { yards          | 8,681,262  | 10,331,075 | 4,155,613                      | 109,500,002 | 106,657,600 | 106,525,284 |
| Drills and jeans . . .                                       | { pounds         | 5,320      | 31,369     | 709                            | 256,802     | 311,454     | 142,042     |
|                                                              | { yards          | 18,697     | 132,185    | 2,210                          | 1,083,363   | 1,399,975   | 634,645     |
| Cambrics and lawns . . .                                     | { pounds         | 12,507     | 3,856      | 823                            | 151,911     | 744,384     | 80,374      |
|                                                              | { yards          | 50,928     | 23,700     | 2,140                          | 690,413     | 1,032,149   | 420,937     |
| Printers . . .                                               | { pounds         | 376,626    | 47,608     | 13,313                         | 2,575,754   | 1,368,043   | 1,463,176   |
|                                                              | { yards          | 1,541,040  | 221,346    | 56,545                         | 11,386,166  | 6,283,460   | 6,406,361   |
| Shirtings and longcloth . . .                                | { pounds         | 1,896,104  | 942,549    | 281,289                        | 15,261,632  | 10,711,594  | 8,601,001   |
|                                                              | { yards          | 9,128,034  | 4,455,694  | 1,275,801                      | 67,636,360  | 50,340,095  | 41,939,519  |
| T-cloth, domestics, and sheetings . . .                      | { pounds         | 158,272    | 146,835    | 22,628                         | 1,746,114   | 1,678,108   | 1,342,549   |
|                                                              | { yards          | 642,198    | 716,414    | 141,423                        | 6,494,960   | 7,629,973   | 7,048,188   |
| Tent cloth . . .                                             | { pounds         | 23         | 33,136     | 31,277                         | 52,122      | 359,610     | 175,300     |
|                                                              | { yards          | 45         | 62,360     | 54,540                         | 152,636     | 833,235     | 334,768     |
| Other sorts . . .                                            | { pounds         | 160,128    | 37,699     | 18,748                         | 1,144,011   | 778,469     | 518,863     |
|                                                              | { yards          | 583,288    | 138,281    | 68,199                         | 4,161,532   | 3,670,709   | 2,339,106   |
| TOTAL                                                        | { pounds         | 4,949,676  | 3,663,786  | 1,275,433                      | 49,324,514  | 41,068,630  | 36,300,353  |
|                                                              | { yards          | 21,810,070 | 17,091,345 | 5,907,849                      | 215,962,867 | 190,188,639 | 171,166,396 |
| Coloured piece-goods                                         | { pounds         | 609,246    | 262,669    | 36,652                         | 4,049,007   | 3,181,904   | 1,194,518   |
|                                                              | { yards          | 3,471,766  | 1,753,008  | 194,765                        | 21,847,480  | 18,285,722  | 7,357,511   |
| Grey and coloured goods, other than piece-goods              | { pounds         | 292        | 13         | 18                             | 15,084      | 2,305       | 126         |
|                                                              | { dozens         | 121        | 2          | 9                              | 3,023       | 847         | 74          |
| Hosiery . . .                                                | { pounds         | 11,938     | 7,988      | 2,835                          | 50,332      | 50,435      | 15,925      |
|                                                              | { dozens         | 6,992      | 3,800      | 829                            | 28,284      | 20,883      | 5,668       |
| Miscellaneous Cotton goods mixed with silk or wool (a) . . . | { pounds         | ...        | ...        | ...                            | ...         | ...         | ...         |
|                                                              | { dozens         | ...        | 2,188      | 1,674                          | ...         | 5,348       | 4,926       |
| GRAND TOTAL                                                  | { pounds         | 5,571,152  | 3,936,644  | 1,316,612                      | 53,438,937  | 44,308,622  | 37,515,848  |
|                                                              | { yards          | 25,281,836 | 18,844,353 | 6,102,614                      | 237,810,287 | 208,474,361 | 178,543,907 |
|                                                              | { dozens         | 6,113      | 3,802      | 836                            | 31,307      | 21,734      | 5,642       |

(a) Separately specified with effect from April 1917

No. 6.—*DETAILED STATEMENT of the QUANTITY (in pounds and their equivalent in yards) and DESCRIPTION of WOVEN GOODS Produced—continued*

## MADRAS

| Description                                                    | MONTH OF OCTOBER |           |           | SEVEN MONTHS, APRIL TO OCTOBER |            |            |
|----------------------------------------------------------------|------------------|-----------|-----------|--------------------------------|------------|------------|
|                                                                | 1916             | 1917      | 1918      | 1916                           | 1917       | 1918       |
| <i>Grey and bleached piece-goods—</i>                          |                  |           |           |                                |            |            |
| Chadars . . . { pounds                                         | 16,494           | 11,831    | 11,837    | 89,030                         | 221,916    | 51,936     |
| { yards                                                        | 43,101           | 24,376    | 28,816    | 208,244                        | 646,622    | 160,811    |
| Dhatis . . . { pounds                                          | 89,685           | 131,858   | 55,311    | 469,130                        | 614,045    | 434,517    |
| { yards                                                        | 171,676          | 530,254   | 273,534   | 1,861,011                      | 2,325,290  | 2,159,195  |
| Drills and jeans . { pounds                                    | 109,617          | 50,224    | 51,784    | 924,235                        | 526,461    | 507,638    |
| { yards                                                        | 887,025          | 166,795   | 146,889   | 3,116,370                      | 1,748,044  | 1,539,057  |
| Cambrics . . . { pounds                                        | ...              | 4,588     | ...       | ...                            | 19,519     | 84,483     |
| lawns . . . { yards                                            | ...              | 18,000    | ...       | ...                            | 119,842    | 367,282    |
| Printers . . . { pounds                                        | ...              | ...       | ...       | ...                            | ...        | ...        |
| { yards                                                        | ...              | ...       | ...       | ...                            | ...        | ...        |
| Shirtings . . . { pounds                                       | 26,822           | 42,732    | 11,073    | 100,863                        | 262,434    | 287,513    |
| longcloth . . . { yards                                        | 88,042           | 142,907   | 42,618    | 347,202                        | 858,601    | 1,162,490  |
| T-cloth, domestic, { pounds                                    | 4,016            | 6,554     | 1,132     | 134,519                        | 90,653     | 72,957     |
| and sheetings . { yards                                        | 12,041           | 14,770    | 4,190     | 436,760                        | 310,228    | 201,838    |
| Tent-cloth . . . { pounds                                      | 7,354            | 49,028    | 104,641   | 72,551                         | 316,920    | 648,327    |
| { yards                                                        | 9,241            | 88,600    | 193,141   | 118,314                        | 567,435    | 1,007,067  |
| Other sorts . . . { pounds                                     | 69,030           | 76,267    | 97,662    | 417,277                        | 367,074    | 694,732    |
| { yards                                                        | 230,384          | 158,997   | 195,356   | 1,552,982                      | 915,604    | 1,339,732  |
| TOTAL . . . { pounds                                           | 273,918          | 373,082   | 333,447   | 2,207,605                      | 2,418,022  | 2,771,208  |
| { yards                                                        | 947,409          | 1,144,699 | 883,544   | 7,639,833                      | 7,480,666  | 7,927,472  |
| <i>Coloured piece-goods</i> { pounds                           | 881,963          | 1,007,058 | 1,213,981 | 5,648,360                      | 6,898,631  | 7,645,241  |
| { yards                                                        | 2,221,043        | 2,413,501 | 2,873,038 | 14,677,730                     | 16,370,293 | 18,184,808 |
| <i>Grey and coloured goods other than piece-goods</i> { pounds | 41,919           | 47,921    | 16,902    | 259,827                        | 260,810    | 132,255    |
| { dozens                                                       | 6,872            | 8,680     | 3,658     | 50,557                         | 49,560     | 25,895     |
| <i>Hosiery</i> . . . pounds                                    | ...              | ...       | ...       | ...                            | 28         | ...        |
| <i>Miscellaneous</i> . . . "                                   | 1,358            | ...       | ...       | 7,158                          | 800        | ...        |
| <i>Cotton goods mixed with silk or wool</i> . . . "            | ...              | ...       | ...       | ...                            | ...        | ...        |
| GRAND TOTAL . . . { yards                                      | 1,199,656        | 1,428,061 | 1,564,330 | 8,122,950                      | 9,578,291  | 10,548,704 |
| { dozens                                                       | 3,168,452        | 3,558,500 | 3,556,592 | 22,317,613                     | 23,850,959 | 28,112,280 |
|                                                                | 6,872            | 8,680     | 3,658     | 50,557                         | 49,560     | 25,895     |

No. 6.—*DETAILED STATEMENT of the QUANTITY (in pounds and their equivalent in yards) and DESCRIPTION of WOVEN GOODS Produced—continued*

**BENGAL**

| Description                                        | MONTH OF OCTOBER |           |           | SEVEN MONTHS, APRIL TO OCTOBER |            |            |
|----------------------------------------------------|------------------|-----------|-----------|--------------------------------|------------|------------|
|                                                    | 1916             | 1917      | 1918      | 1916                           | 1917       | 1918       |
| <i>Grey and bleached piece-goods—</i>              |                  |           |           |                                |            |            |
| Chalars . . . { pounds                             | 12,469           | 3,381     | ...       | 20,981                         | 10,765     | ...        |
| { yards                                            | 39,123           | 11,136    | ...       | 66,363                         | 31,825     | ...        |
| Dhatis . . . { pounds                              | 136,317          | 237,355   | 245,776   | 955,136                        | 1,407,882  | 1,896,221  |
| { yards                                            | 684,108          | 1,217,783 | 1,805,654 | 5,233,513                      | 7,600,964  | 9,883,268  |
| Drills and jeans . { pounds                        | ...              | 89        | ...       | 60,522                         | 10,881     | 9,567      |
| { yards                                            | ...              | 308       | ...       | 153,928                        | 29,757     | 26,560     |
| Cambrics and { pounds                              | ...              | ...       | ...       | ...                            | ...        | ...        |
| lawn . . . { yards                                 | ...              | ...       | ...       | ...                            | ...        | ...        |
| Printers . . . { pounds                            | ...              | ...       | ...       | ...                            | ...        | ...        |
| { yards                                            | ...              | ...       | ...       | ...                            | ...        | ...        |
| Shirtings and { pounds                             | 24,848           | 12,024    | 9,680     | 891,467                        | 196,448    | 176,375    |
| longcloth . { yards                                | 109,293          | 44,460    | 37,596    | 1,734,619                      | 1,025,669  | 632,556    |
| T-cloth, domestic, { pounds                        | 98,682           | 115,959   | 99,120    | 514,703                        | 1,320,291  | 792,224    |
| and sheetings . { yards                            | 542,788          | 676,444   | 466,778   | 2,613,609                      | 5,992,537  | 4,108,695  |
| Tens cloth . . . { pounds                          | 531              | ...       | ...       | 3,400                          | 2,063      | ...        |
| { yards                                            | 540              | ...       | ...       | 3,440                          | 2,220      | ...        |
| Other sorts . . . { pounds                         | 2,476            | 3,023     | 18,467    | 72,130                         | 89,195     | 107,505    |
| { yards                                            | 43,416           | 49,728    | 170,332   | 918,290                        | 578,594    | 1,036,520  |
| TOTAL . . . { pounds                               | 274,823          | 369,831   | 373,042   | 2,018,339                      | 2,887,025  | 2,981,892  |
| { yards                                            | 1,219,267        | 1,899,859 | 1,980,360 | 10,723,760                     | 15,261,566 | 15,687,529 |
| Coloured piece-goods { pounds                      | 36,130           | 4,273     | ...       | 92,423                         | 50,509     | 707        |
| { yards                                            | 142,939          | 40,050    | ...       | 370,512                        | 458,282    | 5,749      |
| Grey and coloured goods other than { pounds        | ...              | ...       | ...       | ...                            | ...        | ...        |
| piece-goods . . . { dozens                         | ...              | ...       | ...       | ...                            | ...        | ...        |
| Hosiery . . . pounds                               | ...              | ...       | ...       | ...                            | ...        | ...        |
| Miscellaneous . . . " . . .                        | 7,765            | 4,132     | 7,928     | 55,660                         | 41,329     | 64,475     |
| Cotton goods mixed with silk or wool . . . " . . . | ...              | ...       | ...       | ...                            | ...        | ...        |
| GRAND TOTAL . . . { " . . .                        | 318,718          | 378,236   | 380,970   | 2,166,427                      | 2,978,863  | 3,047,074  |
| { yards                                            | 1,562,206        | 1,939,903 | 1,980,360 | 11,094,272                     | 15,719,848 | 15,693,278 |

No. 6.—*DETAILED STATEMENT of the QUANTITY (in pounds and their equivalent in yards) and DESCRIPTION of WOVEN GOODS Produced—continued*

UNITED PROVINCES

| Description                                            | MONTH OF OCTOBER |           |           | SEVEN MONTHS, APRIL TO OCTOBER |            |            |            |
|--------------------------------------------------------|------------------|-----------|-----------|--------------------------------|------------|------------|------------|
|                                                        | 1916             | 1917      | 1918      | 1916                           | 1917       | 1918       |            |
| <i>Grey and bleached piece-goods—</i>                  |                  |           |           |                                |            |            |            |
| Chadars . . .                                          | { pounds         | 81,026    | 50,576    | 35,204                         | 555,836    | 351,612    | 342,030    |
|                                                        | { yards          | 309,463   | 113,157   | 75,489                         | 2,096,340  | 979,544    | 703,133    |
| Dhatis . . .                                           | { pounds         | 131,248   | 89,310    | 77,622                         | 1,662,978  | 856,727    | 564,145    |
|                                                        | { yards          | 511,731   | 498,609   | 333,819                        | 5,967,166  | 3,926,636  | 2,512,884  |
| Drills and jeans . . .                                 | { pounds         | 38,941    | 80,721    | 94,815                         | 302,575    | 504,022    | 426,075    |
|                                                        | { yards          | 96,147    | 205,152   | 236,202                        | 736,062    | 1,228,862  | 1,085,385  |
| Cambries and lawns                                     | { pounds         | ...       | ...       | ...                            | ...        | 65,432     | 102,233    |
|                                                        | { yards          | ...       | ...       | ...                            | ...        | 336,382    | 406,851    |
| Printers . . .                                         | { pounds         | ...       | 48,823    | 8,969                          | ...        | 227,897    | 36,319     |
|                                                        | { yards          | ...       | 224,909   | 45,686                         | ...        | 1,024,007  | 198,275    |
| Shirtings and longcloth                                | { pounds         | 223,877   | 132,629   | 71,864                         | 1,061,244  | 722,928    | 803,738    |
|                                                        | { yards          | 1,010,286 | 578,838   | 305,946                        | 4,623,634  | 3,238,181  | 1,392,898  |
| T-cloth, domestics and sheetings                       | { pounds         | 216,437   | 93,890    | 74,680                         | 1,365,689  | 561,434    | 514,643    |
|                                                        | { yards          | 560,451   | 207,269   | 191,675                        | 4,110,671  | 1,925,419  | 1,140,652  |
| Tent cloth . . .                                       | { pounds         | 191,157   | 349,272   | 363,106                        | 1,591,004  | 2,265,980  | 3,079,087  |
|                                                        | { yards          | 387,389   | 698,115   | 720,238                        | 3,171,716  | 5,455,009  | 6,244,427  |
| Other sorts                                            | { pounds         | 81,687    | 224,924   | 63,877                         | 413,996    | 1,341,130  | 422,194    |
|                                                        | { yards          | 312,131   | 648,241   | 205,186                        | 1,467,445  | 3,826,251  | 1,260,502  |
| TOTAL                                                  | { pounds         | 964,373   | 1,070,145 | 779,967                        | 6,922,321  | 6,897,062  | 5,790,469  |
|                                                        | { yards          | 3,190,598 | 3,174,290 | 2,114,041                      | 22,173,034 | 21,339,291 | 14,935,007 |
| Coloured piece-goods                                   | { pounds         | 4,704     | 17,446    | 50,265                         | 25,334     | 81,713     | 190,197    |
|                                                        | { yards          | 10,484    | 53,608    | 113,911                        | 59,953     | 230,384    | 470,880    |
| Grey and coloured goods other than piece-goods         | { pounds         | 13,001    | 17,531    | 13,486                         | 118,975    | 126,526    | 96,737     |
|                                                        | { dozens         | 2,166     | 1,915     | 2,549                          | 24,459     | 18,079     | 12,538     |
| Hosiery . . .                                          | { pounds         | ...       | ...       | 1,957                          | 6,921      | 627        | 7,573      |
|                                                        | { dozens         | ...       | ...       | ...                            | 3,145      | 2,332      | ...        |
| Miscellaneous Cotton goods mixed with silk or wool (a) | { pounds         | 3,596     | ...       | ...                            | 23,619     | 45,898     | 34,546     |
|                                                        | { yards          | ...       | 4,715     | 41,154                         | ...        | 184,269    | 120,579    |
| GRAND TOTAL                                            | { pounds         | 985,674   | 1,109,387 | 836,329                        | 7,100,170  | 7,286,095  | 6,239,101  |
|                                                        | { yards          | 3,201,082 | 3,227,898 | 2,237,932                      | 22,232,987 | 21,569,675 | 15,406,887 |
|                                                        | { dozens         | 2,166     | 1,915     | 2,549                          | 27,604     | 20,311     | 12,538     |

(a) Separately specified with effect from April, 1917

No. 6.—*DETAILED STATEMENT of the QUANTITY (in pounds and their equivalent in yards) and DESCRIPTION of WOVEN GOODS Produced—continued*

**AJMER-MERWARA**

| Description                                                     | MONTH OF OCTOBER |         |         | SEVEN MONTHS, APRIL TO OCTOBER |           |           |           |
|-----------------------------------------------------------------|------------------|---------|---------|--------------------------------|-----------|-----------|-----------|
|                                                                 | 1916             | 1917    | 1918    | 1916                           | 1917      | 1918      |           |
| <i>Grey and bleached piece-goods—</i>                           |                  |         |         |                                |           |           |           |
| Chadars . . .                                                   | { pounds         | 2,724   | 5,645   | 1,774                          | 52,445    | 38,220    | 23,253    |
|                                                                 | { yards          | 5,908   | 16,844  | 3,144                          | 132,237   | 90,307    | 45,715    |
| Dhatis . . .                                                    | { pounds         | 39,699  | 19,734  | 36,705                         | 487,983   | 408,129   | 536,391   |
|                                                                 | { yards          | 169,508 | 90,653  | 155,906                        | 2,581,557 | 1,736,216 | 2,217,635 |
| Drills and jeans .                                              | { pounds         | ...     | ...     | ...                            | ...       | 859       | ...       |
|                                                                 | { yards          | ...     | ...     | ...                            | ...       | 7,823     | ...       |
| Cambrics and lawns                                              | { pounds         | ...     | ...     | ...                            | ...       | ...       | ...       |
|                                                                 | { yards          | ...     | ...     | ...                            | ...       | ...       | ...       |
| Printers . . .                                                  | { pounds         | 4,937   | 4,836   | 786                            | 16,836    | 28,298    | 51,478    |
|                                                                 | { yards          | 13,310  | 12,320  | 1,953                          | 41,553    | 71,998    | 143,706   |
| Shirtings and longcloth                                         | { pounds         | 248     | 8,704   | 38,789                         | 873       | 167,083   | 151,334   |
|                                                                 | { yards          | 1,999   | 26,605  | 118,527                        | 3,486     | 527,596   | 477,630   |
| T cloth, domestic, and sheetings                                | { pounds         | 43,026  | 4,877   | 7,931                          | 346,472   | 26,487    | 17,732    |
|                                                                 | { yards          | 124,430 | 18,000  | 29,446                         | 799,622   | 95,730    | 63,902    |
| Tent cloth . . .                                                | { pounds         | 115     | ...     | ...                            | 777       | 4,528     | ...       |
|                                                                 | { yards          | 240     | ...     | ...                            | 1,588     | 9,458     | ...       |
| Other sorts . . .                                               | { pounds         | 17,026  | 18,365  | 10,743                         | 190,179   | 111,091   | 110,854   |
|                                                                 | { yards          | 61,780  | 58,184  | 31,060                         | 687,036   | 404,054   | 350,571   |
| TOTAL                                                           | { pounds         | 107,775 | 62,161  | 96,739                         | 995,568   | 784,698   | 891,042   |
|                                                                 | { yards          | 377,225 | 222,606 | 340,085                        | 4,252,079 | 2,942,182 | 3,299,209 |
| <i>Coloured piece-goods</i>                                     | { pounds         | 43      | 54      | 21                             | 2,791     | 603       | 2,805     |
|                                                                 | { yards          | 179     | 229     | 64                             | 14,785    | 2,426     | 10,338    |
| <i>Grey and coloured goods other than piece-goods</i>           | { pounds         | 10      | 4       | 2                              | 100       | 134       | 15        |
|                                                                 | { dozens         | 48      | 10      | ...                            | 154       | 321       | 1         |
| <i>Hosiery</i> . . .                                            | { pounds         | ...     | ...     | ...                            | ...       | ...       | ...       |
|                                                                 | { dozens         | ...     | ...     | ...                            | ...       | ...       | ...       |
| <i>Miscellaneous Cotton goods mixed with silk or wool</i> . . . | { pounds         | ...     | ...     | ...                            | ...       | ...       | ...       |
|                                                                 | { yards          | ...     | ...     | ...                            | ...       | ...       | ...       |
| GRAND TOTAL                                                     | { pounds         | 107,828 | 62,219  | 96,751                         | 998,459   | 785,434   | 893,862   |
|                                                                 | { yards          | 377,404 | 222,835 | 340,009                        | 4,266,864 | 2,944,618 | 3,303,547 |
|                                                                 | { dozens         | 48      | 10      | ...                            | 154       | 321       | 1         |

No. 6.—*DETAILED STATEMENT of the QUANTITY (in pounds and their equivalent in yards) and DESCRIPTION of WOVEN GOODS Produced—continued*

## PUNJAB

| Description                                    | MONTH OF OCTOBER |         |         | SEVEN MONTHS, APRIL TO OCTOBER |           |           |
|------------------------------------------------|------------------|---------|---------|--------------------------------|-----------|-----------|
|                                                | 1916             | 1917    | 1918    | 1916                           | 1917      | 1918      |
| <i>Grey and bleached piece-goods—</i>          |                  |         |         |                                |           |           |
| Chadars                                        | { pounds         | 2,003   | ...     | 53,684                         | 85        | 10        |
|                                                | { yards          | 6,011   | ...     | 139,670                        | 227       | 25        |
| Dhatis                                         | { pounds         | 9,100   | 4,748   | 27,366                         | 58,683    | 47,595    |
|                                                | { yards          | 27,900  | 15,800  | 88,494                         | 196,380   | 160,798   |
| Drills and jeans                               | { pounds         | 25      | 11      | 12,274                         | 1,023     | 129       |
|                                                | { yards          | 77      | 84      | 35,076                         | 5,681     | 791       |
| Cambrios and lawns                             | { pounds         | ...     | ...     | ...                            | ...       | ...       |
|                                                | { yards          | ...     | ...     | ...                            | ...       | ...       |
| Printers                                       | { pounds         | ...     | 8,520   | ...                            | 21,440    | 1,600     |
|                                                | { yards          | ...     | 17,800  | ...                            | 107,200   | 8,000     |
| Shirtings and longcloth                        | { pounds         | 28,037  | 19,387  | 141,693                        | 178,535   | 108,402   |
|                                                | { yards          | 130,125 | 104,098 | 729,425                        | 875,633   | 540,001   |
| T-cloth, domestics, and sheetings              | { pounds         | ...     | 9,547   | 19,537                         | 13,616    | 6,788     |
|                                                | { yards          | ...     | 29,520  | 69,101                         | 42,815    | 21,458    |
| Tent cloth                                     | { pounds         | 8,934   | 23,557  | 128,411                        | 159,464   | 72,015    |
|                                                | { yards          | 17,666  | 45,173  | 247,968                        | 305,490   | 143,682   |
| Other sorts                                    | { pounds         | 22,694  | 17,800  | 249,123                        | 188,078   | 186,022   |
|                                                | { yards          | 69,614  | 49,007  | 703,788                        | 472,940   | 525,779   |
| TOTAL                                          | { pounds         | 70,693  | 78,648  | 629,088                        | 620,924   | 418,554   |
|                                                | { yards          | 250,393 | 261,363 | 2,013,422                      | 2,005,766 | 1,400,532 |
| Coloured piece-goods                           | { pounds         | 8,680   | 6       | 169,945                        | 17,525    | ...       |
|                                                | { yards          | 44,000  | 40      | 725,308                        | 91,373    | ...       |
| Grey and coloured goods other than piece-goods | { pounds         | 12      | 15      | 1,725                          | 904       | 404       |
|                                                | { dozens         | 2       | 5       | 614                            | 242       | 21        |
| Hosiery                                        | { pounds         | ...     | ...     | ...                            | ...       | ...       |
| Miscellaneous                                  | "                | ...     | ...     | ...                            | ...       | ...       |
| Cotton goods mixed with silk or wool           | "                | ...     | ...     | ...                            | ...       | ...       |
| GRAND TOTAL                                    | { pounds         | 79,385  | 78,669  | 790,758                        | 639,353   | 418,958   |
|                                                | { yards          | 294,393 | 261,402 | 2,738,730                      | 2,097,139 | 1,400,532 |
|                                                | { dozens         | 2       | 5       | 614                            | 242       | 21        |

No. 6.—*DETAILED STATEMENT of the QUANTITY (in pounds and their equivalent in yards) and DESCRIPTION of WOVEN GOODS Produced—continued*

## DELHI

| Description                                                         | MONTH OF OCTOBER |       |        | SEVEN MONTHS, APRIL TO OCTOBER |         |         |
|---------------------------------------------------------------------|------------------|-------|--------|--------------------------------|---------|---------|
|                                                                     | 1916             | 1917  | 1918   | 1916                           | 1917    | 1918    |
| <i>Grey and bleached piece-goods—</i>                               |                  |       |        |                                |         |         |
| Chadars . . . . .                                                   | { pounds         | ...   | ...    | ...                            | ...     | ...     |
|                                                                     | { yards          | ...   | ...    | ...                            | ...     | ...     |
| Dhutis . . . . .                                                    | { pounds         | ...   | 1,296  | ...                            | 1,296   | ...     |
|                                                                     | { yards          | ...   | 3,355  | ...                            | 3,355   | ...     |
| Drills and jeans . . . . .                                          | { pounds         | ...   | ...    | ...                            | 978     | 139     |
|                                                                     | { yards          | ...   | ...    | ...                            | 1,878   | 300     |
| Cambrics and lawns . . . . .                                        | { pounds         | ...   | ...    | ...                            | 103     | ...     |
|                                                                     | { yards          | ...   | ...    | ...                            | 230     | ...     |
| Printers . . . . .                                                  | { pounds         | ...   | ...    | ...                            | ...     | ...     |
|                                                                     | { yards          | ...   | ...    | ...                            | ...     | ...     |
| Shirtings and longcloth . . . . .                                   | { pounds         | ...   | ...    | ...                            | ...     | ...     |
|                                                                     | { yards          | ...   | ...    | ...                            | ...     | ...     |
| T-cloth, domestics, and sheetings . . . . .                         | { pounds         | ...   | 10,172 | 923                            | 16,412  | 89,433  |
|                                                                     | { yards          | ...   | 25,205 | 2,289                          | 42,099  | 78,286  |
| Tent cloth . . . . .                                                | { pounds         | ...   | 27,891 | 54,610                         | 310,136 | 329,924 |
|                                                                     | { yards          | ...   | 51,332 | 110,268                        | 561,143 | 694,811 |
| Other sorts . . . . .                                               | { pounds         | 6     | ...    | 17,358                         | ...     | ...     |
|                                                                     | { yards          | 10    | ...    | 33,220                         | ...     | ...     |
| <b>TOTAL</b> . . . . .                                              | { pounds         | 6     | 39,359 | 54,610                         | 18,281  | 328,925 |
|                                                                     | { yards          | 10    | 79,892 | 110,268                        | 35,509  | 608,705 |
| <i>Coloured piece-goods</i> . . . . .                               | { pounds         | 474   | 104    | ...                            | 3,800   | 18,823  |
|                                                                     | { yards          | 2,500 | 172    | ...                            | 16,260  | 43,247  |
| <i>Grey and coloured goods other than piece-goods</i> . . . . .     | { pounds         | 788   | ...    | ...                            | 1,804   | 167     |
|                                                                     | { dozens         | 235   | ...    | ...                            | 478     | 52      |
| <i>Hosiery</i> . . . . .                                            | { pounds         | ...   | ...    | ...                            | 779     | ...     |
| <i>Miscellaneous Cotton goods mixed with silk or wool</i> . . . . . | "                | ...   | 10,178 | 26,101                         | 247     | 69,106  |
|                                                                     | "                | ...   | ...    | ...                            | ...     | ...     |
| <b>GRAND TOTAL</b> . . . . .                                        | { " yards        | 1,264 | 49,639 | 80,711                         | 24,664  | 417,023 |
|                                                                     | { dozens         | 235   | 80,064 | 110,268                        | 51,769  | 651,952 |
|                                                                     |                  | 235   | ...    | ...                            | 725     | 62      |

No. 6.— DETAILED STATEMENT of the QUANTITY (in pounds and their equivalent in yards) and DESCRIPTION of WOYEN GOODS Produced— continued

CENTRAL PROVINCES and BERAR

| Description                                    | MONTH OF OCTOBER |           |           | SEVEN MONTHS, APRIL TO OCTOBER |            |            |            |
|------------------------------------------------|------------------|-----------|-----------|--------------------------------|------------|------------|------------|
|                                                | 1916             | 1917      | 1918      | 1916                           | 1917       | 1918       |            |
| <i>Grey and bleached piece-goods—</i>          |                  |           |           |                                |            |            |            |
| Chadars . . .                                  | { pounds         | 79,103    | 99,909    | 71,307                         | 526,327    | 564,005    | 428,735    |
|                                                | { yards          | 181,198   | 248,627   | 259,045                        | 1,415,078  | 1,545,703  | 1,347,386  |
| Dhotis . . .                                   | { pounds         | 132,973   | 844,439   | 185,833                        | 2,071,918  | 2,049,680  | 2,326,681  |
|                                                | { yards          | 557,570   | 1,486,636 | 816,995                        | 8,273,520  | 8,465,871  | 10,052,010 |
| Drills and jeans . . .                         | { pounds         | 150,453   | 240,430   | 157,198                        | 1,163,371  | 1,404,634  | 1,173,431  |
|                                                | { yards          | 533,684   | 821,114   | 569,133                        | 3,383,794  | 4,894,599  | 4,266,345  |
| Cambries and lawns                             | { pounds         | ...       | 720       | ...                            | 61,743     | 7,189      | ...        |
|                                                | { yards          | ...       | 4,080     | ...                            | 211,976    | 46,615     | ...        |
| Printers . . .                                 | { pounds         | 40,692    | 81,424    | 15,188                         | 363,312    | 341,034    | 324,678    |
|                                                | { yards          | 187,736   | 155,171   | 77,120                         | 1,710,356  | 1,672,433  | 1,781,367  |
| Shirtings and longcloth                        | { pounds         | 159,896   | 158,132   | 118,703                        | 1,602,298  | 1,134,354  | 920,227    |
|                                                | { yards          | 626,881   | 669,781   | 539,470                        | 6,299,349  | 4,645,711  | 4,133,208  |
| T-cloth, domestics, and sheetings              | { pounds         | 53,674    | 107,027   | 53,098                         | 479,482    | 530,430    | 843,399    |
|                                                | { yards          | 214,567   | 435,532   | 219,586                        | 2,197,623  | 2,272,250  | 2,659,534  |
| Tent cloth . . .                               | { pounds         | 16,912    | 37,317    | 65,909                         | 188,182    | 341,659    | 636,198    |
|                                                | { yards          | 35,425    | 80,198    | 131,636                        | 457,371    | 677,084    | 1,354,733  |
| Other sorts . . .                              | { pounds         | 123,857   | 86,384    | 28,707                         | 606,564    | 352,754    | 196,173    |
|                                                | { yards          | 547,159   | 161,791   | 154,744                        | 2,949,458  | 1,598,623  | 855,238    |
| TOTAL                                          | { pounds         | 757,560   | 1,056,082 | 695,838                        | 7,052,197  | 6,725,739  | 6,848,427  |
|                                                | { yards          | 2,883,220 | 4,061,930 | 2,707,729                      | 27,448,524 | 25,821,886 | 27,449,820 |
| Coloured piece-goods                           | { pounds         | 282,514   | 386,245   | 234,850                        | 2,558,513  | 2,276,529  | 1,816,143  |
|                                                | { yards          | 1,132,581 | 1,527,848 | 987,627                        | 10,564,892 | 9,559,595  | 7,911,944  |
| Grey and coloured goods other than piece-goods | { pounds         | 2,767     | 3,583     | 24,575                         | 30,548     | 31,092     | 137,712    |
|                                                | { dozens         | 1,066     | 1,104     | 689                            | 8,658      | 9,373      | 5,541      |
| Hosiery . . .                                  | pounds           | ...       | ...       | ...                            | ...        | ...        | ...        |
| Miscellaneous . . .                            | "                | 58        | 79        | 3                              | 110,366    | 855        | 111        |
| Cotton goods mixed with silk or wool . . .     | "                | ...       | ...       | ...                            | ...        | ...        | ...        |
| GRAND TOTAL                                    | { pounds         | 1,042,897 | 1,445,989 | 955,266                        | 9,751,624  | 9,034,145  | 8,802,393  |
|                                                | { yards          | 4,016,801 | 5,539,778 | 3,695,356                      | 37,963,416 | 35,381,484 | 35,361,764 |
|                                                | { dozens         | 1,066     | 1,104     | 689                            | 8,658      | 9,373      | 5,541      |



No. 6.—**DETAILED STATEMENT of the QUANTITY (in pounds and their equivalent in yards) and DESCRIPTION of WOVEN GOODS Produced—concluded**

**TOTAL OF BRITISH INDIA**

| Description                                    | MONTH OF OCTOBER |             |             | SEVEN MONTHS, APRIL TO OCTOBER |             |             |             |
|------------------------------------------------|------------------|-------------|-------------|--------------------------------|-------------|-------------|-------------|
|                                                | 1916             | 1917        | 1918        | 1916                           | 1917        | 1918        |             |
| <i>Grey and bleached piece-goods—</i>          |                  |             |             |                                |             |             |             |
| Chadars                                        | pounds           | 1,636,518   | 1,745,037   | 485,521                        | 12,796,686  | 11,089,817  | 5,958,598   |
|                                                | yards            | 4,622,764   | 5,370,836   | 1,419,357                      | 38,862,712  | 34,490,795  | 17,110,270  |
| Dhutis                                         | pounds           | 3,533,624   | 5,121,621   | 3,190,654                      | 40,365,797  | 40,469,066  | 44,879,046  |
|                                                | yards            | 15,557,324  | 24,193,139  | 15,912,110                     | 183,418,738 | 187,404,673 | 215,406,356 |
| Drills and jeans                               | pounds           | 999,113     | 1,704,171   | 673,884                        | 8,151,564   | 12,045,805  | 7,930,357   |
|                                                | yards            | 3,743,143   | 6,572,170   | 2,305,624                      | 20,159,599  | 43,872,946  | 29,437,301  |
| Cambrias and lawns                             | pounds           | 42,111      | 125,690     | 36,540                         | 715,689     | 812,028     | 560,341     |
|                                                | yards            | 255,747     | 730,049     | 215,449                        | 4,179,861   | 4,597,683   | 3,136,571   |
| Printers                                       | pounds           | 545,968     | 289,838     | 53,863                         | 3,914,274   | 3,229,264   | 2,477,541   |
|                                                | yards            | 2,260,270   | 1,342,971   | 257,643                        | 17,209,509  | 14,575,957  | 11,436,861  |
| Shirtings and long-cloth                       | pounds           | 6,672,726   | 7,954,079   | 3,520,040                      | 53,638,982  | 56,950,073  | 45,912,241  |
|                                                | yards            | 29,430,173  | 36,245,715  | 16,166,121                     | 232,092,354 | 262,085,487 | 211,881,811 |
| T-cloth, domestic, and sheetings               | pounds           | 3,553,687   | 2,773,258   | 861,061                        | 25,050,731  | 17,048,737  | 11,943,501  |
|                                                | yards            | 14,929,212  | 9,615,517   | 4,213,624                      | 106,341,073 | 77,274,559  | 57,651,531  |
| Tent cloth                                     | pounds           | 370,688     | 897,436     | 2,253,649                      | 4,578,944   | 6,059,216   | 15,390,581  |
|                                                | yards            | 734,116     | 1,725,843   | 4,124,329                      | 8,901,160   | 13,824,482  | 23,323,829  |
| Other sorts                                    | pounds           | 677,933     | 501,365     | 806,183                        | 4,647,178   | 5,336,025   | 5,285,329   |
|                                                | yards            | 2,681,051   | 2,915,381   | 1,863,356                      | 18,446,173  | 19,597,276  | 16,343,092  |
| TOTAL                                          | pounds           | 18,032,368  | 20,712,495  | 11,901,595                     | 153,862,045 | 153,039,533 | 140,360,860 |
|                                                | yards            | 74,263,800  | 88,611,571  | 46,477,612                     | 639,611,179 | 656,223,856 | 590,727,140 |
| Coloured piece-goods                           | pounds           | 7,913,111   | 10,841,504  | 6,055,194                      | 57,995,487  | 65,004,469  | 53,129,375  |
|                                                | yards            | 35,973,740  | 47,162,855  | 24,125,069                     | 259,822,484 | 289,810,145 | 229,470,121 |
| Grey and coloured goods other than piece-goods | pounds           | 815,873     | 331,697     | 513,952                        | 1,820,484   | 2,388,557   | 2,508,585   |
|                                                | dozens           | 60,038      | 64,945      | 84,061                         | 339,884     | 457,092     | 472,605     |
| Hosiery                                        | pounds           | 35,623      | 18,714      | 9,265                          | 155,838     | 152,265     | 100,893     |
|                                                | dozens           | 28,327      | 12,685      | 3,673                          | 115,637     | 108,220     | 66,367      |
| Miscellaneous                                  | pounds           | 66,978      | 134,227     | 106,952                        | 565,678     | 717,136     | 919,136     |
| Cotton goods mixed with silk or wool (a)       | "                | ..          | 12,202      | 57,603                         | ..          | 197,053     | 185,968     |
|                                                | "                | 26,362,955  | 31,850,839  | 18,644,562                     | 214,399,532 | 222,499,013 | 197,504,817 |
| GRAND TOTAL                                    | yards            | 110,237,540 | 135,764,426 | 70,602,671                     | 999,433,683 | 946,034,033 | 820,197,261 |
|                                                | dozens           | 88,365      | 77,630      | 87,734                         | 505,621     | 565,312     | 538,972     |

(a) Separately specified with effect from April, 1917

No. 7.—DETAILED STATEMENT of the QUANTITY (in pounds and their equivalent in yards) and DESCRIPTION of WOVEN GOODS Produced

INDIAN STATES (a)

| Description                                              | MONTHS OF OCTOBER |           |           | SEVEN MONTHS, APRIL TO OCTOBER |            |            |
|----------------------------------------------------------|-------------------|-----------|-----------|--------------------------------|------------|------------|
|                                                          | 1916              | 1917      | 1918      | 1916                           | 1917       | 1918       |
| <i>Grey and bleached piece-goods--</i>                   |                   |           |           |                                |            |            |
| Chadars . . . { pounds                                   | 80,835            | 67,574    | 13,592    | 559,719                        | 471,577    | 805,880    |
| { yards                                                  | 202,685           | 170,017   | 40,420    | 1,407,487                      | 1,475,158  | 884,897    |
| Dhulis . . . { pounds                                    | 168,625           | 298,624   | 86,105    | 2,033,351                      | 2,292,469  | 2,280,282  |
| { yards                                                  | 729,949           | 1,315,850 | 396,767   | 8,765,571                      | 9,799,117  | 9,782,151  |
| Drills and jeans . { pounds                              | 23,492            | 56,307    | 16,008    | 389,005                        | 504,502    | 1,297,183  |
| { yards                                                  | 72,958            | 223,001   | 50,258    | 1,521,617                      | 1,665,365  | 4,832,345  |
| Cambrics and lawns { pounds                              | 3,000             | 36,446    | ...       | 4,938                          | 106,238    | 2,437      |
| { yards                                                  | 10,000            | 150,211   | ...       | 16,842                         | 428,567    | 10,816     |
| Printers . . . { pounds                                  | 42,844            | 66,828    | ...       | 416,278                        | 511,973    | 532,677    |
| { yards                                                  | 215,872           | 285,996   | ...       | 1,735,655                      | 2,061,445  | 2,023,699  |
| Shirtings and longcloth { pounds                         | 604,319           | 496,944   | 222,118   | 4,416,060                      | 4,199,531  | 2,475,252  |
| { yards                                                  | 2,477,237         | 2,113,997 | 983,779   | 17,566,530                     | 17,525,827 | 10,733,750 |
| T-cloth, domestics, and sheetings { pounds               | 352,387           | 395,059   | 452,983   | 2,666,953                      | 2,501,738  | 3,252,677  |
| { yards                                                  | 1,105,218         | 1,272,941 | 1,492,566 | 8,714,631                      | 8,423,138  | 10,309,159 |
| Tent cloth . . . { pounds                                | 21,479            | 13,519    | 45,455    | 116,448                        | 230,213    | 229,056    |
| { yards                                                  | 72,148            | 36,129    | 65,515    | 415,234                        | 586,459    | 349,104    |
| Other sorts . . . { pounds                               | 102,525           | 59,704    | 192,026   | 887,109                        | 402,955    | 1,398,033  |
| { yards                                                  | 466,842           | 204,378   | 706,932   | 2,913,812                      | 1,350,081  | 4,780,040  |
| TOTAL . . . { pounds                                     | 1,404,508         | 1,436,105 | 1,029,287 | 11,989,861                     | 11,221,196 | 11,773,477 |
| { yards                                                  | 5,352,909         | 5,772,520 | 3,736,237 | 43,057,202                     | 43,317,057 | 43,685,961 |
| Coloured piece-goods { pounds                            | 299,560           | 185,648   | 188,260   | 2,461,280                      | 1,696,043  | 909,410    |
| { yards                                                  | 1,260,402         | 927,948   | 691,666   | 10,293,253                     | 7,159,328  | 3,586,688  |
| Grey and coloured goods, other than piece-goods { pounds | 899               | 3,979     | 175       | 18,035                         | 25,092     | 20,658     |
| { dozens                                                 | 168               | 700       | 36        | 2,245                          | 4,571      | 4,207      |
| Hosiery . . . { pounds                                   | 12,886            | 9,902     | 3,496     | 87,949                         | 52,140     | 54,766     |
| { dozens                                                 | 3,512             | 3,506     | 1,329     | 26,947                         | 18,216     | 21,940     |
| Miscellaneous . . . { pounds                             | 3,925             | 49,055    | 24,956    | 35,414                         | 284,042    | 200,977    |
| Cotton goods mixed with silk or wool . . . { pounds      | ...               | ...       | ...       | ...                            | ...        | 240        |
| { yards                                                  | 1,722,776         | 1,734,689 | 1,246,174 | 13,992,536                     | 13,278,513 | 12,959,528 |
| { dozens                                                 | 6,613,311         | 6,700,468 | 4,327,903 | 53,290,456                     | 50,476,485 | 47,272,649 |
| GRAND TOTAL . . . { pounds                               | 8,678             | 4,206     | 1,865     | 29,192                         | 22,787     | 26,147     |
| { yards                                                  | 6,613,311         | 6,700,468 | 4,327,903 | 53,290,456                     | 50,476,485 | 47,272,649 |
| { dozens                                                 | 8,678             | 4,206     | 1,865     | 29,192                         | 22,787     | 26,147     |

(a) See notes at foot of table No. 2

No. 8.—*DETAILED STATEMENT of the QUANTITY (in pounds and their equivalent in yards) and DESCRIPTION of WOVEN GOODS Produced*

**GRAND TOTAL INDIA (British India and Indian States)**

| Description                                                                      | MONTH OF OCTOBER |             |            | SEVEN MONTHS, APRIL TO OCTOBER |             |             |
|----------------------------------------------------------------------------------|------------------|-------------|------------|--------------------------------|-------------|-------------|
|                                                                                  | 1916             | 1917        | 1918       | 1916                           | 1917        | 1918        |
| <i>Grey and bleached piece-goods—</i>                                            |                  |             |            |                                |             |             |
| Chadars . . . . . { pounds                                                       | 1,727,353        | 1,812,611   | 499,113    | 13,358,405                     | 11,560,594  | 6,264,476   |
| { yards                                                                          | 4,825,449        | 5,440,553   | 1,459,777  | 40,270,199                     | 35,965,963  | 17,975,167  |
| Dhatis . . . . . { pounds                                                        | 3,702,249        | 5,415,245   | 3,276,969  | 42,399,148                     | 42,761,535  | 47,159,331  |
| { yards                                                                          | 16,287,273       | 25,508,989  | 16,308,877 | 192,164,309                    | 197,203,790 | 225,188,510 |
| Drills and jeans . . . . . { pounds                                              | 1,031,605        | 1,760,478   | 689,892    | 8,540,569                      | 12,550,307  | 9,227,540   |
| { yards                                                                          | 3,816,101        | 6,795,171   | 2,355,862  | 31,681,216                     | 45,038,311  | 34,269,650  |
| Cambrics and lawns . . . . . { pounds                                            | 45,111           | 162,136     | 36,540     | 720,827                        | 918,268     | 682,785     |
| { yards                                                                          | 265,747          | 890,290     | 215,449    | 4,196,503                      | 5,026,350   | 3,147,394   |
| Printers . . . . . { pounds                                                      | 588,812          | 356,766     | 53,863     | 4,330,552                      | 3,741,237   | 3,010,217   |
| { yards                                                                          | 2,476,142        | 1,628,967   | 357,642    | 18,945,167                     | 16,637,432  | 13,460,065  |
| Shirtings and longcloth . . . . . { pounds                                       | 7,277,045        | 8,451,023   | 3,742,158  | 58,055,042                     | 61,149,804  | 48,387,498  |
| { yards                                                                          | 31,957,410       | 38,369,712  | 17,149,900 | 249,658,884                    | 279,611,314 | 222,615,561 |
| T-cloth, domestic and sheetings . . . . . { pounds                               | 3,912,074        | 2,468,317   | 1,334,044  | 27,617,684                     | 19,550,475  | 15,199,481  |
| { yards                                                                          | 16,034,430       | 10,888,458  | 5,706,190  | 115,055,704                    | 85,899,697  | 67,960,689  |
| Tent cloth . . . . . { pounds                                                    | 392,167          | 910,955     | 2,300,104  | 4,695,392                      | 6,389,431   | 15,619,645  |
| { yards                                                                          | 806,254          | 1,761,972   | 4,189,844  | 9,316,414                      | 13,410,941  | 28,672,933  |
| Other sorts . . . . . { pounds                                                   | 780,458          | 861,069     | 998,209    | 5,534,287                      | 5,738,980   | 6,683,362   |
| { yards                                                                          | 3,147,893        | 3,119,709   | 2,570,288  | 21,359,986                     | 20,947,357  | 21,123,132  |
| Total . . . . . { pounds                                                         | 19,436,874       | 22,198,600  | 12,930,882 | 165,251,906                    | 164,260,729 | 152,184,337 |
| { yards                                                                          | 79,616,709       | 94,384,091  | 50,213,849 | 682,668,387                    | 699,541,045 | 634,413,101 |
| <i>Coloured piece-goods</i> . . . . . { pounds                                   | 8,212,671        | 10,827,152  | 6,243,454  | 60,456,767                     | 87,700,512  | 54,038,785  |
| { yards                                                                          | 37,234,142       | 48,080,803  | 24,716,725 | 270,055,737                    | 296,909,473 | 233,056,809 |
| <i>Grey and coloured goods, other than piece-goods</i> . . . . . { pounds        | 316,772          | 335,676     | 614,127    | 1,638,519                      | 2,413,649   | 2,529,243   |
| { dozens                                                                         | 60,204           | 65,645      | 84,097     | 392,129                        | 461,663     | 476,912     |
| <i>Hosiery</i> . . . . . { pounds                                                | 49,509           | 28,616      | 12,761     | 243,787                        | 204,405     | 155,659     |
| { dozens                                                                         | 31,839           | 18,191      | 5,002      | 142,584                        | 126,436     | 88,307      |
| <i>Miscellaneous Cotton goods mixed with silk or wool (a)</i> . . . . . { pounds | 69,903           | 183,282     | 131,908    | 661,092                        | 1,001,178   | 1,120,113   |
| { " " }                                                                          | ...              | 12,202      | 57,604     | ...                            | 197,053     | 186,208     |
| GRAND TOTAL . . . . . { pounds                                                   | 28,065,720       | 33,585,528  | 19,890,736 | 228,892,071                    | 235,777,526 | 210,164,345 |
| { yards                                                                          | 118,850,851      | 142,464,894 | 74,930,574 | 952,724,118                    | 996,510,518 | 867,469,910 |
| { dozens                                                                         | 92,043           | 81,836      | 89,099     | 534,713                        | 688,099     | 665,119     |

(a) Separately specified with effect from April 1917

**No. 9.—STATEMENT of the AMOUNT (in rupees) of the VALUE of GOODS  
WOVEN in the COTTON MILLS in INDIA**

|                                                                                                                      | MONTH OF OCTOBER |             |             | SEVEN MONTHS, APRIL TO OCTOBER |              |              |
|----------------------------------------------------------------------------------------------------------------------|------------------|-------------|-------------|--------------------------------|--------------|--------------|
|                                                                                                                      | 1916             | 1917        | 1918        | 1916                           | 1917         | 1918         |
|                                                                                                                      | ₹                | ₹           | ₹           | ₹                              | ₹            | ₹            |
| <b>British India</b>                                                                                                 |                  |             |             |                                |              |              |
| Bombay . . . . .                                                                                                     | —                | 1,87,19,703 | 1,90,64,451 | —                              | 13,08,82,276 | 21,75,77,485 |
| Madras . . . . .                                                                                                     | —                | 11,31,411   | 21,67,820   | —                              | 75,94,584    | 1,15,72,062  |
| Bengal . . . . .                                                                                                     | —                | 2,44,616    | 4,90,707    | —                              | 19,26,284    | 39,27,278    |
| United Provinces . . . . .                                                                                           | —                | 6,62,979    | 10,15,405   | —                              | 43,70,950    | 70,61,617    |
| Ajmer-Merwara . . . . .                                                                                              | —                | 27,991      | 1,21,716    | —                              | 3,54,991     | 11,21,417    |
| Punjab . . . . .                                                                                                     | —                | 48,291      | 15,205      | —                              | 3,70,505     | 4,50,069     |
| Delhi . . . . .                                                                                                      | —                | 80,036      | 82,085      | —                              | 2,48,981     | 5,27,932     |
| Central Provinces and Berar . . . . .                                                                                | —                | 9,80,421    | 12,49,280   | —                              | 61,38,796    | 1,13,43,586  |
| <b>TOTAL</b>                                                                                                         | —                | 2,18,43,448 | 2,42,06,669 | —                              | 15,18,87,367 | 25,85,81,446 |
| <b>Foreign Territory</b>                                                                                             |                  |             |             |                                |              |              |
| Indian States of Indore, Mysore, Baroda, Nandgaon, Bhavnagar, Wadhwan, Hyderabad, Gwalior (Ujjain), and Pondicherry. |                  |             |             |                                |              |              |
| <b>TOTAL</b>                                                                                                         | —                | 8,53,429*   | 9,22,115(a) | —                              | 63,14,865*   | 96,17,661    |
| <b>GRAND TOTAL</b>                                                                                                   | —                | 2,26,96,877 | 2,51,28,784 | —                              | 15,82,02,232 | 26,31,99,107 |

\* Incomplete—excluding Indore and Gwalior (Ujjain)

NOTE—Returns relating to the value of woven goods have been received from April, 1917

(a) Excluding Baroda and Hyderabad

No. 9.—STATEMENT of the AMOUNT (in rupees) of EXCISE DUTY realised from goods woven in the Cotton mills in India, under the Cotton Duties Act, II of 1880

|                                                                                                         | MONTH OF OCTOBER |                 |                  | SEVEN MONTHS, APRIL TO OCTOBER |                  |                  |
|---------------------------------------------------------------------------------------------------------|------------------|-----------------|------------------|--------------------------------|------------------|------------------|
|                                                                                                         | 1916             | 1917            | 1918             | 1916                           | 1917             | 1918             |
| <b>British India</b>                                                                                    | <i>₹</i>         | <i>₹</i>        | <i>₹</i>         | <i>₹</i>                       | <i>₹</i>         | <i>₹</i>         |
| Bombay . . . . .                                                                                        | 1,99,364         | 3,66,342        | 5,69,286         | 16,95,434                      | 24,03,177        | 53,13,72         |
| Madras . . . . .                                                                                        | 22,496           | 35,094          | 45,141           | 1,58,913                       | 2,63,244         | 4,76,30          |
| Bengal . . . . .                                                                                        | 3,532            | 8,491           | 14,019           | 31,973                         | 66,325           | 1,22,43          |
| United Provinces . . . . .                                                                              | 21,534           | 32,717          | 37,286           | 1,13,296                       | 1,55,629         | 2,46,57          |
| Ajmer-Merwara . . . . .                                                                                 | 2,161            | 897             | 4,260            | 15,641                         | 13,653           | 39,92            |
| Punjab . . . . .                                                                                        | 574              | 771             | 580              | 4,053                          | 9,493            | 17,07            |
| Delhi . . . . .                                                                                         | 58               | 1,303           | 3,554            | 693                            | 3,273            | 17,97            |
| Central Provinces and Berar . . . . .                                                                   | 30,457           | 29,108          | 56,157           | 1,76,899                       | 2,08,455         | 4,11,14          |
| <b>TOTAL, GROSS DUTY</b> . . . . .                                                                      | <b>2,80,176</b>  | <b>4,69,708</b> | <b>7,30,283</b>  | <b>21,96,902</b>               | <b>31,27,249</b> | <b>66,45,266</b> |
| <b>TOTAL, NET DUTY</b> . . . . .                                                                        | <b>2,76,580</b>  | <b>4,51,597</b> | <b>6,96,356</b>  | <b>21,67,907</b>               | <b>29,98,509</b> | <b>62,84,472</b> |
| <b>Foreign Territory</b><br>(Indian States of Indore, Mysore, Baroda, Nandgaon, Bhavnagar, and Wadhwan) |                  |                 |                  |                                |                  |                  |
| <b>GROSS DUTY</b> . . . . .                                                                             | 18,170           | 34,055          | 24,162*          | 1,47,520                       | 2,06,655         | 2,72,973         |
| <b>NET DUTY</b> . . . . .                                                                               | 18,170           | 34,055          | 24,162           | 1,47,520                       | 2,06,655         | 2,72,973         |
| <b>GRAND TOTAL, GROSS DUTY</b> . . . . .                                                                | <b>2,98,346</b>  | <b>5,03,763</b> | <b>7,54,445</b>  | <b>23,44,422</b>               | <b>33,33,904</b> | <b>69,18,233</b> |
| <b>GRAND TOTAL, NET DUTY</b> . . . . .                                                                  | <b>2,94,750</b>  | <b>4,85,652</b> | <b>7,20,518*</b> | <b>23,15,427</b>               | <b>32,05,164</b> | <b>65,57,446</b> |

NOTE.—The figures are as reported by the provincial authorities each month, and are not finally adjusted by the Accounts Department

\* Excluding Baroda.

GENTLEMEN,

If I hesitated to accept your invitation to preside at the opening of this Exhibition, the importance of the occasion must be my excuse. You called me to step into the breach, to face publicly the most tremendous question of our times and to give you my solution of a problem on which no two people agree, except that it is urgent.

But I do not think that we realise how urgent it is. Famine, increasing poverty, wide-spread disease, all these bring home to us the fact that there is some radical weakness in our system and that something must be done to remedy it. But there is another and a larger aspect of the matter and that is that this economic problem is our last ordeal as a people. *It is our last chance.*

Fail there and what can the future bring us? We can only grow poorer and weaker, more dependent on foreign help; we must watch our industrial freedom fall into extinction and drag out a miserable existence as the hewers of wood and drawers of water to any foreign power which happens to be our master.

Solve that problem and you have a great future before you, the future of a great people, worthy of your ancestors and of your old position among the nations.

Two years ago I stood looking at the wonders of that Paris Exhibition, great Exhibition at which summed up in so striking a manner, the progress of a century in Civilization, Industry and Commerce. If I were asked what struck me most in that noble and artistic effort of a great nation, I should answer—the magnificent proportions and excellent management of the undertaking, so vast in conception and admirable in execution, the efficiency of the orderly and illuminating arrangement and care-

ful accuracy of detail, and after that, the extraordinary ingenuity displayed in the educational section in methods and appliances; and not only the ingenuity but the thoroughness of these methods especially in the exhibits of Germany and America. But besides these two special exhibits, that which struck me most profoundly was the enormous difference between India and Europe to-day. Those vast halls crowded with shining steel work, the fruits of the combined Industry and genius of a dozen nations: the amazing richness of texture and delicacy of design in the products of those machines; the vigorous life and aspiration which glowed in the Art, as well as the clear precision of the knowledge reflected in the Science, all this impressed me more than I can say. But beyond all this triumph of Man over Nature and her powers, one fact struck me with a curious emphasis,—the enormous gulf which separates the European and the Native of India, in their ideas of comfort.

There rose up before me the interior of a typical Indian home, and as I contrasted it with the truly surprising inventions around me, all devoted to that one object, refinement, our much boasted simplicity seemed bare and meagre beyond description. I contrasted those empty rooms,—without even a chair or a table,—with the luxury, the conveniences, which are the necessaries of a European cottage. My mind went back to the Bazar in my own City of Baroda, the craftsmen working at their old isolated trades with the methods which have sufficed them for centuries without a change, the low irregular houses, the dreamy life drifting between them, and then contrasted it all with this keen and merciless tide which was sweeping and eddying around me, drawing its needs from a thousand machines like these and gathering its comforts from the four quarters of the Globe. And with the contrast I had a vivid sense of the enormous gulf, which we have to bridge over, before India can be said to be on the same plane as the European Nations.

And yet, I thought, there is a change coming over India. The appearance of our houses is being altered by

the revolution which is being made in their furniture. It is slow, for here are many who deplore it and speak of it in tones of regret as a process of denationalisation and a fall from simplicity to a burdensome and costly luxury. But the change is rather in the direction in which the money is spent. Our fathers made up by opulence of material for the poverty of convenience. The futility of such regrets is shown by the fact, that most of these eulogists of the past show in their own houses, even if only in a slight degree, the effects of the tendency which they deplore. I do not mean that we should dispense with simplicity; but let it be a wise moderation in the midst of plenty, not the fatalistic acceptance of poverty as a virtue in itself. And there can be no doubt that this tendency which is now in its initial stage, will grow in strength with the course of years, until with the necessary differences due to climate and other environments it brings us approximately near to the Western model of living.

But this model is a rich and costly model; to maintain it requires easy circumstances and a large diffusion of wealth. A poor country cannot meet its demands. A country without flourishing manufactures must always be a poor country. The future, therefore, imperatively claims this from us, that we shall cease to be a purely agricultural country and vindicate for ourselves some place at least among commercial and manufacturing nations. Otherwise we shall only establish for ourselves the unhappiness of unsatisfied cravings and the benumbing effects of an ideal to which we can make no approach. The cravings must be there, they are inevitable and essential, to progress. To attempt to discourage them for political reasons or from social or religious conservatism is unjust and unwise and must eventually prove futile. The true policy is to provide that the cravings shall find means of encouragement; in other words to encourage and assist the commercial development of the country and so put it on the only possible road to progress, opulence, and prosperity.



## SUPPOSED INFERIORITY OF TROPICAL RACES.

There is a theory which affects to regard the races inhabiting the tropical and subtropical regions of the earth, as disinherited by some mysterious law of Nature from all hope of originality, enterprise and leadership. These things belong to the temperate regions ; the tropics are to be forever no more than the field for the energies of the superior races, to whom alone belong empire, civilization, trade and manufacture. We are to be restricted to a humble subordination, a servile imitation and the production of raw materials for their markets.

At first sight there seems to be some justification for this theory in existing facts. Our trade is in European hands, our industries are for the most part not our own, our Railways are built, owned and managed, by European energy and capital. The Government is European and it is from Europe that we imitate all that we call civilization. Our immobile and disorganized society compares ill with the enlightened energy and cohesion of Europe ; even at our best we seem to be only the hands that execute, not the head that originates.

Yet even if we accept this picture of ourselves without the necessary modifications we need not accept this interpretation of inherent inferiority. For my part I demur to any such hasty generalisation; but however much of this be true be sure that there is no law of Nature which can prevent you from changing it. To suppose that any nation can be shut out from the operation of the law of Evolution is utterly unscientific, and, in the light of History, absurd.

Granted that originality among us is low, that enterprise is deficient, and that leadership has passed out of our hands ; is there in the first place no qualification to the entire truth of the assertion ? And in the second, is this state

Hastiness of the theory.

Reasons for disbelieving it.

of things due to immutable causes and therefore of old existence, or is it the result of recent and removable tendencies? It is true that such originality and power as we still possess has hitherto busied itself mostly in other paths than those of Industry and the Sciences which help Industry; it has worked chiefly on the lines of religion and philosophy which have always been the characteristic bent of the national mind, continuing through Rammohan Rây, Dayanand Saraswati and Keshavchandra Sen, the long and unbroken line of great religious teachers from Goutama to Chaitanya and Kabir. It is true that teachings of fatalism and inactive detachment have depressed the vitality of the people. Yet there is no reason to believe that this depression and this limitation are not removable and are constitutional.

But it is not only in Religion that we were great. We had amongst us brave soldiers like Shivaji, Hyderali, Mahadji Scindbia and Ranjitsing. Can we not again claim to have had an important share in the establishment of that mighty structure—the Indian Empire—erected indeed by the clear sighted energy and practical genius of England, but on the foundations of Indian patience, Indian blood and Indian capital?

It is not an insignificant symptom that considering how recent and meagre is Scientific Education in India, we should be able to show at least some names that are familiar to European Scientists, not to speak of others enjoying a deserved reputation among ourselves. Small as the circumstance may seem it is yet enough to overthrow the theory of constitutional incapacity. And if we consider classes rather than individuals, can it be denied that the Parsees are an enterprising and industrially capable race? Or can it be doubted that the community which could produce a leader in industry and philanthropy like Mr. Tata, will, as circumstances improve, take a leading place in the commercial world? Or can enterprise and commercial capacity

be denied to classes like the Bhatias, Khojas and the merchants of Sindh ?

When we have individuals and classes like these in our midst we may well inquire, why is it that we stand so poorly in Industry and Commerce, without fearing that the answer, however ungrateful to our feelings, will lead us to despair.

But if this theory of the inferiority of the tropical races be untrue, if we find that in the past we had great men whose influence is with us even to-day, we must look for some other cause for the difference and ask what is it that India has not to-day, but which she had in that older stage of her history and which Europe has at the present day.

We have not far to seek; it is obviously that clear and practical examination of Life and Nature which men call Science, and its application to the needs of Life which men call Industry, in which we are deficient and in which Europe excels. And if we question the past we learn that this is exactly what has not come down to us through the ages along with our Religion and Philosophy.

Our early history is scanty and, in many respects, uncertain; but no uncertainty, no scantiness can do away with the fact that this was once a great commercial people. We see a very wealthy nation with organised guilds of artisans, a flourishing inland commerce, a large Export and Import trade. We hear of busy and flourishing ports through which the manufactures of India flowed out to Europe, to Arabia and Persia, and from which, in those early times we sent out our delicate cotton textures, our chintz and muslin, our silk cloth and silk thread, a fine quality of steel; indigo, sugar, spices and drugs; diamonds, ivory and gold. In return we received brass, tin and lead, coral, glass, antimony; woollen cloth and wines from Italy, and also specie and bullion.

THE REVIVAL OF INDUSTRY

AN ADDRESS

DELIVERED BY

His Highness the Maharaja Gaekwar

OF

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AT THE OPENING OF THE INDUSTRIAL EXHIBITION

AT

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All through the Middle Ages, our manufactures and industries were at a very high level. Every traveller attests the existence of large and flourishing towns, ( a sure index of industrial prosperity), and praises the skill and ingenuity of our workmen. It is on the Eastern trade that Venice builds her greatness, for, then we were indeed the "Gorgeous East". Notice, that it is especially in the manufactures which required delicate work, originality of design, or instinctive taste that our products were famous; our carving, our inlaid work and our gossamer cloth.

Coming now to the earlier part of the last century, what do we find? The carrying trade has passed from the Arabs to the East India Company and with it too, the control of nearly all our exports, especially those in Indigo, Iron and Steel, and the newly imported industries in Tobacco, Tea and Coffee. But there is still a large body of trade in Indian hands; even then our manufactures held their own and were far superior to those of Europe; even then there were thousands of skilled artisans; we supplied our own wants and exported enormous quantities of goods to other countries. Where, then, has all this trade gone and what has caused our decline?

The most obvious answer is, as I have said, the difference between Europe and India in Industrial methods and appliances. But this is not quite sufficient to explain it. A deeper examination of the facts at our disposal shows that the life had left Indian Industry before Europe had brought her machines to any remarkable development, and long before those wonderful changes which the application of Chemistry and Electricity have more recently wrought in Industry. Nor can we ascribe it to a superiority which England possessed in Industrial and Technical Education for at that time there was no such training and England has never relied on it for commercial capacity. If we go a little deeper into the matter we find that there is a further reason which does not depend on the natural working of

economic laws but which is political in its nature, the result of the acquisition of political power by the East India Company and the absorption of India into the growing British Empire.

As Mr. Dutt shows in his able *Economic History of British India*, this political change had the gravest effect on our economic life. In the first place we have the economic policy of the East India Company which, so far as its export trade was concerned, accepted manufactures indeed, but paid an equal, if not greater, attention to raw materials. Even our internal trade was taken from us by the policy of the East India Company; there were heavy transit dues on all inland commerce and there were commercial Residents in every part of the Company's possessions; who managed to control the work of the local artisans, and so thoroughly that outside their factories all manufacture came to an end.

On this came the protective policy of the British Government, which, despite the powerful interests of the East India Company, crushed Indian manufactures by prohibitive import duties; and then the application of steam to manufactures. It is scarcely to be wondered at then if with all this against us at home and abroad, our manufactures declined and with the great advance in the improvement in machinery and the initiation of a Free Trade Policy, this decline was hastened into ruin.

Moreover, a country not exporting manufactures is necessarily stagnant and commercial progress and self-adaptability cease. Once the manufacturing superiority of India had been transferred to England, it was impossible for the weaker country to recover its position without some measure of protection. Not only was the struggle in itself unequal but the spectacle of a mighty commerce, overshadowing and dominating ours, flooding our markets and taking away our produce for its own factories, induced a profound dejection, hopelessness and inertia among our people. Unable to re-act against that dominating force we came to believe that the

inability was constitutional and inherent in ourselves; there is a tendency in fact to hypnotise ourselves into apathy by continual repetition of the formula that Indians, as a race, are lacking in enterprise, deficient in business faculties, barren in organising power. If, therefore, I have dwelt upon our old manufactures and commerce and the way in which they were crushed, it is not with the unprofitable object of airing an old grievance, but in order to point out that there is no reason for this discouraging view of ourselves. We were a trading and manufacturing country from ancient times down to the present century and if our manufactures have fallen into decay, our commerce languished, it was under a burden which would have crushed the most flourishing industry of the most energetic people.

Our weakness lies in this that we have for many years lain prostrate under the fictitious sense of our own helplessness and made no adequate attempt to react against our circumstances. We have succumbed where we should have exhausted every possibility of resistance and remedy. We have allowed the homekeeping propensities and the out-of-date semi-religious prejudices, which have gathered round the institution of Caste, to prevent us from choosing the line of activity most consonant with our abilities, or from seeking other lands in search of fresh markets and the knowledge of new industries. The restriction against foreign travel is one of the most serious obstacles in the way of commercial success and must be utterly swept away, if we are not to go on stagnating. It is a pity that communities like the Bhatias should be restrained by an out-worn prejudice from going abroad and furthering that task of development for which they are so admirably fitted. The endeavours hitherto made have been, with few exceptions, sporadic, half-hearted and prematurely abandoned; and the support given to them by the public has been scanty, wanting in confidence and in personal and active interest. It is this state of things which must cease before we can hope to revive our old manufactures, to establish firmly and extend those, which exist;

and to set on foot any new industries which our needs demand, and for which the conditions offer sufficient opportunity; then India may again be what she was in the past and what she is so admirably fitted by nature to be, a self-sufficing country, famous for artistic and useful industries; and to raise her again to this should be the ideal of every patriotic citizen. But in order that the ideal may be realised we need, first, knowledge of our possibilities, of the means and facilities necessary to success, and of the lines on which activity would be best repaid, and secondly, belief in ourselves and in each other so that our knowledge may not fail for want of co-operation.

If we get these, if we realise the progress of Science and Mechanical Invention and resolutely part with old and antiquated methods of work, if we liberate ourselves from hampering customs and superstitions, none of which are an essential part of our religion, if, instead of being dazed in imagination by the progress of Europe, we learn to examine it intelligently, and meet it with our own progress, there will be no reason for us to despair; but if we fail in this we must not hope to occupy a place in the civilized and progressive world.

To speak with any fulness on this subject is not possible within the short limit of time at my disposal. I shall, therefore, pass lightly over a few salient points; for, the lines of activity, open to us and calling for our energies, are unlimited in their extent, variety and promise. This country is not poor in its resources, but may rather be said to be blessed by Nature in many respects; its mineral wealth is anything but contemptible; its soil produces valuable and useful products in great variety and abundance; the provision of water power is also unstinted. We have an excess of cheap labour and we have hereditary artisans who are quick in hand and eye, and who only need to be properly trained to make them the equals, if not the superiors, of their rivals. If there are certain serious



disadvantages and defects in its mineral wealth such as the inferiority of its coal supplies, and in its vegetable products, such as the greater coarseness of its cotton and the difficulty of growing the finest silk, yet so great is the advance Science has made that we need not despair of meeting some of these difficulties at least in part. Nor is there any imperative necessity that we should always vie with other countries in producing the very best. If we utilise to the best advantage what nature has given us and advance in such manufactures as the country is fitted for, we shall have done no inconsiderable task. What is required is greater knowledge, a more earnest endeavour of the Government towards improvement and the provision of facilities, and more serious activity on the part of the people to take advantage of such facilities as already exist—improvement in Agriculture, facilities in Industries; for in a country like India, which produces or can produce the bulk of its own raw material, the agricultural question cannot be separated from the industrial.

#### **AGRICULTURE.**

Improvement in Agriculture is necessary to secure an increased quantity and improved quality of the produce of our fields. What Science can do for Agriculture the development of the Beet-sugar industry and the improvement of Cotton clearly show; and as Sugar and Cotton are two of the most important of our products and especially of our export trade I wish to call your attention to what has been done by our rivals.

Beet-sugar cultivation has been gradually developed by careful selection of the best roots and the application of Agricultural Chemistry, until the percentage of Saccharine has been doubled and trebled. Here is the remedy for Indian sugar. We must not be ashamed to borrow our rivals' tactics, but strive hard to get the very best canes and take care to use nothing but the very best methods of cultivation and manufacture.

The same is true of Cotton. It is certain that the competition which Indian Cotton has to meet will be much intensified in the near future; and our only hope of meeting it successfully is to improve our indigenous varieties up to a point at which they can hold their own. I believe that we can do this, but it demands the most patient research, and above all, that when the best variety has been discovered the cultivator will really grow it.

Science is our great hope, but there is one great obstacle to be overcome before Science can help us, and that is the ignorance and apathy which is the general condition of the agricultural classes at present.

The failure of the old arts and crafts, and especially that of arms, has thrown vast numbers back on the soil and these classes are neither intelligent nor progressive. Many old professions are dying out and while those, who should have followed them, go back to the land, many of these professions are not such as to provide any hereditary capacity for Agriculture. It is not to be wondered at, therefore, if our Indian cultivators, despite their traditional skill, are neither enterprising nor capable of undertaking improvements, which demand considerable energy and foresight. Their methods, despite Dr. Voelcker's high encomiums, are backward, their resources are very limited, and their implements, though they may be those best suited to their narrow means and small holdings, are old and economically wasteful. But their most serious drawback is their helplessness. There is a general complaint that the soil is deteriorating, but that they can do nothing to remedy it; and in times of scarcity and famine they seem incapable of doing anything to help themselves. This is a most serious question and one which demands all our attention.

In the first place this deterioration of the soil is a very real danger. Do you know that the average product per acre has in some parts of the country diminished by

50 per cent since the middle of the seventeenth Century, when the Ain-i-Akbari was compiled? Is it any wonder that the peasant grows poorer, or that his resources diminish?

Improvement. Our remedies must fall under two heads:—

- (1) The improvement of methods, implements and general conditions and—
- (2) Education.

Implements. In the first place the attempts to introduce new implements have nearly all failed. Iron flails and threshing machines have been tried at one time or another but the ryot will have none of them. At the same time this does not mean that the old implements are the very best that the wit of man can devise, or that we are to suppose that failure is conclusive.

Cattle breeding. Another matter to which Government has given some attention has been Cattle-breeding. The results so far have not been encouraging, though there are Government farms at Hissar and at Bhadgaum in Khandesh, and another called the Amrit Mahal, maintained by the Mysore Government, from which are derived certain superior breeds of cattle to be found in the Madras Presidency.

But until we can get the co-operation of the people the results must be disappointing. Nevertheless, I think that there is a great deal of good work to be done on these lines and I am of opinion that besides improving the breed of cattle, much might be done in the way of encouraging the ryots to breed other stock, such as horses, mules, etc. It is a thousand pities that our Indian breeds of horses should be dying out and that there seems to be no sensible effort made to keep them alive. Perhaps the chief reason that Government breeding farms have failed is that they

are too elaborate for the people in their present condition. I believe that much might be done by reviving the old custom of keeping sacred bulls in every village and taking care that the bulls supplied were the best that could be procured, or if the cultivator could be persuaded to breed only from the best animals. One advantage of this scheme is that it can be carried out by private enterprise.

Instead of helping ourselves we always depend upon Government; here is an instance where the people can, with advantage, help themselves. To it I would add the planting of trees, which are of economic value, round the cultivators' fields and the encouragement of the Fibrous plants which are now articles of commerce; the question of good drainage to relieve the bad effects of Irrigation and besides that, a serious endeavour to help the ryot to sow only the best seed and to pay some attention to the best rotation of crops.

But in a country like India, where the introduction of improved implements is so limited in its possibilities and where everything depends upon the timeliness and sufficiency of the annual rains, it is Irrigation that must necessarily take the largest place in all plans for agricultural improvement. This importance of Irrigation has been recognized by the successive Rulers of this country from the times of the ancient Hindu Kings. From the days of Asoka, and before him, the digging of wells and tanks had been the subject of royal edicts and one of the first religious duties of Princes, Zemindars and wealthy philanthropists. The number of small tanks in ruins that one finds in the districts, the multitude of old wells that still exist round about Mahomedan capitals, above all, the immense system of artificial reservoirs in the Madras Presidency bear testimony to the steady persistence of this old tradition of administrative benevolence. In the Southern Presidency there are over 6,000 tanks mainly of native origin, the magnitude of which will be best remembered when it is

understood that the embankments measure over 30,000 miles with 300,000 separate masonry works and that these tanks irrigate over 34 lacs of acres, an area almost equal to that irrigated by the entire system of the major and minor works of the Madras Presidency. These works were getting out of repair in the troublous times of the eighteenth century, when general disorder and mal-administration, the usual concomitants of any violent change in the form of Government, prevailed in our country. The British Government when they occupied the country, with their characteristic administrative energy, not only put them in order, but in many cases improved and enlarged them. They have brought, or kept under irrigation, an area of little less than 20 millions of acres at the cost of 42 crores of Rupees; and the work has been done with so much judgment and success that the works yield a profit of nearly 7 per cent. and the produce raised equals 98 per cent. of the total capital outlay. Not content with this they are now undertaking to prepare and gradually execute a scheme of protective works which, when complete, ought to do much to insure the country against famine. The work in Irrigation will always be one of the most splendid and irreproachable chapters in the history of British rule.

The proposed extension of irrigation works would also offer to the capitalists of the country a very eligible field for the investment of their surplus savings. If the people only co-operate they would find Irrigation Projects a very profitable channel for investment; and if they fail to take advantage of the favourable opportunity one need not be surprised if European capital is extensively employed in their development as has been done in the case of Railways in India. I trust the Government on its part, will also offer more than usual inducements to attract private Indian capital in these profitable undertakings.

Besides great irrigation works there is another way in which much might be done to protect the country against drought, that is, by encouraging the digging of wells. This

Wells.

is a method well adapted for States which have no facilities for works on a grand scale. In my own territories I have found that the advance of Tagavi, for this purpose, was a measure which the cultivator could understand, and, under the guidance of experienced officers, one which worked well. At the same time large irrigation works have been commenced in various parts of the territory and a survey is being made for the repair of old tanks and the utilization of favourable spots for the storage of water.

But it must not be forgotten that Irrigation will not end all our troubles. Indeed, unless it is accompanied by a considerable measure of intelligence and foresight, it brings others in its train, such as the debilitation of the soil. The remedy for this is, of course, the use of artificial manures which will restore to the soil some of the qualities which are removed from it by over-irrigation. But here we are at once faced by our usual want of foresight and ignorance of which I have already spoken. In the face of the deterioration of the soil, which I have mentioned as a wide-spread evil, widely acknowledged, it is inconceivable to me that we should seek to encourage the export of cotton-seeds, on which so much of the efficiency of the simple manure, which we use here in Guzerat, depends. Yet the value of this export has risen in one year from five to fifty lacs of Rupees, and it is certain that at this rate the cattle will have to go without it and that their manure will become practically valueless. An artificial manure is, therefore, a crying necessity.

Another point is the growth of deep-rooted grasses which can resist drought and so prevent the terrible mortality of cattle which was so painfully marked in the late famine. We must follow the example of Australia in this matter and find indigenous deep-rooted grasses which we can plant systematically on waste land and then, when we are cursed with another season of drought, we shall have something to meet it with.

But before we can hope that the ryot will try to employ measures which demand a high level of intelligence and scientific knowledge, we must awaken his curiosity and enlist his sympathy, which can only be done by a good system of general education. Without it our best endeavours are bound to fail. Government has established Agricultural colleges and model farms in different parts of the country, but Agriculture has been but little improved in consequence. Partly, I think, this is due to the vastness of the area and the great variety of local conditions, for each district has its own difficulties to meet and overcome. But the main reason for the failure is I believe, the indifference and apathy of the people themselves. Another reason is the fact that these measures have come from outside and not from the people. However imperfect our education may be it is equally lamentable that it has so far affected no more than five per cent. of the population of the country. Before any noticeable change can take place there must be a general feeling among the people that improvement must be made and a desire to take advantage of the efforts of Government to help them. At present, they are more inclined to laugh at our attempts to aid them than to help us by their advice and showing us where their real difficulties lie. Their criticism, as a rule, is more destructive than educative.

I have found it possible to do something to improve the more backward classes of cultivators by sending more intelligent ryots to show them better methods of cultivation; and the school for the Dhankas at Songad has been more or less successful. But these measures only serve to raise the internal level of the lower agriculture up to the highest of our present system, while the problem is to raise the general level.

Perhaps something might be done by agricultural associations which studied local requirements and popularised such improvements as admitted of practical application.

But I believe the only change, which would do much, would be to induce a more intelligent and enterprising class to engage in agriculture.

Over and above all this it is very important that our agriculturists should have cottage industries or some work on which they can usefully engage themselves and the members of their family during the slack season of agriculture. Such would be wood-carving and the making of toys for the men, and for the women, needle work and embroidery.

#### MANUFACTURES.

I do not think we should stop short at improving our raw materials; I believe we might do much in the way of working them up. The annual review of the Trade of India published by the Statistical Department of the Government of India teaches us some wholesome lessons, which it would be always useful to remember. They show the large number of objects for which we are at present dependent on foreign factories, but for which we have plenty of raw material at hand, and which, if we only avail ourselves of the latest scientific methods, we can ourselves manufacture. Our endeavour should be to reduce this dependence upon foreign industries and, where the necessary facilities do not exist for such manufactures at home, we should so improve the quality of our raw material as to enable it to hold its own in the foreign market to which it is sent out. The wheat, for instance, which we export at present, is used for the manufacture of bread in Europe, but it is scarcely fit to be turned to the many other uses to which it can be put, unless it is much improved in quality. The same remarks apply to many of the most ordinary articles of daily use, such as paper, oils, leather etc. The case of leather is peculiarly striking. We export the hides, and the materials for tanning them and that is not all. There is a cheaper and more efficient process of cleaning the hides in use in Europe



and the hides are exported to Europe to be cleaned there. Is it impossible for India to tan her own hides, in her own factories, with her own tanning materials? Another point which seems inconceivable when the need for artificial manure is remembered and that is, that we export bones in large quantities to be turned into bone-manure for the beet-fields of our rivals, and so for their sugar, which we so largely import.

Glass again is an article of which we import a large quantity every year, but which we might manufacture for ourselves. Last year we imported glass of the value of over ninety lacs of Rupees. In 1887 I made some inquiries into the matter and found that there were raw materials in plenty for the manufacture not only of rough glass, but of glass of the finest quality. I was advised that it would not pay to establish a factory, but the reasons against success were not insuperable.

I also made some enquiries into the possibility of manufacturing paper in Guzerat and discovered that there were abundant raw materials of an excellent quality to be obtained here, and that this too was quite feasible.

We have already some glass-blowing factories at Kapadwanj and in the Punjab; Paper Mills in Bombay, Poona and Bengal; Leather Tanneries in Madras, Cawnpore and Bombay; and it would be interesting to study the quantity and quality of these home products and compare them with the articles imported from abroad. We may thereby learn the difference and know how to remove their short comings and extend their sale. Experience is the only path to knowledge; comparison perfects it; it is the spirit of the age and the basis of all reform. I would suggest that, of the many manufactures which might be successful in India, it would be advisable to begin with those in which there is a steady local demand such as soap, candles, glass, furniture, nibs, carpets, etc. and afterwards extend

the field of our operations so as to include other and more elaborate articles.

To enable us to take up these manufactures we need a system of Industrial Education, and for this we have to rely very largely on the assistance of Government. But we must remember that our position is not quite that of any European country in this respect, and that our best model would probably be Japan. Now Japan, when she aimed at general and, particularly, at industrial progress, adopted three main lines on which her education, was to run. These were, first to send a number of her young men abroad, and especially to Germany, for education; secondly, to establish great colleges in Japan itself, the staff of which was at first composed of Europeans; and thirdly, to employ the services of Europeans, in the initial stages of her manufactures, under whom her people were gradually trained in efficiency.

Now I should like to call attention to the last of these first, because I think that here we have the solution of a difficulty which has been met with in the case of some industries which have recently been started. I have heard complaints that the quality of the goods turned out was not satisfactory and from what I heard, it seemed to me that perhaps the failure was due to the incompetency of the directors, or to some culpable laxness in their management, or to our having commenced the enterprise on too impracticable or ambitious a scale, or to our having lost sight of some essential conditions of success at the outset. Some industries, may require European skill and supervision to pilot them through their initial stages, and a hasty attempt to dispense with it may lead to disappointing results. But there is another aspect to this apparent incompetency; we have to learn trustworthiness, a capacity for obedience, the art of management accuracy, punctuality, method and the sense of justice, and the only school which will teach us these is a position in which they are called out by use.

To come to the second point, it is obviously impossible to send any very large proportion of our Indian youths abroad, though I think more might be done in this direction. I would appeal to Government and to our philanthropists to see if they cannot help us.

That which will help us most, however, is a largely extended system of technical and general education, such as that on which Germany has built her commercial greatness. It is of course impossible to imitate the German system exactly. But it is not impossible to provide ourselves with a system which will meet our requirements. Though private individuals may do something in the matter, a satisfactory solution of the whole question must depend upon the sympathy and generosity of the Government.

I believe that Government could not give a greater boon than such an education, and I think, I am voicing the feelings of the educated classes at large, when I say that we are confident that we have not long to wait to see our rulers grapple with this problem, with their usual energy and decision. Meanwhile we must start our factories, as best we can, and do the best with our present circumstances. I do not over-look the fact that the odds against us are heavy and that our infant industries have to struggle from the start in an open market with long established competitors.

I am not afraid of being thought an economic heretic if I say that I think we need Protection. Protection. to enable our industries to reach their growth. The economic history of Germany and America shows that there is a stage in the growth of a nation when protection is necessary.

The laws of Political Economy are not inexorable and must bend to the exigencies of time and place. Theories and doctrines, however plausible, cannot take precedence of plain and practical truths. It is true that Free Trade enables a country to procure at cheaper rates those articles that can

be manufactured more conveniently in foreign lands, but this cheapness is dearly bought by the loss of industrial status, and the reduction of a whole people to a helpless proletariat. National defence against alien industrial inroads is more important than the cheapness of a few articles.

Protection, therefore if only for a short time, is what we need for our nascent manufactures; for some time must elapse before more perfect methods are naturalised in India and the standard of Indian workmanship attains the excellence of Europe. A high wall of tariffs has secured to American manufactures the home market as an undisputed field for their own development; and India, maimed and helpless as she has been, may expect that relief from her beneficent Government. Government, like the climate and geographical conditions of a country, has a peculiar force of its own and must leave an indelible impress on the mould of the destinies of nations. It may, as powerfully hamper, as promote the moral and material development of the people entrusted to its care. If the Government was backed up by a more informed and intelligent public opinion and if the people, awakened to a sense of national life, were allowed and induced to take a livelier interest in their own concerns and if they worked in unison they would conduce to mutual strength. Government is a matter of common sense and compromise and its aim should be to secure the legitimate interests of the people governed.

But at the same time I would warn you against some false methods of encouraging Industry, such as the movement to use no cloth not produced in the country. The idea is quite unsound so far as any economic results go; and the true remedy for any old industry which needs support is to study the market, find out what is wanted and improve the finish of the work and the design, until an increasing demand shows that the right direction has been found. This applies particularly to the artistic trades, such as wood-carv-

Handicrafts and  
Home Industries.

ing and metal-work for which the country has been so famous and which it would be a pity to allow to die altogether. Among other means of improvement, the education of women in decorative art would bring a fresh economic force into play; and as I ascertained by enquiries in London, made from a desire to find lucrative home-industries for our women, and especially for widows, would prove extremely profitable, if the right steps were taken. Tapestry, for instance, is a great women's industry in Switzerland; lace work, cretonne and embroidered cushions could all very well be done by women. Needle work is even now done in Guzerat homes and if the designs and colouring are improved it might be turned into an active industry, supplying our own wants and possibly, outside demands. Carpet weaving also which is now done in several of our jails, might in the same way be turned into a profitable home industry. The main thing is to study the market and not to pursue our own hobbies. It would be necessary to have agents in Europe, who would study European wants, consult professional men and get designs which could be executed in India. Something of the sort is, I believe, done in the School of Arts in Madras. My inquiries in Paris convinced me that in the hands of capable persons this method would be both practicable and profitable.

I would, however, direct your attention more to the  
 Larger Industries. establishment of the larger industries involving an extensive use of machinery, for it is upon this that our economic future and any increase of our wealth depends.

Before we have a large demand at home for the Arts we must produce the wealth to support them, and we shall never have that wealth, until we have an economic system on a much broader basis than our present limited Industry.

With a little energy and the assistance of Government we can broaden this basis and then we may look forward to

a new lease of life for Indian Art and Indian Literature and for those industries which depend on leisure and wealth.

Now I should like to say a few words on the subject of Government help. the assistance which a Government can give in developing the resources of its territories. I have indicated a few ways in which I think Government can help economic development in the direction of Education. To these I would add improvements in the means of communication and the establishment of banks and other co-operative institutions. It can also encourage merchants and manufacturers by advances of capital and by granting other facilities.

Native States in India, seriously handicapped as they are by their limited means and scope and the want of trained men, though they cannot emulate their great exemplar, the British Government, seem to limit themselves as yet, too much to the routine of administration and might do more for the material and commercial development of the country. Granted freedom of action, and with proper endeavours, I am inclined to think that many states in Central India, Rajputana and elsewhere would be able to get even more treasure out of the bowels of the earth than Mysore and Hyderabad at present obtain. But Government help has its limits.

My experience teaches me that it is very difficult for Government to provide industries for its people in the absence of a real business spirit amongst the people themselves. It is very difficult for so impersonal an entity as Government to get capable managers or to supervise its enterprises properly. I have tried various measures in my own State but I am sorry to say that the results are disappointing. A sugar-mill, a cotton-mill and an ice-factory were tried, but were not a success. A state fund for the advance of capital and other assistance to manufacturers also failed. I found that the managers were not sufficiently interested in the

scheme and not impartial in the working of it. I am convinced, however, that the fault lay not with the industries themselves but in the fact that they were State-enterprises.

I have also made an experiment in technical education. I founded an institution called the Kala-Bhavan with departments in dyeing and weaving, carpentry and mechanical engineering, and with the object of diffusing technical education I had branches of it set up in various parts of the Raj; but the response among the people was so faint that after a time the institution had to be contracted within narrower limits. Until the means of the people and the material wealth of the country expand, there can be but little demand for the work which such institutes turn out. So far, the Kala-Bhavan has done but little beyond providing skilled dyers for Bombay mills; but until the people co-operate more earnestly its utility will not be recognised. Once more it is the prevailing ignorance which hampers every movement to help the people. They are sunk in a fatalistic apathy and do not care to learn how to help themselves.

I have omitted to refer to the many endeavours made by other Native States in the same direction, not because they are not worth mentioning; the wonderful Cauvery electric power scheme and the Irrigation projects of the Mysore and Jeypore States, as well as the fine Technical School at Jeypore, are indisputably entitled to a high rank in the record of such laudable work; I have to pass them over for want of time and adequate information of all their details.

It is the general lack of education and intelligence which hampers us at every turn and has been our ruin. Once we can make education general we may hope for increased dexterity, an increased power of concentration, increased trustworthiness and quickness to discover new processes. We need these qualities in every class of Indian society. Education in England has diffused a spirit of self-reliance and a capacity for initiative; education in Germany aims

Effect of Education on Industrial efficiency.

that ough knowledge, methodical application and exact learning: but education in India has hitherto aimed only at providing a certain amount of food for thought without ever touching the mental capacity or character.

I do not think that the plea that our industries are poor for want of capital is one that can be sustained. We have more capital than we imagine to develop our resources if we would only use it. But we lack the active foresight always seeking the best investments. We prefer to hoard our savings in our women's ornaments, or to invest it in Government securities at low rates of interest, when we might be using it in ways which would be profitable to the country at large, as well as to ourselves, such as agricultural improvements, insurance of agricultural stock and the establishment of factories. And this is especially true of some Native States, which invest their surplus capital in Government securities, instead of using it in the development of the resources of their own territories.

This is not, however, our only fault. There is another fault which is nearly as fatal to any system of industry and that is our lack of confidence in ourselves and in one another.

Without self-confidence you can never do anything; you will never found an industry or build up a trade, for you have nothing to carry you through the first anxious years when the only dividend is Hope, and the best assets are unfaltering courage and faith in oneself. And without confidence in one another you will never have a credit system, and without a credit system no modern commerce can exist. It is this want of co-operation and mutual distrust which paralyses Indian industry, ruins the statesman, and discredits the individual even in his own household. I believe that this trait of our character, (though in some cases arising from our obvious defects and instances of actual misconduct among ourselves, is mainly due to the fact



that the nation has long been split up into incoherent units, but also to the ignorance and restricted vision which result from our own exclusiveness. We have denied ourselves the illuminating experience of foreign travel and are too prone to imagine that our weaknesses are confined to India. Failures and defalcations are as common in Europe, as among ourselves; and yet we allow ourselves to be too easily discouraged by such incidents. Hence arises a habit of censorious judgment, a disposition to put the worst construction on the conduct of our friends and relatives, without trying to find the truth, which destroys all trust and tolerance. Our view of the conduct of friends, of the policy of administrations, of the success and integrity of commercial undertakings, are all vitiated by a readiness to believe the worst. It is only when we learn to suspend judgment and know the man and the motive before we criticise, that we shall be able to repose trust where trust is due. We must stiffen our character and educate ourselves up to a higher moral standard.

We despair too easily. Let us remember that we must expect failures at first; but that it is those who learn from failure that succeed. Moreover as any one may learn from a survey of the present state of Industry, there is evidence that some do succeed. We have not, of course, made the most of our opportunities, but it is worth while remembering that something has been done because it shows us what it is possible to do, and encourages us to do it. If any one wishes to know, in more detail, what has been done and what might be done, he could not do better than consult Mr. Ranade's excellent book on the subject.

And now let me say a word about this Exhibition and its aims. I take it that an Exhibition is intended to draw together the scattered threads of industrial activity, so that the members of any trade may learn not only what is the latest development in their own trade, but also what other trades

are doing, and what in the other trades is likely to help them. Then it is hoped the spectacle of advance and improvement will arouse emulation and suggest new ideas and also draw industries together. But are the conditions in India such that we may hope for this? I fear not; I fear that the ryot will not come to learn from us and that there will be few craftsmen who will go away with new ideas and the memory of new processes. But we should not despair.

It should be remembered that a similar difficulty was experienced in England in connection with the Workmen's Institutes which sprang up all over the country in response to Dr. Birkbeck Hill's suggestions. The object was to provide the mechanic with lectures on his own trade; but the attempt failed from the incapacity of the working man to learn anything from the lectures. Lectures and Exhibitions bear fruit only when the people have received sufficient general education to make them mentally receptive and deft in adaptation and invention. When that goal is reached, such Exhibitions may most usefully be turned into local Museums, and if possible a syllabus of instruction attached to the Exhibits. On the other hand there is yet another function which Exhibitions perform and which is equally useful and that is their influence as general education among the classes whose intelligence is already aroused, and who go away with a new sense of what there is to learn. Life is not yet all machinery which it takes an expert to understand and there are many new ideas which the collection of the most recent efforts in Art and Science in one place can inspire, and especially is this true, if there is the comparison of the old and the new.

#### AWAKENING.

But before any of these undertakings and enterprises, which I have mentioned, can succeed India must be thoroughly awakened. Understand what this means. *It means action.* There is no reality in our social reform, our politi-

cal progress, our industrial revival, because, as you know, there is scarcely one of us who dares to act even in his own household.

You complain of an overcentralised Government, of the evils of heavy Home charges, of Inland Excise duties on cotton, of the treatment given to your emigrants, and the want of a legitimate share by the people in their own Government, and there may be much in your complaints, but until you realise that the ultimate remedy lies in your own hands and that you have to carry it out by yourselves, no external reform can help you.

That awakening, that realisation is your share of the work, you who know something of Western thought and Western methods, and who imitate much from the West. But to the bulk of the population it does not apply so simply. The masses of India are lost in a hopeless ignorance and that is why they are so intensely conservative and lacking in confidence and initiative. We cling to old customs because we do not know that they are not essential to our religion, and we dare not adopt new ideas or establish new industries because we do not know how to set about it. But there is another side to this ignorance and that is that we let our old customs hamper us and blind us to the present, because we do not understand the past.

Remember two inevitable tendencies in history, one, that no system, however perfect, however glorious, however far-reaching, can go on for two thousand years (or two hundred for that matter) without enormous changes being made in it simply by Time: the other that the Religious, the Political and Mental elements of a nation are indissolubly connected and interwoven, so that you cannot alter a single feature in one of them without changing all three. Now apply these principles to the past.

From 500 A. C. we find a steady decline in the political and mental condition of the country down to the two centuries of  
 The past.

darkness from which we emerge into the periods of the Rajputs and the Mahomedan conquest. Follow the fortunes of India down the next eight centuries and note the steady decline in Hindu power both political and mental, till we come to the time when Europeans obtain a firm footing in India and conquer the country with very slender means, meeting and conquering each problem as it arises. For fourteen hundred years the record is one of steady decline in political and mental nationality. How then can religion have fared and especially all those social institutions, which depend on Religion?

Surely it is clear that just as our trade and our political power collapsed before the attacks made upon them because they were inefficient, the other features of our system cannot have escaped degradation and that in clinging to them blindly we are clinging to the very tendencies, the very forces that have dragged us down.

The fact, that we cling so tightly to them, has only ruined them and us. Consider the effects of cumulative physical heredity on the capacity of any caste when the action, for which that caste and its institutions were designed, is taken out of its power.

Here then is the problem—to carry out a great change in this respect, to realise our ignorance and to make up our minds to face the question, how and what to change boldly and altogether. We have changed before, when it has suited our convenience, adopting details from the Mahomedans when it fell in with our wishes and many of us, even our Conservatives, are European in their tastes at times.

It is obvious that our Religion and Institutions of to-day have nothing in them except perhaps a faint shadow of their old vigour and glory on which our old greatness was founded.

India needs a great national movement in which each man will work for the nation and not for himself or for his caste, a movement carried out on common-sense lines.

It does not mean that we are to adopt a brand new system from Europe, but it does mean that we must borrow a little common-sense in our solutions of the problems of life.

We must resolutely see what we need and if we find a plain and satisfactory solution adopt it whether we have authority for it or not. Turn to the past and see what made India great and if you find anything in our present customs which does not square with what we find there, make up your minds to get rid of it boldly, without thinking that it will ruin you to do so. Study the past till you know what knowledge you can get from it which you can use in the present and add to it what the West can teach us, especially in the application of Science to the needs of life.

You, gentlemen, are the leaders of India and if you fail, she fails. Let each of you make up his mind that he will live by what his reason tells him is right, no matter whether it be opposed or approved by any sage, custom or tradition. Think and then act at once. Enough time has been wasted in waiting for Time to solve our problems. Wait no longer but strike and strike home.

We have our "ancient regime" of custom and prejudice to overcome; let us meet them by a new Liberty, Equality and Fraternity; a Liberty of action, Equality of opportunity and the Fraternity of a great national ideal. Then you may hope to see India a nation again, with a national Art and a national literature and a flourishing commerce, and then, but not till then may you demand a National Government.

I should like to pay a personal tribute to the organisers of this Exhibition, for the trouble and energy they have expended in making this collection of Indian Arts and Industry—so fine and representative a collection, and to the local authorities and their able head, Mr. Lely, the popular

Commissioner, whose name will ever be a house-hold word in Guzerat for his unfailing kindness in famine and plenty, and who has taken so encouraging an interest in this Exhibition.

Surely it is a good omen for the success of our industrial revival that this Exhibition takes place in Ahmedabad, a town long famous for its enterprise and energy and which already possesses factories and industrial connections of importance with the industrial world. If only we had a few more Ahmedabads, India would not have long to wait for a real revival of her commerce.

And last of all, I have to pray for the long life, happiness and prosperity of His Gracious Majesty the King Emperor, whose accession we are about to celebrate in so splendid a manner and whose reign will, we trust, inaugurate a new period of strong and prosperous national life for India, which will make her the brightest jewel in that Imperial Diadem.

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THE

# Presidential Address

OF

**D. B. Ambalal Sakeral Desai,**

**M. A., LL B.**

**Late Chief Justice, Baroda State.**

AT THE

**Third Industrial Conference at Surat.**

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GENTLEMEN,

I thank you sincerely for asking me to preside at this important conference. I cannot claim the practical experience of trade and industries possessed by my worthy predecessor, nor the literary eminence and broad economic outlook of Mr. Romesh Chandra Dutt, the first President. My connection with industries is indirect, and my studies in Indian Economics are somewhat recent. I beg, therefore, that you will be good enough to take an indulgent view of any shortcomings in the observations that I offer for your consideration.

The fundamental facts of our economic situation are well-known: (1) Wide-spread and chronic poverty among a large proportion of the population; (2) dense ignorance of the masses; (3) an abundance of raw materials; (4) absence of scientific and technical knowledge, and practical skill; (5) a low state of commercial enterprise; (6) a large deficiency of capital. The question that we are called upon to consider is how to evolve a state of wide-spread industrialism out of the conditions just postulated.

Some of the remedies suggested are those that have proved efficacious elsewhere; viz., a wide provision of elementary education; foundation of technical schools and scientific institutes; establishment of commercial schools, and acquisition of scientific and technical knowledge by students sent abroad. All these



are comprised under one comprehensive head, Education. The efforts made till now to supply it have been spasmodic and feeble. But strong, systematic, and sustained exertions are indispensable. They ought to be continually re-enforced by a strong national spirit, that is determined to achieve success at all costs, and is immovably steadfast in the pursuit of its high national aim of securing our industrial regeneration.

In the meanwhile we must depend for our immediate progress on our resources as they now exist. Our merchants are indeed mostly ignorant of the intricate ramifications of modern industrial conditions, their vast extent, and the foundation on which they ultimately rest. Happily there arise now and then above our economic horizon a few persons of the towering eminence of the late Mr. Jamsedji Tata; and commercial enterprise on a considerable scale has existed in Western and North-Western India from time immemorial. Our traders have penetrated into East Africa, Persia, Turkey, and eastwards into China and Japan. Merchants of Gujrat have recently gone to England and opened agencies there for the purchase of British machinery and Mill-stores. Hindu pearl merchants have lately established firms in Paris and London. The Indian Specie Bank of Bombay has quite recently opened a Branch under Indian management in the heart of the British Empire. It is to such agencies that we must look for the immediate help that we require in the shape of commercial enterprise.

### Capital.

Next to the want of commercial enterprise and industrial knowledge, the thing that stands in the way of our industrial growth is the absence of the requisite capital. Nay it may be asserted that the want of capital is now our chief desideratum. It is true that the capital now employed in our cotton industry amounts to nearly 30 *crores* of rupees. But if we remember our final aim viz., to clothe ourselves wholly with home made fabrics, we must confess that we have only made a fair beginning for a general regeneration of our industry. The great problem awaiting a practical solution is that of raising the necessary funds.

The question admits of a satisfactory solution, provided our best minds apply themselves to the task. The Rupee debt of the Government of India held in India amounts to Rs. 105 *crores*; and of this Rs. 55 *crores* are held by Indians. It may not be possible to divert all this into the channels of trade and industry, but even if we could secure for the latter purpose  $\frac{1}{4}$ th of it, say Rs. 14 *crores*, the impetus imparted to our industries would be very great. It is to be wished that Indian publicists will earnestly endeavour to create a public opinion in favour of the diversion. That it is quite within their power, I have no doubt. The higher returns of trade and industries ought to prove a strong argument in favour of the change.

There is another and a cognate source which may well be tapped by our enterprising men. The

amount deposited in the Postal Savings Banks was for the year 1904-05, Rs. 14 *crores*. Nearly 13 *crores* out of this sum were purely private Indian savings. Now if we could succeed in getting even a half of this sum, say Rs. 6 *crores*, for our commercial purposes, an amount of strength would be imparted to our industrial activity, of which we have at present no adequate conception.

The best way of fulfilling the latter purpose, as well as that of getting at the money now locked up in Government Promissory Notes, would seem to be the establishment of Banking institutions all over the land. Efforts on a small scale have already been made notably in Pona, Ahmedabad, Benares, Lucknow, Lahore and other places. But these are tiny beginnings of very large potentialities. There is no reason why every town of importance should not have a Bank of its own. These small institutions may establish connections with the bigger ones at large commercial centres, and the whole capital of the country will be thus utilized to the best advantage.

It may be here stated in passing that it is not at all a difficult thing for men of character to inaugurate such establishments. In fact the great thing to be remembered is that there is no department of business for which Indians of the middle classes are better fitted by heredity, and past traditions, than that of Banking. Practical Bank management requires just those qualities in which we excel and which we have cultivated for generations viz., patience, calculation, foresight, thrift and the like. We have further a

natural advantage over our foreign rivals in this respect viz., we possess an intimate acquaintance with local conditions, and with individual solvency.

A satisfactory beginning has already been made as regards large Banking institutions. Bombay has started two large Banks: Calcutta has launched its National Bank and Madras is following in the wake. These institutions have already proved of great value to trade; our Indian genius for banking is so far full of promise. We want now a network of small Banking establishments which will act as feeders to the bigger Banks. One of the principal functions of these small Banks will be to inspire confidence in the poorer population, and to attract the sums that now lie idle or concealed underground owing to distrust and ignorance. Education alone can finally remove the economic blindness which favours hoarding. But small well-managed Banks can do a great deal in the meanwhile.

It is clear, however, to all who take a comprehensive view of the present industrial situation, that Indian productive industry requires more capital than all the ways just mentioned can be expected to secure. The question arises whether we should resort to foreign countries for loanable capital, or prefer to wait till our resources grow equal to our wants. There is a strong feeling among a section of our people that foreign capital should be shunned. Similar was the feeling of some Japanese patriots formerly. The sentiment is natural. But our interests require that we should look at the matter from a purely business point of view. From this standpoint, the only reason-

able rule of conduct to follow is that we should freely borrow money of foreigners for industrial purposes. The Government of India has been long doing this for Railway construction. Very powerful nations go to the markets of London and Paris for war-loans, or for naval construction and also for industrial development. There is no reason why we should not do the same.

The Honourable Mr. Vithaldas, my worthy predecessor in this chair urged the same view. "We cannot" he said "do without foreign capital. It will be extremely short-sighted to reject it on sentimental grounds. We must avail ourselves of it, but we must take care that we do not pay for it more than other nations." This is sound advice. In this respect we might follow the example of our fellow-subjects of Canada. Patriotic Canadians welcome the advent of American brains and money in the development of Canada; but they naturally prefer that the work now being done by the capitalists of the United States should be shared in a vastly greater degree than now by those of their own countrymen, who have money to invest.

### **The Swadeshi Movement.**

The new propaganda termed the *Swadeshi* movement requires some remarks. The aim of this movement is the establishment of new industries in India, by means of Indian capital if possible, so that the Indian people may be, as far as is practicable, self-contained and independent of the foreign imports that now flood the land.

The justification of the movement consists in the fact that the country has been impoverished during the last century by the inroads of outside manufactures on its old industries, so that it is now unable to supply its population even with the necessaries of life. The foreign goods now imported are not economically speaking indispensable. The materials of many of them are produced in the country, and an ample supply of labour is ready to hand. The *Swadeshi* movement ultimately seeks to call into existence the directing capacity, the technical skill, and the requisite capital, so that our own labour and money may convert our raw materials into the commodities which we now import.

There is a general consensus of opinion that the endeavour to establish new industries in India is very laudable in itself. The Government of India favours it. Every new factory established, every banking institution created, every steamship launched, is hailed by men of all shades of opinion. Scholarships for obtaining technical instruction outside the country are given to a small extent by the Government of India, to a larger extent by public bodies and public spirited citizens, while many enterprising and high-spirited youths go abroad at their own expense to acquire high technical proficiency. So far there is no radical difference of opinion.

Honest and patriotic men all over the country are trying their best to induce our countrymen to abjure the use of foreign goods altogether, or in favour of indigenous ones of the same description. These

earnest efforts, which are gradually spreading over all parts of the land, are viewed differently by different persons. So far as the methods are accompanied by unlawful acts of violence and intimidation, they deserve to be severely condemned. But unlawfulness apart, there is nothing in them that any honest man can seriously object to. The economic ideas of men differ in many points and a difference on this one is allowable. But no candid man ought to stigmatize these patriotic efforts as dishonest. They are perfectly legitimate.

But the statement may be ventured that even from an economic point of view, they are not only justifiable but urgently needed. The protection of new or nascent industries by means of high import duties, and by bounties is held to be allowable by some of the highest authorities of the free trade school of Political Economy. If the State in India had been identified in economic interests with the Indian people, some measure of protection might have been adopted by it long ago. But the Government of India being the representative in India of Free Trade Britain is not at liberty at present to afford economic protection in any form to Indian industries. The people of India ought, therefore, to step into the vacuum, and do by **voluntary protection** what the State might have achieved in an easier way by tariffs and bounties. Thus the *Swadeshi* propaganda is in its essence an endeavour to re-inforce the cause of Indian industries by enlisting the Indian patriotic sentiment on its behalf. It is difficult to see how any objection can exist against

such a move. Organized voluntary efforts are specially needed now in all departments of national activity. The *Swadeshi* movement is the application of this principle to that of national industrial regeneration.

In finally determining the utility of the movement our view need not be restricted to the free trade formulae of English Economists. Almost all the independent nations of Europe and America are at the present day encouraging their own industries by means of high tariff barriers and bounties. Germany and America are the two most prominent instances before us. Why should not Indians do by Voluntary effort what these two nations are doing by the collective action of their States ?

That this line of conduct is correct is proved by actual experience. The Finance Minister in his Budget statement last March recognized that the *Swadeshi* movement had resulted in the contraction of imports of cotton goods to the tune of more than a *crore* of rupees, indigenous manufactures having replaced them. An impetus is given to the handloom industry in Bengal and elsewhere, such as it had not felt for nearly a century, and large numbers of our countrymen have obtained a living thereby. There is an all-round industrial revival due to the *Swadeshi* propaganda. Fifteen Banks with a total capital of nearly 4 *crores* have sprung into existence. Five navigation companies with a capital of 121 *lacs* have been started. 22 new cotton mills with a capital of nearly 2 *crores* have been established. Two jute mills, several oil pressing mills, sugar factories, and mining and mineral



companies, besides many that are not known, have been launched. ( These figures are taken from R. B. Lala Baijnath's speech at the U. P. Conference ) In the department of cotton spinning and weaving, the number of spindles has risen from 50 to 60 *lacs* and of looms from 45 to 60 thousand. These gratifying results are largely attributable to the *Swadeshi* propaganda, and to the *Swadeshi* spirit which it has aroused. In the face of these results it is not reasonable to cavil at the *Swadeshi* movement.

There are well-meaning people who urge that the propaganda imposes an extra burden on the poor, or that it deteriorates taste and workmanship. Now it is not always true that any extra burden is suffered by our poorer countrymen on account of the *Swadeshi* movement. In several cases, the propaganda has been only the means of advertising widely Indian goods of admirable quality and cheapness which were languishing for want of support. In some cases the preference for our own goods has indeed implied a small and often imperceptible sacrifice. But all protection implies such a sacrifice. When a State imposes a high tariff against foreign imports to bolster up a nascent industry, the sacrifice is equally real. Why should it be grudged because it is voluntarily borne? As to taste and quality, it is not always the case that the Indian article is inferior to the foreign. Often the reverse is the fact. The element of durability again is generally in favour of our products, and often goes far to counterbalance the loss in point of superficial finish. Lastly there is no ground for the

fear that patronizing crude articles will cause a permanent deterioration of our workmanship. Such patronage can at the best be very temporary, and competition among our own producers is bound in the long run to keep up the quality. The poor ultimately gain by the extended employment that arises for their labour.

Of the four elements of national manufacturing prosperity, viz., Raw materials, technical skill, capital, and demand, the demand is the dominating factor which gives direction, shape and substance to productive activity. Now our resources in raw materials are abundant. Technical skill can be created gradually, and for our immediate purposes we can rely upon importing it from outside. I have already dwelt upon the question of augmenting our capital. As to demand, it is very extensive in India. Thus all that is necessary to do at present is to make the demand flow in such a way that it may fertilize native industries instead of foreign ones. All the foremost nations of the world are endeavouring at present to get wider and wider markets, for their goods. Their political action is largely governed by this policy. In their mutual jealousy and competition they insist on an open door for all—notably in the vast Asiatic countries. The ordinary weapon used by these nations, is that of making their goods cheap to the consumer, of lessening the cost of transport by subsidizing shipping lines, of practising economies in production and utilising scientific inventions. They rely in the last resort on an appeal to the *avarice* of the foreign consumer.

Now it is permissible to inquire why a nation situated like ours, and deprived of all means of enforcing its will by collective action, may not seek to extend its industries by appealing to a higher sentiment than avarice, viz., Patriotism. Even Royal personages have commended such an appeal and enforced it by their example.

### Railway Transport.

The question of a cheap and quick transport of our manufactured goods and machinery from one part of the country to another has not received the attention it deserves. It is, however, of vital importance to the growth of our industries. The utter collapse of the carrying capacity of the principal Railway lines last season is fresh in our minds. It caused enormous losses to traders and producers and a serious dislocation of all commercial arrangements. A sufficient supply of rolling stock on each line is a *sine qua non* of Railway efficiency, and ought to be insisted on. Smooth working arrangements for interchange of waggons between the various lines are also badly needed. The Railway staff ought to be imbued with the spirit of business. The Railway Board has succeeded indeed in effecting a few minor improvements, but is still far from coming up to the expectations of business men. The delay in the dispatch and handling of goods after arrival are often scandalous. For example it generally takes 8 days before goods loaded in Bombay reach the hands of the consignees at Ahmedabad which is only 300 miles from Bombay. The loading and unloading arrangements at bye-sta-

tions are defective, and add to the delay. Mr. Morley made a boast that the Railway rates in India are very cheap. They may be cheap. But there is great room for improvement still. Now it costs nearly 15 Rs. (all charges included) per bale of yarn or cloth sent from Ahmedabad to Cawnpore or Calcutta; while it can be sent to the latter place by rail and sea combined for nearly half the sum. The Railways yield a large surplus revenue after deducting interest and wear and tear of the fixed capital. Why should not this surplus be utilized to reduce the freight charges on all internal manufactures? A reduction in freights acts on trade like fresh capital or a new market. It is as new blood to a living organism. It is by cheap and quick transport that America has achieved her industrial pre-eminence. Indian manufactures need very cheap freights and rapid transport. I would commend this point to the earnest consideration of the Conference.

#### **Uniform Weights and Measures.**

Somewhat akin to the question of cheap railway freights and quick transport is that of having for the whole country a common currency, and common weights and measures. The existence of important Native States some with a standard coin of their own accounts for the difficulties that confronts us in the way of getting a common medium of exchange. Political considerations are here interwoven with the economic problem. Maharaja Sayaji Rao of Baroda has generously adopted the British coin; and it is to be hoped that equally broad views will influence the

counsels of Gwalior, Hyderabad and the Rajputana States in this important matter. It is the poor people of the native States and travellers that suffer most from the existence of a separate local currency. There is less reason, however, for maintaining the present confusing labyrinth of weights and measures. Big traders can always protect their interests; and it is the poor and the ignorant that suffer most. The necessity of developing the domestic commerce of our vast country makes the question of a common currency and common weights and measures one of national importance.

#### **Agricultural Industry.**

I will now with your permission proceed to offer a few remarks on some of our leading industries and among these, Agriculture first demands our attention. It stands at present at the head of all our other industries. An extension of purely industrial occupations, will no doubt reduce its relative magnitude. But it will be a long time before its place becomes secondary, as in England. It behoves us therefore, to pay special attention to it. The greatest impediments to its growth are—(1) the ignorance of the peasant; (2) his heavy indebtedness; (3) the irregularity of the rainy seasons; (4) the absence of irrigational facilities; and (5) the land policy of the Government. The charge of blind conservatism brought against our cultivator is not fully justified. He has always shown a readiness to produce crops that pay him best, and due regard being had to his indebtedness he cannot be expected to do more. The Government of India

have of late taken some steps to improve the returns of agriculture. But as usual they have begun at the top instead of at the bottom. Something more is needed than having big central institutions or associations. Big central associations have failed in Bengal and cannot expect a better fate elsewhere. The theory that knowledge will filter down to the peasant in his village from the central Institution or bureau is not supported by actual experience. There are thick impervious strata intervening, which prevent the desired percolation. The villager ought to be approached in his home and placed in possession of the knowledge which he lacks. For this village committees should be formed, and Model farms ought to be established for every small group of villages. Trained Indian experts ought to be brought into direct contact with the peasant. Lastly the interposition of the Revenue Agency ought to be sedulously shunned. As regards the peasant's indebtedness a further expansion of the Co-operative Credit Associations ought to be encouraged. In the matter of irrigation large works are good in their way, but the old system of having a good storage tank for every village deserves to be revived. Free education, and that of the right sort must be placed within the reach of the agriculture population. Finally the present land policy of periodical settlements must be abolished, and a permanent land tax ought to be fixed.

### **The Cotton Industry.**

The cotton industry is next in importance, but stands on a different footing altogether. We get almost all the raw material for it in our own country.

and spare some of it for foreigners. Egyptian and American cotton is now annually imported in small quantities, and these imports will increase during the present year. The cultivation of the new Sind cotton promises, thanks to the liberal initiative and help of the Bombay Government, to give great impetus to our staple industry. Our Millowners' Association may fairly be expected to show a practical appreciation of the efforts of Government by offering prizes to growers of long-stapled cotton in other parts of the country. Meanwhile it is agreeable to note that the cotton industry is now on a firm basis, though we are yet far behind our legitimate place in the production of cotton fabrics. The system of paying the managing agents huge commissions calculated on the outturn alone, is happily getting into public disfavour, and a more sensible one is gradually taking its place. The labour supply is unsatisfactory from a variety of causes, plague being the main one. The public can now justly demand that the excise duties on cloth which have trebled during the last 10 years and now amount to nearly 30 *lacs* of rupees per annum should be abolished. The increasing Revenue from Excise on cotton cloths involves a new danger to the industry to which the attention of all publicists might be invited. At present the interests of Lancashire form the sole pretext for the impost. But if the Revenue from it grows at its present rate, considerations of finance are likely to be utilized for its continuance. It will be said that the amount is too large to be at once remitted. This is an additional reason for taking concerted action now to get this obnoxious tax removed. At the

same time we have a right to expect that the industry shall not be allowed to be threatened with new artificial restrictions on any grounds whatever. Whilst on this subject we must thankfully acknowledge that the composition of the Factory Commission now sitting is quite satisfactory. We may be permitted to hope that the interests of India alone will dominate its final recommendations.

### **Iron, Coal and Manganese.**

It is a pleasing feature of the new industrial spirit that Indian merchants are turning their attention to the mining of coal and manganese. It is gratifying that recently a few coal and manganese concerns have been launched by Indians with Indian capital. Ignorance had hitherto hindered our progress. To ensure future progress it would be well if steps were taken to train Indian experts in Geology, Mining and Metallurgy. The suggestion put forward last year by the Hon'ble Mr. Vithaldas viz., that all companies formed outside India for mining should be compelled by Government to reserve a portion of stock for Indian investors is worthy of consideration. The difficulty lies in the fact that rich foreign capitalists are satisfied with a smaller return than Indian investors, and that the latter generally fight shy of uncertain investments. The Tata Iron Works mark an epoch-making advance in mining and metallurgy, and are pregnant with very far-reaching results.

### **The Sugar Industry.**

The United Provinces of Agra and Oudh supply half the home grown sugar. But it is now becoming



clear that our sugar production is losing ground in competition with that of Java, Mauritius, and Germany. The *Swadeshi* agitation is trying to enlist the religious scruples of the people in favour of native sugar, but the practical question of extending the indigenous industry remains unsolved. Perhaps Mr. Hadi's new way of making sugar may aid in the solution. More irrigation works may hasten the desired result. The difficulty of getting sugar-cane all the year round is at the root of the question. It is not easy to suggest a remedy. The refinement of molasses however pays fairly well, if the manufacture of rum as a bye-product is permitted by the State. Our patriotic countrymen are however in earnest, and Madras is going to have a Sugar factory soon.

### Jute and Silk.

The Jute and Silk industries are at present confined to Bengal, but the Jute Mills are financed and managed by Europeans. We on this side of India are unable fully to understand the latter phenomenon. There is no reason why awakened Bengal should not claim a share in this thriving industry. In the article of silk Bengal has a practical monopoly, though Kashmir is preparing itself to enter the lists. Praiseworthy efforts are made in Mysore to produce silk on a commercial basis. Maharaja Sayajirao, the enlightened ruler of Baroda, has taken the question in hand for the benefit of Gujrat. A Deccan Brahmin who has returned from Japan after studying sericulture in all its branches has, it is stated, started a small and successful factory of his own in the Kon-

kan. It is to be hoped that his bold example will find enterprising imitators elsewhere.

### **Leather and Paper and other Industries.**

The leather industry is gradually spreading, though no impression seems to have been made on the imports as yet. The efforts of Mr. Chatterton of Madras in this direction are deserving of great praise. But the field for leather manufactures is still very extensive, for we export skins and hides of the value of Rs. 14 *crores*. A factory at Navsari and another at Bombay both lately started are doing good business. There is no reason why every province should not have a leather factory of its own. The new Alembic Chemical Works at Bombay mark a valuable departure, which is pregnant with valuable results in the immediate future. The glass works at Umballa, Dehra Dun and Bankipur are among the offspring of the new *Swadeshi* spirit in British India. Cheap Railway freights are especially necessary in the case of glassware. Enamelled ware and pottery have been taken in hand by patriotic Bengali gentlemen, and the Victoria Technical Institute at Bombay trains young men in enamelling. Surgical tools of excellent finish are now produced locally in Bombay and sold at a reasonable price. A tobacco factory near the same place must be reckoned among the progressive works of the year. There is of course abundant room for these industries all over the country.

### **Home Industries.**

The question of creating home-industries for our rural areas is one deserving of serious consideration.

For more than 6 months in the year almost the whole agricultural population of unirrigated tracts is absolutely without any employment. It might greatly improve their material condition if some handicrafts suitable to their needs could be successfully introduced into our rural areas. The handloom may answer the purpose in many cases. Knitting and lace making also suggest themselves. The matter is very important, and suggestions or papers dealing with it ought to be invited.

### Education.

No review of national industries can be complete without a reference to the subject of Education. I have touched upon the deficiency of the labour supply for factories. Agriculture makes the same complaint. Plague is no doubt one of its principal causes, but there are others of a deeper kind. The labourer in the principal industrial centres gets higher wages than he can dispose of according to his present ideas. He is very ignorant and his wants are few. He squanders a considerable proportion of his earnings on liquor and also on flimsy foreign finery. If he still has money left he deliberately absents himself from work till his pocket is again empty. In the meanwhile his dwelling continues to be insanitary, his load of debt remains undiminished, and his food also remains the same as before. It is absolutely necessary, if his condition is to be really elevated, that he should receive a sound elementary education. It is the duty of the State as well as of the rich to provide this as extensively as possible. From an industrial point of view, it is as

much needed as from any other. The quality of this ought to be such as will make him physically robust, and mentally and morally equal to his foreign competitor.

The need of technical education on a broad scale is now equally acknowledged. The Government might be reasonably expected to take the lead, but the question is a national one and the whole nation ought to combine. It is our own problem, and we should apply our shoulders to the wheel to bring about the desired result. The difficulty of getting the funds is not so great as is imagined. How to begin is practically a more difficult matter than the raising of funds. Each Province, in fact each district, ought to decide the lines of industry for which it will provide industrial and technical training for itself. Bengal for instance might select the industries of silk, jute, tea, and indigo; the United Provinces sugar, glass, and woollen manufactures; Bombay cotton, and woollet, and so forth. The manufacture of leather ought to be taught in all the provincial schools. Similarly Mechanical engineering, electrical engineering, and industrial chemistry might form the subject matter of instruction in all our technical schools. The point to be constantly kept before the eye in all these endeavours is that there ought to be a living connection between the technical school of a district or Province and its actual or projected industries. When each Province has at least one technical school of its own it will be time to think of a big and all-embracing poly-technic institute for the whole of India. Further all industrial progress ul-

mately depends on scientific knowledge. It is to be hoped that the Tata Research Institute will serve as the head reservoir that will perpetually replenish all the technical Institutions of the country with the freshest achievements of science and art.

The requirements of the productive industry will be met by a provision for a course of education as just indicated, but to complete our national equipment industrially, a school or college providing a full commercial course is very much needed. Among the subjects that may be taught in such an institution may be included national and cosmopolitan, political economy, private and public international law, commercial law, the commercial policy of the leading nations, one or two foreign languages, commercial and political geography, and statistics of trade and commerce, agriculture, manufactures, and mining; and lastly currency.

### Concluding Remarks.

The usefulness of this conference is now placed beyond question. It effectually focusses the interest of the public in our industries which are a matter of vital importance to the whole nation. The very able papers written by gentlemen possessing special expert knowledge which this conference has been the means of evoking form by themselves a mine of valuable information. The Directory of Indian goods which may be claimed as the special work of our indefatigable Secretary and his staff is a production of great practical utility. By making it the medium of advertisement for our producers and *Swadeshi* con-

sumers, its scope will be greatly enlarged. The Exhibition of Indian products which has been abandoned this year for unavoidable reasons, will it is hoped always form an adjunct to our annual gathering. It is a question whether the annual Exhibition may not be taken up by the conference, of course with the help and active co-operation of the Congress Reception Committee. The idea that the Exhibition is a mere show is not borne out by facts. Producers exhibiting their goods have obtained a degree of publicity for them which would have been otherwise hardly attainable. Further it makes the materials for a comprehensive directory of Indian goods easily accessible. While a considerable proportion of the visitors must be sight-seers, there is always an important but increasing minority who benefit by it even commercially. A few foreign rivals may perhaps derive advantage from it. But industrialism is now an international race, in which the fittest will win. At the same time we are always ready to adopt suggestions for making it widely beneficial.

It will be well if each separate Province is able to have its Industrial conference as the United Provinces had lately. There is much that is common to all the provinces, besides certain matters that are more or less local. It is for the National Industrial Conference to deal with the general topics, and also to offer suggestions even to local conferences.

While the lines of work hitherto pursued may be continued with advantage, it will arouse and sustain general interest, if practical aims are associated

with our labours. The prizes for an improved hand-loom are very appropriate. The conference may similarly encourage the acquisition of specialized practical knowledge in directions suggested by those who are in touch with industries. The encouragement may take the shape of scholarships, of prizes for proficiency in advertised subjects, or for monographs on particular industries that now await practical action. For these and other purposes that may be named, large funds are needed. Is it patriotic to wish them to come from outside sympathizers? *Can* they come from other people? Has any nation ever been industrially regenerated by external help? There are many here who I am sure would proudly spurn the idea of receiving such assistance. Let us never forget that Nations are made by themselves. In this as in all our other activities, self-help and self-sacrifice ought to be our watch-words. Let every patriotic Indian who feels for the existing poverty of his country honestly contribute his mite, and exert his best to get others to do the same. To quote His Highness Maharaja Sayajirao's words "To help in the Industrial movement of the present day is a duty which devolves on all equally." Let us then earnestly act in this spirit, and ample funds will be always at our disposal.

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PROCEEDINGS  
OF  
**THE SECOND**  
**UNITED PROVINCES INDUSTRIAL CONFERENCE**

HELD IN  
**LUCKNOW, ON MARCH 1ST, 1908.**

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ALLAHABAD:

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# THE SECOND UNITED PROVINCES INDUSTRIAL CONFERENCE

1908

ON Sunday, the 1st March, at 11 A.M., the Industrial Conference was held in the Conference Pandal, in Lucknow. Raja Kampal Singh, C.I.E., proposed Mr. A. C. Chatterji to the Chair, and Pandit Moti Lal Nehru seconded the proposal. Mr. A. C. Chatterji then read his address.

The Chairman informed the Conference that papers contributed by several gentlemen would be incorporated in the report. The following resolutions were passed:—

## I. TECHNICAL EDUCATION.

(a) That this Conference thanks the Government of the United Provinces for the action taken by them with a view to introduce a fairly comprehensive system of Technical Education in these Provinces and it expresses the earnest hope that the Government of India and the Secretary of State would sanction the scheme recommended by the Naini Tal Industrial Conference and provide funds for giving effect to it in the next financial year.

(b) That this Conference urges on the public the necessity of founding stipends to enable deserving young men without private means to take full advantage of the instruction provided in technical colleges and factories in India and abroad.

Proposed by the Hon. Pandit Sundar Lal.  
Seconded by Rai Baij Nath Bahadur.  
Supported by Mr. B. N. Sinha.

## II. AGRICULTURE.

(a) That this Conference notes with pleasure the gradual development in various directions in the Agricultural Department of these Provinces and offers thanks to the Government for the liberal scheme that has been sanctioned for its re-organisation on a large scale.

(b) That this Conference is of opinion that wherever possible, small classes for giving instruction in the improved methods of agriculture in the vernacular, should be attached to the Agricultural stations which the Government is now establishing in different centres in these Provinces.

(c) That this Conference urges the enlightened and well-to-do Zamindars of these Provinces to adopt in their private farms the improvements which the

experience of the Government Farms has confirmed and to demonstrate their usefulness to their tenants.

Proposed by Syed Zahur Ahmad.  
Seconded by Mr. K. P. Bose.  
Supported by Sh. Faiyaz Ali.

## III. THE CO-OPERATIVE CREDIT MOVEMENT.

That this Conference notes with satisfaction the progress made by the Co-operative Credit Movement in these Provinces in both rural and urban areas and records its appreciation of the efforts that are being made by Government to foster industrial co-operation. And this Conference wishes to impress on the people in the districts the great desirability of extending the scope and helping in the further spread of the movement by starting associations of artisans and working men, and of small producers and traders, stores for the sale of indigenous goods, and urban industrial banks on the co-operative system.

Proposed by the Hon. Pandit Madan Mohan Malaviya.  
Seconded by M. Nizam-ud-din Ahmad.

## IV.—HAND-LOOM WEAVING.

(a) That this Conference is pleased to find that the Government have established several weaving schools at important weaving centres and that the Bara Banki District Board supported by the Taluqdars of Bara Banki have established a well-equipped weaving school in that district;

(b) That this Conference draws the attention of small capitalists to the success of private hand-loom factories in the Madras Presidency and would invite them to start similar factories in these Provinces;

(c) That this Conference desires that the local bodies and landholders in other districts should follow the example of Bara Banki and establish similar schools in their localities;

(d) And that to supplement the work done by weaving schools already established this Conference desires that the Zamindars and the general public should help the weavers to buy improved looms and other appliances on a system of easy payments.

Proposed by M. Eh'tsham Ali.  
Seconded by Mr. C. Y. Chintamani.  
Supported by Pt. Shev Behari Lal,  
and Babu Banarsi Lall.

## MR. A. C. CHATTERJI'S PRESIDENTIAL ADDRESS.

Gentlemen, I thank you most cordially for electing me President of the second session of the United Provinces Industrial Conference. I am not vain enough to imagine that it means any personal compliment to me, for I have no first-hand knowledge of industries, and I am fully conscious that there are amongst you many eminent men in the professions or in commerce and industry as well as in public life who would have more worthily filled the chair to-day. I take it however that in offering me this honour you recognise that the interests of the people and the Government are identical so far as the objects of your Conference are concerned and also that you appreciate the endeavours that have been and are being made by Government to ameliorate the industrial condition of the province to evoke an industrial spirit in the community. It is in this belief that I have accepted the chair.

It is nearly a year since the first session of your Conference met at Allahabad. After a masterly survey of the industrial condition of the province by the Chairman, Lala Baij Nath Rai Bahadur, there was a discussion on a number of important subjects and several resolutions were passed. The most hopeful and distinctive feature of the meeting was, however, the determination to form a company to work a particular branch of one of the most important industries of the Province and a very fair amount of capital was immediately promised by some of the gentlemen present. We congratulated ourselves that the first session of the U. P. Conference had achieved something definitely practical, thus setting an example to all other provinces. It has been to me a matter of the deepest regret that nothing tangible followed the speeches and the resolution on the subject at the last Conference. I also recollect that an Industrial Association for the Provinces was constituted at the same time but I have not heard if this Association or its Committee has ever met since or done anything. I can find no reference to its proceedings in the recently issued report of the All-India Industrial Conference. I have no desire to deprecate the good work that is done at an annual Conference but I am inclined to the opinion that steady work all through the year is likely to be fruitful of more solid results.

I am not making these observations in any captious or fault-finding spirit. It is to my mind one of the healthiest signs of the times that we have progressed from the stage when we talked only of our past industrial glory to a period when we talk of what we shall do in the future; but, gentlemen, I think it is nearly time that we took another step forward and instead of merely talking, began to act as well. We in these provinces have always taken credit to ourselves for preferring the gold of silence to the silver of speech, but every one will admit that it is the silence of action and not of vacuity which the philosopher referred to in his figure of speech. So far as industrialism is concerned we have to admit with shame and sorrow that we are being outstripped by

the inhabitants of other parts of India, whom we have hitherto been in the habit of considering visionary and impractical people. The chapters of the report of the Indian Industrial Conference for the last two years which describe the industrial activity of the people in different parts of India are not pleasant reading for those of us who are gifted with the undoubted virtue of provincial pride. During the course of the last few months, it has been my duty to travel through parts of Madras and Bengal. It has been fashionable for many decades to look upon Madras as the benighted Presidency. I saw, however, everywhere the dawn of genuine industrial enterprise, and the most hopeful sign was that the educated and professional classes also were permeated with the true industrial spirit. I do not wish to refer to large joint-stock enterprises but during the few weeks of my sojourn in the Province I was astonished to find how many small industrial undertakings owed their existence to the efforts of educated gentlemen acting by themselves. A number of very promising hand-loom factories have been started in various parts of the Province and several of the owners assured me they had found it a good business, commercially speaking. I may in passing state that the apprehensions entertained in some quarters that the development of the factory system for hand-loom is like to depress the weaver socially and morally or destroy his artistic temperament are entirely chimerical. The conditions of life for the workmen prevailing in the factories I visited are in no way inferior to the conditions obtaining in the home of the weaver and there is nearly as much scope for the display of his art in the factory as in the cottage industry. The word factory is really a misnomer for these collections of hand-loom under one roof, for there is no resemblance whatever between such a concern and a power-loom factory. I must apologise for this digression. Turning again to the industries of Madras I would recommend all of you to visit the Minakshi silk cloth factory of Madura or the many houses established in that ancient and sacred town, for the dyeing of yarn. Indeed, the Turkey red yarn dyed at Madura finds its way as far as the homes of the cottage weavers of this province. I need hardly refer to the many factories in and round Madras which tan hides and skins. Small chrome leather tanneries are now being started in several towns in the Presidency. Even in the matter of the adoption of up-to-date inventions and improvements in agricultural farming, very useful lessons might be learned from the farm belonging to a private resident of Tanjore.

So also in Bengal. During the last few years the people of Bengal have not only embarked to an appreciable extent in coal and mica mining, but have taken over and are managing a large Cotton Spinning and Weaving Mill, and have started many smaller industries. Thus a fair number of soap and perfume factories run on modern lines have sprung up. Chrome tanneries have been established in Calcutta and Cuttack and a large, fully equipped

tannery and leather manufactory is projected. A match factory has already started work, as also a pottery. Arrangements are in active progress for a hosiery factory on a fairly large scale. A wealthy and enterprising young man has established in Calcutta a factory run by electric power which turns out excellent pens and pen-holders of local materials. It is not necessary to refer to the many oil and flour mills in the vicinity of Calcutta belonging to native capitalists.

Even in the Punjab, a visit to Delhi, Amritsar, Lahore or Ambala will at once bring home to us the industrial spirit and enterprise of the people of that Province. It is useless to compare ourselves with the residents of Bombay or Gujarat in this respect.

In this Province, on the other hand, with the exception of a few Cotton Gins and Presses here and there, one finds practically no instances of large industrial undertakings during the last year or two on the part of Indian capitalists. Honourable mention must, however, be made of the two sugar factories established in the vicinity of Cawnpore. Not that there are no examples to be followed. In the city of Lucknow, we have the Paper Mills and Mr. Pragharain's Iron Works. A Cotton Spinning Mill is also now being worked by Indian enterprise. Successful Cotton Mills have also existed for sometime at Hathras and Mirzapur. Flourishing Flour Mills are to be found in various towns in the Province. The Cotton Gins and Presses have almost always done well.

Why is not there a more rapid expansion? I feel certain there is no lack of capital, and as I shall presently show, there is no want of raw materials either for many promising ventures. So far as I have been able to gather from a study of the causes of our failures in the past and from conversation with capitalists in different parts of the Province, four factors have usually militated against large industrial enterprises on the part of Indians. None of these obstacles, however, seem to be insuperable. In the first place, most of our ventures in the past have been started with insufficient fluid capital. We have obtained estimates from experts and machinists and fixed our total capital at a sum only slightly exceeding the estimate. Now it is not the peculiar experience of Government that estimates are apt to be much exceeded when the actual work is undertaken. Moreover we have usually forgotten to make adequate provision for working capital. In order to secure a margin of profit, raw materials have to be purchased in large quantities in particular seasons of the year, and finished products similarly have to wait for a favourable turn of the market. In a highly organised industrial community, banks come to the aid of industries. We have, however, very few industrial banks here to cater for the Indian community. This difficulty has also been experienced in other provinces and banks with substantial capitals have been established within recent years in Bombay, Calcutta, Madras and the Punjab. We are also waking up to the necessity of industrial banks. So long, however, as banking facilities are

not perfect we should take care in our enterprises to have enough fluid capital for working purposes. The neglect of this precaution has been fatal in several most promising enterprises in this province. The second great difficulty has arisen in connexion with securing skilled supervision in technical matters. European capitalists undertaking industries in this country are able to select their men on the spot from similar factories in Europe or America. Native capitalists are naturally shy of entrusting their venture to inexperienced men belonging to this country or to imported managers with whom they have had no previous acquaintance. There are, however, nowadays for ordinary industries sufficient men to select from among those employed in the mills in Calcutta and Bombay. The bonds of caste are also not so rigorous as in former days, and it ought to be possible for one of the promoters to visit a seat of the industry in Europe and choose a man. In this connexion I may refer to the movement to send young men abroad to learn various arts and industries. The idea is a most excellent one provided the young man thus sent to a foreign country possesses all necessary equipment, secures adequate facilities for his particular work and is carefully supervised during his residence abroad. I am not, however, entirely satisfied with the actual results in many cases that have come under my personal observation. To take an imaginary instance: a young lad of twenty, knowing nothing whatever of, say, pottery work, is sent to Japan to study the pottery industry. He stays there for three years and returns to India professing to be an expert in the pottery industry. Now, I believe Japanese is a fairly stiff language and it would take the youth eighteen months to two years with hard work to acquire a working knowledge of the language. He has probably no powerful friends to introduce him into a really good factory. He may join some technical school and spend a few hours a week at a factory which serves as an adjunct to the school. What can you expect the youth to learn during a total period of three years in Japan? It is sheer folly and extremely unfair to the young man himself to entrust him, as is sometimes proposed and actually done, with the charge of new pottery works in this country. The industrial scholarship system was largely adopted in Japan and was admirably successful but the circumstances, so far as I am aware, were entirely different. The Japanese, when they found that raw materials existed in the country, and there was a local market for the goods, established a factory and obtained the best technical expert they could get in *any part of the world* to run it, with the stipulation that he was to train local talent also. A few smart youths were apprenticed under him, learnt the business locally and were then sent out with scholarships to centres of the industry in other parts of the globe. The diplomatic representatives of Japan were as a rule successful in securing ample facilities for the training of these scholars in various factories and institutions. When after a prolonged stay in a foreign country, these scholars returned to Japan, they were not at once placed in charge of the factories

but had to be content with posts at the lowest rung of the ladder and rose gradually as they displayed industry and business capacity. The scheme of the technical scholarships awarded by the Government of India is based on similar principles but will be fully successful only when the people start factories where the scholars can receive their initial training. I have dwelt on the subject at some length because I have often encountered much misconception in the matter. It is nothing but placing the cart before the horse when we send boys to learn a new industry in a foreign country and expect them to pioneer such industries immediately on their return to India. The third obstacle in the path of a rapid extension of our industries is the want of trained labour. It is true that unskilled labour of a sort is cheap in this country. It is, however, cheap only in a sense. Many economists hold that he is the best captain of industry who pays the highest wages. Even in industries like cotton spinning and weaving, where it is not essential for the hands to have any extensive technical knowledge before joining the mill, things would be much easier if they were trained to habits of industry, regularity and discipline. In some industries, e.g., manufacture of glassware, you must have considerable technical skill in the artisans. Such is the dearth of skilled labour in the province that even in the ordinary handicraft of carpentry, most large employers have to engage either Chinese or Punjabi carpenters. To remedy this state of things would take several years. His Honour the Lieutenant-Governor has been giving particular attention to this problem and it formed one of the main subjects of discussion at the Industrial Conference. I feel confident that the measures now being initiated by the Local Government to introduce a better state of things will bear fruit at no distant date. Meanwhile our undertakings must make the best use of existing material and, where necessary, import skilled labour from outside. It has to be remembered that in this respect the Indian capitalist is no worse off than the European. On the other hand, his knowledge of the country and the people should give him a distinct advantage.

I now come to the last difficulty which has to be contended with by us, viz., our lack of knowledge of business methods. This is really the difficulty that dominates all others. Hereditary specialisation due to the caste system has unfitted most of us whose ancestors were not in trade or industry for all business excepting agriculture and landholding. It is a drawback which can be cured only by time. Much can be done by giving a more practical turn to our education in the early stages and I am glad to see steps are being taken in this direction. At the same time the trading and commercial castes amongst us have usually keen business instincts and it ought to be our endeavour whenever launching in any important venture to associate ourselves with already experienced members of the business world. It is a matter of secondary importance whether such gentlemen have any knowledge of the industry we are taking in hand. One who has proved his capacity in a particular line of

business will probably repeat his success in other branches as well.

I said a little time ago that there were many unoccupied or only partially occupied fields for large ventures in this province. Take the industry of cotton spinning and weaving. I do not wish to weary you with many detailed figures or statistics, but in the western districts of these provinces more than a million acres are, in a normal year, under cotton. Most of the cotton thus produced is exported. In the Agra and Meerut divisions there are only four cotton spinning mills, of which one is owned by native capitalists. There is not a single weaving mill. That the climate of this tract of country is no bar to the development of a successful mill industry is proved by the examples of Cawnpore on one side, Beawar in Rajputana on another and Delhi in a third direction. You have only to study the wonderful expansion of the cotton spinning and weaving industry in the Bombay Presidency during the last three or four years to be convinced that it is good business, if properly managed.

We may next turn our attention to Silk. It is true we do not produce very much silk ourselves but a very fair quantity of tasar silk is collected in Mirzapur, most of which is probably exported to Sambalpur and Bilaspur in the Central Provinces. Benares, Azamgarh, Agra, Lucknow and Jhansi, have for centuries been famous for the fine silk fabrics woven there and the hereditary skill of the silk artisans of these towns is a distinct asset in our favour. In the silk mills in Calcutta belonging to a firm of Musalman capitalists I found the best artisans were drawn from the centres of the silk industry of these parts. Why is there no attempt made to manufacture silk fabrics on a fairly large scale in these provinces? I may also mention the subsidiary industry of gold thread making, which at one time supported thousands of workmen in the cities of Benares, Lucknow and Agra. The competition of gold thread imported from Lyons in France threatens to extinguish our local industry in a very short time. Enterprising capitalists can do worse than study the methods in vogue in Lyons and try to introduce them in this country.

Look again at the industry of woollen manufactures of the cheaper grades. Although Indian wool is inferior in quality and limited in quantity still a fair supply is available in the Punjab and Rajputana which could be profitably utilised for the manufacture of blankets and rugs and mixtures of wool and cotton or wool and fibre. The woollen mills at Cawnpore and Dhariwal appear to be in a flourishing condition but their example has not stimulated the enterprise of a single Indian capitalist.

There is then the industry of tanning and leather manufacture. I am glad to say there is very little social prejudice now against this industry but in spite of the enormous export from the province of raw hides and skins, and the greatly increased local demand for boots and shoes and leather articles generally there is not a single tannery run on modern lines with the aid of Indian capital. The large

European tanneries of Cawnpore are unable to supply leather for the local market. Consequently the native shoemaker or saddler has to use leather imported from Calcutta or abroad. It should be perfectly feasible to start a fairly large tannery at some suitable site in this province where a good supply of hides as well as of bark would be available. I would also draw attention to the new process of chrome-tanning. It is very little more expensive than bark tanning and produces a leather which has been proved to stand wetting better than bark-tanned leather. It is, therefore, an ideal article for irrigation buckets. The fluid capital required for a chrome tannery is smaller than for a bark tannery, and adequate instruction in the technical processes is now given at the Government Chrome Tannery in Madras.

There is a possibility of the development of a large industry in this province in the manufacture of goods made out of sann hemp. Immense quantities of the raw material are now exported from the Benares, Agra and Rohilkhand Divisions to Europe. There seems to be no reason why a part of it at least should not be worked up locally on modern lines. Even the sann hemp matting manufactured by the rudest primitive processes in the villages of the Partabgarh district are sent as far as Calcutta and Bombay.

The paper-mill of this city is unable to supply the total demand of this province and a very large quantity of imported paper specially of the cheaper lines is used here. There would seem to be room for another well conducted mill in a locality with a good supply of fibrous grass. The prohibitive cost of wood pulp which is one of the principal ingredients of good paper has hitherto been a stumbling block in the way of enterprise in this direction. There is an abundant supply of spruce and silver fir in some of the forests of the province. It is believed that excellent wood pulp could be manufactured at a profit out of this timber. The Government is at present investigating the question and I hope when the results are obtained and published, capital will be at once forthcoming to take up such a promising enterprise.

Another industry, still untried in this province but holding forth much promise, is the business of crushing cotton seed. The cake will be found to be excellent cattle food while the oil can be used as a substitute for ghi and also for the manufacture of soap and similar substances. More than a hundred thousand tons of cotton seed are available every year in the province and a large industry can be developed. To those of you who are likely to feel an interest in the subject I would recommend the paper, contributed by Mr. Whitenack of the Baroda service to the Surat Industrial Conference and a very able series of articles dealing exhaustively with the subject which appeared in recent issues of the Indian Trade Journal and have, I believe, since been reproduced in pamphlet form.

There are many other industries which one hopes will sooner or later be taken up in this province. I need only refer to the manufacture of matches, of

pencils and pen-holders, of paints and varnishes (the raw materials of which are available in the forests of the province.) Similarly there are many industries which are at the present moment represented by one or two factories in the province but are capable of greater development. I may mention the manufacture of sugar by modern methods, glass making, rice, flour and oil mills, manufacture of chemicals out of locally obtainable materials, etc.

The question may be pertinently asked, these are all large ventures which can be undertaken only by joint-stock enterprise. Where is there room for the small capitalist wishing to run his own business? If the small capitalist will look about, he will also find plenty of occupation but he too must bring to his business a certain amount of training not only in general industrial methods but also in the particular industry he wishes to adopt. Experience in any line of business is always useful but it is not much good, say, for a man starting a tannery to do so without learning to differentiate between the various kinds of raw hides, available in the market. There is, however, usually very little difficulty in obtaining the requisite training either in an institution or at a similar factory on payment of a premium. The expense of such an education does not compare unfavourably with the expense one incurs in a training for the professions of law, medicine or teaching, and should not, therefore, be grudged. As regards the industries themselves, I would draw attention in the first place to small hand-loom factories for the weaving of cotton, silk and wool. There is a resolution on the subject among the Agenda of this meeting, and I need not enlarge on it. Among other industries I may mention dyeing and calico-printing, small tanneries, sugar refineries on the model of Mr. Hadi, perfume and soap factories, hand-power hosiery factories, furniture and cabinet-making, button and comb-making and carpet factories. No useful purpose will be served by discussing at once the prospects of each of these industries. Persons desirous of taking them up should study carefully the conditions prevailing in their own locality and also in a centre where the industry already occupies an assured position and then come to a decision.

Gentlemen, at the beginning of this address I had ventured to suggest that steady work all through the year by an Industrial Conference or association like yours was likely to be more effective than an annual meeting which contented itself with passing a few pious resolutions. For fear I may be taken to task as a mere destructive critic, I would crave the indulgence of your attention for a few minutes more while I indicate very briefly some of the things that an industrial association may accomplish. I concede that it is not the duty of an industrial association to start industries itself and that its proper function is to foster the industrial spirit and to give indirect aid to the development of industries. A powerful impetus would be given to your ideas in this respect by the existence in every popular centre of a good library

containing a sound and up-to-date collection of economic, industrial and commercial books, periodicals and publications. I do not think there is a single institution of this sort now in this province. Is it too much to hope that your Association will attempt to organise a library of this kind at one centre at least in this province? Then again proper industrial museums are a great want in the province. I am not speaking of art museums but a place in every district head-quarters where a representative collection can be made of all the industrial products of the locality and especially of the handicrafts. The work will take time but is worth attempting. Another desideratum is a journal written in simple easy language, in Hindi and Urdu, dealing with industrial and commercial topics, particularly those of special interest to the province. There is every likelihood that a really well conducted paper will soon pay its own way. You may also emulate the good example set by the Indian Industrial Conference and hold exhibitions of agricultural and industrial products. It is not necessary to organise these exhibitions on an ambitious scale. I think they are productive of more good if each exhibition is limited to a few allied industries and held at different small places. You can also institute competitions in the handicrafts like the Hand-loom competition now in progress in Madras. A committee of the association can also devote its time to a consideration and ventilation of the difficulties of the industrial and trading classes—for instance, the questions of railway rates, want of communications between different places of business, postal and telegraph facilities, uniformity of weights and measures and similar points. Other spheres of activity for an industrial association could easily be enumerated but I do not desire to try your patience too long.

Gentlemen, as you are all well aware the Government of these provinces has embarked on a comprehensive and well considered scheme of technical and industrial education. The Lieutenant-Governor is also devising means to encourage industries in many other ways. But as he said in the course of his speech at the Naini Tal Conference last year,

"If the Government does its part, if it trains up skilled workmen and foremen capable of managing industrial business the people must do their part; they must make up their minds to invest their capital in the development of the country. If the youth of the country is trained up for industrial employment, and after they have been trained, it is found that there is no employment for them, the last state of things will be worse than the first. Government cannot do everything. The main effort must be made by the people themselves."

I do hope the people of these provinces will seize this splendid opportunity of falling into line with more advanced industrial communities. The opportunity once lost may never come again. That is why I entreated you at the very commencement of this address to begin real earnest work, and I can not do better than repeat the same entreaty before I sit down.

### Co-operative Credit Societies in the United Provinces.

1. *What is a co-operative credit society?*—A co-operative credit society is a collection of persons requiring credit who combine in order to obtain that credit on more favourable terms. Its first and principal function, therefore, is to provide its members with cheap and easy credit. A true co-operative society, however, does more than this. Experience shows that the mere provision of cheap credit unless at the same time the people are educated to a proper knowledge of its use tends to make them more indebted and is, therefore, a very doubtful benefit. For a man who owes Rs. 1,000 at 12½ per cent. is in no way better off than one who owes Rs. 500 at 25 per cent. The second function, therefore, of co-operative credit societies may be said to be the exercise of such control over the loans to its members as may discourage improvident borrowing while making full provision for real wants. Such societies may also be said to have a third function, i. e., to teach an improvident people how by the exercise of thrift and self-denial and business-like habits capital may be gradually accumulated sufficient for all the ordinary needs of production. The efficiency of a society may, therefore, be judged by the extent to which the second and third functions are recognised and by the success which has been obtained in carrying them out.

2. *The need for co-operative banks in India.*—India has long been known as the home of usury. A large portion of the population, both industrial and agricultural, must borrow to carry on their business and do borrow at a high rate. Their state is frequently one of chronic indebtedness. Besides this, the character of the people is unbusiness-like and there are practically no banking facilities except in a few large towns. What more favourable soil could be found for sowing the seed of co-operative banking?

3. *The scope for them in agricultural districts.*—Large Farms are almost unknown in India. The land is divided into small holdings owned or rented by the peasantry and all the expenses of cultivation fall on their heads. Few of them have sufficient money for the proper conduct of agricultural operations. "They require money to purchase seed, manure, and plough-bullocks, to pay for hired labour, for irrigation, and for many other purposes. There are very few who can meet all these expenses from their own capital. They are consequently forced to borrow, and borrowing, they have as a rule to pay very high rates of interest. The poorer a cultivator is, the higher rate of interest will he have to pay. In some districts the usual rate of interest on agricultural loans is half an anna in the rupee per month (*taka rupaiya*). This rate is increased in the cases of the poorer cultivators, until sometimes as much as an anna a month is charged. The reason for these high rates of interest lies partly in the necessity of the borrower who has to take the money, no matter what interest may be demanded, and partly in the inferiority of the security offered. The money-lender fears

that in many cases he may lose the principal of his loans, and so attempts to ensure himself by obtaining as large a return as possible in the way of interest." Occasionally the money-lender refuses to advance at all except with the proviso of a certain amount of grain being delivered at harvest in addition to the return of his money or a condition for the sale of produce at a low price is inserted in the bond. In such cases the rate of interest works out to a very high figure. If grain for sowing is advanced and, owing to a calamity of the season, not recovered from the crop, the crop of the following year is burdened with such a load of debt that payment is almost impossible. The ryot pays what he can and interest being added to the balance he probably sinks further and further into debt. "The rate of interest charged on loans varies, as is well-known and for reasons which are obvious, in accordance with the security offered by the investment. The security of Government, which controls the revenue of the country, being unquestioned, it is able to borrow money at 3½ per cent. The larger municipalities can obtain loans at 4 or 4½ per cent. They have to pay more because the security they offer is not quite so good as Government security. A large land-owner borrowing on the security of his property can obtain money at 5½ or 6 per cent. A smaller zamindar may get loans on the security of his smaller property at 12 annas per month or Rs. 9-0-0 per cent. per annum. The substantial cultivator who desires a loan will probably have to pay at least one rupee per month or 12 per cent. per annum. It is clear that where 10 or 12 men become jointly and severally responsible for a loan, the security that they offer is better than the sum of the security which each of them could offer, were they to borrow separately. If they borrowed separately, the principal might in one or two cases prove irrecoverable. Where they borrow jointly, if one borrower fails to pay up the amount of his loan, the creditor can recover from the remainder. The creditor has additional advantages in dealing with a body of men rather than with a number of individuals. For instance, in the case of default, in place of being compelled to institute a number of suits, he has only to institute one. Again instead of having to keep a number of accounts in his books he has only to keep one. If the body is registered as a co-operative credit society, the creditor is in a still better position, for he knows that the society will be regularly inspected and its accounts audited by a Government department."

4. *The scope for co-operative credit societies among the industrial classes.*—The Indian artisan is generally poor and he is almost always improvident. In some trades he buys his raw material from and is supplied with funds by a middleman who takes from him the finished product at an inadequate price. In others he borrows on the *ugahi* system, Rs. 10 repayable by twelve monthly instalments of Re. 1 or Rs. 8 repayable by 9 monthly instalments of Re. 1 or again he borrows small sums at an interest of 25 per cent. for 6 months. Even when he earns good wages he

is extraordinarily improvident. The Cawnpore Mill-hand scoffs at saving money when, as he says, he can well afford to borrow, and borrow he does, the usual terms for an advance of Rs. 10 being the repayment of Rs. 12 by 6 monthly instalments of Rs. 2. Here the rate of interest works out at nearly 70 per cent. per annum. Co-operative credit societies would not only provide loans, when required, for necessary purposes at a reasonable rate of interest, but they would gradually imbue the industrial population with the habits of thrift and self-reliance.

5. *Objections which have been urged.*—Some persons, though they admit the great success achieved by co-operative credit societies on the continent of Europe, dispute their suitability for this country on the ground that Indian peasants and artisans will not trust one another and will not, therefore, co-operate satisfactorily. Possibly this opinion is due to the comparative failure of Indian capitalists to form successful joint-stock companies, but there is no reason why this should disturb us—for the cases are by no means similar. Professor Marshall points out in his *Principles of Economics* how in the earlier stages of material civilisation, the standard of fairness and honesty is lower than in later times in dealing with strangers, but higher in dealing with neighbours and relations. And in fact in ordinary village life co-operation and combination take a considerable part. In many parts of the country villages are owned by communities and the cultivators of neighbouring fields constantly co-operate for ploughing and irrigating their land, for cutting of sugarcane and many other purposes. The Agricultural Department now advances its seed and Government its *takavi* to groups of borrowers on their joint responsibility and experience of societies already started shows that the principle of joint liability is well-understood and willingly accepted by the members.

6. *The different forms of societies.*—There are two main types of societies. The Schultz Delitzsch society is one in which each member takes at least one share which can, if necessary, be paid up by small yearly, half-yearly or monthly instalments. Such a society distributes profits as soon as a share is fully paid up, but the rate of dividend is carefully limited by the bye-laws, so that the main object of the society—the provision of cheap credit—may not be lost sight of. The second main type of society is that called after Raiffeisen. In it there are no (or merely nominal) shares and unless they have wealthy members ready to make deposits they are financed entirely by borrowed capital. Such societies distribute no profits, all profits go to the reserve which is used to increase the working capital of the bank and to provide a sinking fund for repayment of debt and ultimately to reduce the rate of interest on loans.

7. *Societies with share capital.*—Societies with share capital are well-suited for formation among artisans in towns and among the lower ranks of Government and private servants. A small monthly contribution of 4 annas, 8 annas or 1 rupee should be

provided for until the full amount of the share of Rs. 10, 20, 50 or 100 is paid up. The richer members should be encouraged to take more than one share. All profits will at first be treated as a reserve which may, however, be used in the business of the bank. Thus no interest will be payable until the shares are fully paid up which may be from 2 to 10 years after subscriptions have been begun. When the shares are fully paid up they will be a valuable property. Profits may then be divided but there are the following restrictions, first, that one-fourth of the profits must be credited to reserve and secondly, that the rate payable as dividend must not in any case exceed 10 per cent. nor may it exceed by more than, say 2 per cent., the rate at which a society can borrow. Thus if 6 per cent. is the rate allowed on deposits 8 per cent. is the highest dividend admissible. If further profits are made they must be applied

- (a) To further building up of the reserve fund.
- (b) To paying off borrowed capital.
- (c) To reducing the rate of interest on loans.

The important matter to keep in mind is that the society must be managed primarily with a view to benefit its borrowing members.

Societies on similar principles with shares payable by instalments of Rs. 2, 5 or Rs. 10 each half-year may also be formed among prosperous agriculturists and are especially suitable for peasant proprietors whose holdings are fairly large and whose crops are secured by irrigation. Such men can well afford to invest Rs. 2 or Rs. 5 every spring and autumn harvest. In unfavourable seasons the contributions may be postponed. It should be noted that according to Act X of 1904 rural societies are not permitted to divide profits until certain conditions are satisfied, but it is anticipated that, if the shares are made payable by subscriptions extending over 10 years, the societies will be able to fulfil the necessary conditions by the time the shares are fully paid up and will, therefore, be able to divide profits as urban societies do. In rural societies, therefore, it is necessary to fix a term of 10 to 12 years before the expiry of which profits cannot be divided.

8. *Limited or unlimited liability.*—Societies with share capital may have either limited or unlimited liability. The former is better and simpler as the mere possession of a share is sufficient to induce members to interest themselves in the working of the bank and if liability is limited to the actual value of the shares the result should be that the richer members will take up more than one share and so supply the society with larger funds. On the other hand there may be some danger of a prominent shareholder acquiring power in the bank and (having only the small stake in it represented by his share) exerting that power to ruin the bank while benefiting himself—and this he could not do with unlimited liability. So concentration of power in the hands of one man is to be avoided. With true democratic management by the members for the members such concentration

is impossible and on the whole limited liability appears in this as in other countries to be the better system for a share capital bank.

9. *Societies without share capital.*—These are merely collections of members who combine to borrow money on their joint security. The responsibility is of course unlimited. They are generally named after Raiffeisen and they are suited for establishment among the poorer classes of cultivators and artisans who are too poor to subscribe for shares while owing to their lack of substantial security and the small sums they require they have now to borrow individually at very high rates of interest. It is, therefore, profitable to such societies to borrow on their joint security at a fair rate of interest and to advance to their members at a slightly higher rate the balance being the profit of the bank. But owing to the difficulties connected with the management of such societies which will be discussed later on the type of society in which a share capital is gradually paid up appears to be preferable except among the very poorest classes of the people.

10. *Large and small societies.*—A society according to the Act must consist of at least 10 persons and there are many societies formed on Raiffeisen lines which have only very few members. These very small societies have been preferred in some quarters because it was found that it is only in a small and homogeneous body that the principle of joint liability though everywhere well-understood has any practical force. In the societies first started with a large, varied and scattered clientele the principle of joint responsibility was altogether too remote, i. e., no member had any idea of bringing pressure to bear on another member to induce him to pay up punctually. Hence default where it did occur as it frequently did was difficult to deal with. In a small society composed of a few members of similar status and generally of the same caste joint responsibility is effective and loans are as a rule punctually repaid. But it is obvious that small and homogeneous societies have considerable disadvantages. Firstly, the members will probably all be wanting loans at the same time and wish to repay at the same time so that there is danger of money lying idle. Secondly, if the members are all of much the same status and therefore require to borrow money no one will be ready to deposit money in the bank and it will have to rely entirely on borrowed capital. This is not objectionable in itself but it prevents well-to-do persons who are willing to deposit money in the bank if they are allowed some control of it being members of the bank and they cannot therefore take that prominent share in the management which their position, education and the extent of their interest in it would otherwise entitle them to, and so the services of a most useful class of persons are lost to the societies. Thirdly, it is certain that a large society controlled by substantial persons can borrow with less difficulty than a small society of poor men and fourthly, it is obvious that the control by the Registrar, which is



required in the early stages of the movement, can be more easily exercised over a few large societies than over a great number of small ones.

Now these disadvantages of small societies can be to some extent remedied by the formation of a number of small societies into a co-operative union combined with a central bank, the chief function of which would be to raise money and distribute it to the branch societies, but this plan has disadvantages of its own, for the organization and control of a number of independent societies by a central union and bank is a very difficult matter. For this reason a new form of society has been started in the United Provinces and is now being most successfully worked in the Unao district. In that district the members are distributed into *pattis* or divisions of 10 to 30 members living in one locality and preferably of the same or similar castes, each of whom is jointly responsible for the loans advanced by the bank to every member of his *patti*. Each *patti* is represented by a head man who is primarily responsible for all loans advanced to the members of his *patti* and assists in their realisation. The head men elect the committee of the bank. The *pattis* are as far as possible homogeneous so that joint liability is an active force, and as a rule no loan is advanced to any member of a *patti* until all loans due by the other members have been repaid to the bank. The members of one *patti* generally take loans at the same time and for the same purpose and repay on the same date, and this very much simplifies the accounts of the bank and enables it to deal with a large body of members. The largest of these societies, Sufipur, in Unao, has about 4,000 members with a capital of about Rs. 40,000.

In societies which work with share capital every member has from the first an interest in the success of the bank and there is not the same risk of unpunctuality and default. Hence there has been no tendency to form small societies with share capital.

In any case whether societies are large or small it is important that the number of members be not increased without reference to the amount of working capital likely to be available. The only result of electing members for whom no or merely nominal loans are available is to expose the society to ridicule and to discredit the movement.

11. *The area in which societies should work.*—Where small societies on Raiffeisen lines have been established it is obvious that they should work in a small area. The members should all be residents of the same village or hamlet.

With larger societies formed on the *patti* system or based on share capital the area will, of course, be larger but care should be exercised to keep it within reasonable limits. Where villages are large a village should as a rule be a sufficiently large area in which to work. When they are small and cannot provide efficient management more extensive limits must be allowed but it is only in very exceptional cases that members should live more than 3 or 4 miles from the headquarters of the bank.

12. *Working capital is necessary.*—The first function of co-operative credit societies is to supply its members with loans and it is, therefore, obvious that whether a society is organised on a share basis or on Raiffeisen lines most of its working capital will have to be provided from sources outside the bank. In every locality, whether in Europe or in India, at the first starting of societies difficulty has been experienced in providing the initial capital. As time went on and the efficient management of the earlier societies inspired confidence these difficulties were overcome and in Europe ample funds are now forthcoming either in the form of deposits from local residents or as loans from joint stock banks. But at first the societies were largely dependent on philanthropic persons who either lent the money themselves or guaranteed to the society credit up to a certain sum at the market rate of interest with a local bank. In India societies are still in the initial stage. They are as yet little known to the monied class and their management has not yet inspired such confidence as to enable them to raise money for themselves locally. At this stage to give the societies a fair start outside assistance is indispensable.

13. *How working capital should be provided.*—The question is frequently asked why does not the Government with its ample resources provide whatever assistance is necessary? Now Government has aided the societies to some extent, for it has sanctioned a sum of Rs. 50,000 in each province as a loan to rural societies, the amount lent in each case not to exceed the amount actually deposited by the members. It is obvious, however, that from this concession the poorer societies, the members of which can deposit little or nothing, gain but little advantage. But beyond this the best authorities are agreed that State aid is to be deprecated as far as possible. In India, it is specially dangerous. The obvious result of Government financing the early societies would be that they would be regarded as a department of Government and its officers would be expected to assist in the recovery of loans and even in their distribution. The members would never learn to control the societies and there would be an end to all hope of the spread of the movement. The first help to a nascent society should be given by friends and neighbours who are willing and able to watch over the affairs of the society. It is not of course intended that doles of money should be given as a free gift. The assistance should be in the form of a loan at a fair rate of interest—6, 7, 8 or even 9 per cent.—or it may be in the form of a guarantee for a loan provided by some capitalist—and the interest should be regularly demanded. Such conditions may be attached to the loan as appear sufficient to ensure its safety. The lender may well have the right to be present at all meetings of the committee to satisfy himself that his money is being usefully laid out and the right to withdraw it at 6 months' or one year's notice. His advice will no doubt be readily listened to, but he should guard himself carefully against monopolising or even taking a prominent part in the actual management of the society, for if he does this

the sense of responsibility of the members will be greatly lessened and they will very likely leave it to him to recover his money as best he may.

14. *The administration of societies.*—In share capital banks where every member has in the society a stake, which may be large or small, but which will generally be approximately in proportion to his status and where he has the hope of ultimately sharing in the profits, there is little difficulty in inducing the members to feel an interest in the society and to take part in its administration. But it is far otherwise in the Raiffeisen form of society. For here the borrower has as a rule nothing of his own in the bank and beyond the fact that it supplies him with loans at easy rates he feels little interest in it. It is true that in course of time the profits fund will increase and benefit will accrue to the members in the form of larger loans at more convenient times and at still lower rates of interest, but these benefits are so remote that it is difficult even to explain them to the members and almost impossible for ignorant men to appreciate them. It is not, therefore, surprising that in Raiffeisen societies the general body of members show but very little interest in their ultimate success. The general meeting of all the members, in which by the rules of all systems of co-operative banking the general direction of affairs is vested, is not held at all or is a mere formality and the whole control gets into the hands of a committee of two or three men. There is no great harm in this if the committee is fairly representative of the members though it is essential that once a year at least the members be taken into the confidence of the committee—the year's transactions and the pecuniary results obtained being intelligibly laid before them in order to stimulate their interest in the society. But frequently matters go much further than this and one man, the *Sarpanch* or President of the committee, concentrates all power in his own hands. This is a very dangerous state of affairs. In some cases he misuses that power in order to benefit himself or his friends. Even if he uses it well the result must be that he alone as responsible for the work of the bank will be considered interested in its success, that borrowers will not feel it incumbent on them to repay their loans as a duty they owe to their own bank and they will only do so if the *Sarpanch* happens to be a man of great local influence and energetic habits. If the *Sarpanch* have not these qualities default will undoubtedly occur and if having these qualities he dies or leaves the neighbourhood the society will very probably have to cease work. So every effort should be made to induce the members to consider the society to be their own concern. The committee should be as representative as possible; they should meet regularly on a fixed day of the week or month and at a fixed hour and record their proceedings in the vernacular of the district. Everything should be done as publicly as possible and at the annual general meeting, as already indicated, care should be taken to present to the members a really intelligible report on the transactions of the year and the position of the

society. The accounts should be as simple as possible and in a small society no payment for services should be necessary, but in large societies the account work is sufficient to take up the whole time of one man and a regular salary will have to be paid him.

15. *Loans—their objects.*—Loans can only be made to members of the society. In share capital societies every member must take up at least one share but in the Raiffeisen type of societies a man becomes a member simply by being elected and paying his entrance fee.

It is an essential part of the system of European co-operative credit societies that they make loans only for productive objects, and as a general rule this restriction is undoubtedly sound, but in India, where social obligations compel the expenditure of large sums on family ceremonies, it was very soon perceived that little interest would be taken in a society providing funds for productive purposes if the borrower who requires a loan for a marriage in his family were refused accommodation. It was also felt that expenditure on family ceremonies being admittedly necessary the provision of funds through a co-operative credit society might have a good effect in restricting the tendency to expenditure beyond a man's status and recent experience shows that in some cases this result has been actually attained. Loans then may be given for unproductive as well as for reproductive objects provided that the object is necessary and the amount of the loan demanded is a reasonable amount. Among other permissible objects of loans is the repayment of old debts. But in the earlier days of a society, where capital is scarce and no experience of punctuality of repayments has been gained, it is as well to restrict loans to directly reproductive objects—such as the digging of wells, the purchase of bullocks, implements and seeds, the payment of labour for irrigation and weeding of crops, and in artisan societies the purchase of raw material and improved implements. It is also permissible to advance a loan to a cultivator for payment of rent on the security of his produce provided that the loan is repaid when he sells the produce. But in any other case the payment of rent is not as a rule a proper object for borrowing. Rent should be paid from the proceeds of the crop and not by a draft on that of the following year. Thus a loan for payment of rent (unless repaid by sale of the produce) should only be made on the same conditions as a loan for repayment of debt—to wit—the cultivator's whole financial position should be brought under review and the society should consider whether it can afford and risk the taking over of the whole of his liabilities. If it is not prepared to do this the matter had better be left alone. It may sometimes be justifiable in cases of short crops to help tenants who are pressed to pay their rent but it should be distinctly recognised that the loan is allowed only in special circumstances and will not be given in ordinary seasons. It is above all things necessary that the object of every loan given should be carefully recorded. It is also essential in a co-operative bank that care be taken to see that a loan is applied to the purpose for

which it is granted. In European societies there is a special body of men—the committee of supervisors—charged with this duty—and in the case of the larger societies this example might well be followed in India. But for the majority of loans which are given for seed and the expenses of cultivation at the proper season it may be assumed that they are applied to these purposes and it is, therefore, unnecessary to make special enquiries. It is when larger sums are given for purchase of cattle or for repayment of old debts that the matter assumes importance and in such cases enquiries should be made into the use to which the loan has been put and if found to have been misused it should be re-called.

16. *Loans—their conditions.*—A loan issued for productive purposes should naturally be repaid from the produce raised with its assistance. Thus loans for seed or expenses of cultivation should be repaid from the crop and loans to weavers for purchase of yarn from the price of the cloth manufactured—and the date of repayment should therefore be fixed to correspond with the season at which the crops are cut or the time at which the cloth is sold. Societies should not endeavour to save trouble in account keeping by granting loans for six or twelve months without considering whether the date fixed for repayment is otherwise suitable.

For the larger loans granted for purchase of bullocks, for repayment of debt or for family ceremonies no definite term can be laid down but the practice of some well-managed societies may be quoted with approval. Loans for bullocks are made repayable in 4 half-yearly instalments (to correspond with the harvests) of Rs. 3 each for every Rs. 10 advanced. Loans for repayment of debt are recoverable in 6, 8 or 10 half-yearly instalments. Loans for marriage may be recovered from the *neeta* or by instalments. Loans to servants of Government or private persons are realised by monthly payments extending over 6 or 12 months. (Thus Rs. 11 is advanced and recovered by 12 monthly instalments of Rs. 1). In all cases the principle is the same—to fix the conditions of repayment so that the borrower may be able to meet his engagements without incurring debt elsewhere.

17. *Loans—their rate of interest.*—In the earlier societies started in the United Provinces the rate of interest on loans was fixed very low, at 9, 8 or even 7 per cent. and the societies were only enabled to make a profit because the funds lent to them were provided by philanthropists at the low rate of 4 or 5 per cent. and even sometimes without interest. It was, however, soon understood that if the co-operative credit movement is to expand and grow, it must be based on business principles and not on philanthropy. Its institutions must be able to afford to borrow at the market rate of interest, i.e., that rate at which capitalists will be ready to lend from business and not from philanthropic motives to an institution in whose stability they feel confidence. At present capital is not attracted by a rate of less than 9 per cent. so the rate at which a society advances to

members must not be less than 12½ per cent. With this rate the society can make a fair profit.

18. *Loans—their amount.*—It is not necessary to say much on this score. The *panchayat* are responsible that the amount of the loan given is reasonable considering the status of the borrower and the object of the loan and if care has been taken only to elect a number of members proportionate to the amount of capital likely to be available, the loans will be sufficient for the ordinary purposes of cultivation. In course of time as capital increases larger loans for purposes not directly productive such as repayment of old debts and family ceremonies may be granted.

19. *Loans—their security.*—As a general rule one or two sureties should be demanded from every applicant for a loan. In small and homogeneous groups of which some Raiffeisen societies and the *pattis* of banks constituted on the Unao principle consist, it might appear unnecessary to demand further security than that provided by the joint liability of the members of the groups—but even in such cases it is as well to have one or two persons besides the borrower more directly responsible for the loan than the general body of the members. Such person will probably take care to see that the amount and purpose of the loan is reasonable and that it is actually applied to the purpose for which it is given. If owing to imprisonment, illness or death without adult male heirs the borrower is incapacitated from discharging his debt they may (and have in some cases) take charge of his affairs in order to protect themselves and satisfy the demands of the bank.

20. *Savings Deposits.*—In most of the Raiffeisen societies in these Provinces the system of compulsory deposits has been introduced. A sum of 8 annas per plough per harvest is taken from each borrower or 2 pice in the rupee are deducted from each loan taken by him. The amount in either case is credited to the member's accounts as a deposit and carries interest of 6½ per cent. on each whole rupee at the end of the year. These compulsory deposits have three objects, first to enforce saving, secondly to lead the member to take an interest in the affairs of the bank by giving him a definite if small stake therein and thirdly, they serve to test the popularity of the bank. When some of the societies were first started the *asamis* were suspicious of the object of Government and were unwilling to take loans. That they now are eager to do so even though they have to make a small deposit is evidence that they appreciate the advantages which they derive from the society. The contributions so made are at present treated as deposits withdrawable after three or five years. When this period expires it may perhaps be found advisable to convert them into shares or some other means of disposing of them may be found preferable. Meanwhile they serve to augment though slowly the capital of the society besides fulfilling the other objects mentioned above and they should be insisted on in all societies which are without share capital. In bad seasons they may well be remitted,

21. *Assistance from Government.*—Government realising the usefulness of co-operative credit societies has passed an Act (X of 1904) laying down how they may be constituted, registered, and managed and how they may be dissolved, if unsuccessful. The Act too gives them the following special privileges which are detailed below:—

1. Exemption from income-tax, stamp duty on documents and registration fees.
2. Exemption from attachment in Court of the amount subscribed to a society by a member.
3. A first claim on crops raised from seed purchased with money lent by the society and on cattle and implements similarly purchased.
4. Permission to open a public account in the nearest post office savings bank.
5. The services of a Government officer to help and advise the societies and to audit their accounts yearly so that the public may have full confidence in them.

Government has also, as already stated, made a grant of Rs 50,000 for loans to societies on easy terms. This grant is now almost exhausted and it is not proposed at present to apply for further funds for the reasons already given. Government has done its part. In more than half the districts of the United Provinces one or more efficient societies are now at work, ready to provide object lessons to the neighbourhood of the methods and aims of co-operative banking. It remains for the people and especially for the educated classes to carry on the work.

22. *Assistance from the educated classes.*—The lines on which societies can be formed have been indicated above and also the best method by which financial assistance can be afforded. Without such assistance of course nothing can be done. In some districts banks have been formed with the direct object of financing the societies—and here gentlemen who wish to further the movement can easily do so by taking up shares or debentures or making fixed deposits in the district bank and also by taking a share in its administration. District co-operative banks have been formed in Mainpuri, Meerut, Bulandshahr, Gorakhpur, Kasia, Basti, Unao, Rai Bareilly, Hardoi and Fyzabad and, it is proposed to institute them in several other districts. Investments in such banks are perfectly safe as the shares are held in great part by the wealthiest and most prominent men in the district, their reserves are growing fast and their operations are conducted to a great extent in consultation with the Registrar, who periodically audits their accounts. Such investments are also lucrative, as debentures carrying 6 or 7 per cent. interest can usually be obtained while 6 per cent. is generally payable on one year's deposits. In the absence of a district bank they can either lend money themselves at 7 or 8 per cent. or guarantee a loan at similar interest to societies in which they are interested. But this financial assistance alone is not enough. Experience has shown that efficient societies cannot be formed simply by providing a loan, furnishing a set

of bye-laws and leaving the people to themselves. Until the principles and methods of working of societies are better known, it is absolutely necessary that there should be some one constantly present who has sufficient education to be able to acquaint himself with and to appreciate the accepted principles and methods of working and is willing to exercise some control in the initial stages. As the members themselves acquire this knowledge the organiser himself may well gradually retire from the direct control and leave the management of the affairs of the society to the members. But it will be long before a society will be able to stand alone.

In any district where there are rural societies the services of the Honorary Organisers who would visit societies in their villages and give them advice and assistance would be invaluable and Government has agreed to the grant of travelling allowance to such persons. The Registrar would be glad to hear from any gentleman who is willing to take up such a post.

23. *The safety of investments.*—It has already been shown that deposits in district co-operative banks are safe enough. The primary security is the share capital and reserves but the ultimate security is the stability of the local societies financed by the district banks. These are under the close control of the Registrar and his staff who audit the accounts at least once a year. It is six years since rural societies were started and though owing to want of control in the early stages before the appointment of a Registrar the importance of punctual repayments was not understood and default has frequently occurred, none of the money lent to the societies has ever been lost. When, as sometimes happens, the committee of the society is unable to prevent default or embezzlement occurs there is no resource but to dissolve the society. In that event the Registrar appoints a liquidator who recovers the dues of the society and discharges its liabilities. In no case hitherto have the liabilities exceeded the assets. There has always been a profit which has been applied to some public object. It is not distributed because the chance of sharing in the profits might tempt some of the members to scheme for the dissolution of the society.

24. *New Societies.*—Before a new society is formed the circumstances of the proposed members should be carefully considered: they should themselves be consulted and the form of society best suited to their needs and the area in which it should work should be decided on in correspondence with the Registrar. As already stated that area should not be too wide and wherever it extends to more than one village the organization by *patti* should be made use of. It is best if possible to keep the village as a unit. The next step is to make the list of members and in doing so, especially in Raiffeisen societies, it is essential that only such persons should be included as are wholly acceptable to the other members of the *patti* or society as men for whose debts they are willing to be responsible. Persons whose reputation is bad should be rigorously excluded.

In share capital societies the matter is not of such importance but even here as a member's liabilities to the bank usually exceed his payments towards a share it is important that persons likely to default be not elected as members. The criterions by which a man should be judged are not his wealth and status but his reputation for honesty. Default is more frequently caused by recusancy than by poverty. As already stated the number of members should be regulated by the amount of the capital likely to be available. The capital having been obtained, business may be begun and loans granted in accordance with the principles already laid down. The most important of these is that each loan should be granted for a definite object. Punctuality of repayments should be insisted on from the first. If this is done the habit of punctuality will be easily acquired and loans will come in of themselves on due date but if unpunctuality is allowed at first it will be very difficult subsequently to enforce regular habits and it will only be possible to recover loans by the exercise of constant pressure. Thus both in financing and in organising societies the help of influential and educated men is indispensable. Most aid can perhaps be afforded by retired civil and military officers of Government who retire to their homes in receipt of pension. Their training enables them to appreciate the objects of Government in forwarding the movement and the accepted principles of co-operation while they have the necessary local influence and the leisure to enable them to control the society in its initial stages. It is by the co-operation of these gentlemen that the most useful results should be produced.

25. *Co-operation in agriculture.*—The history of co-operation in European countries shows that institutions for obtaining credit are the first and simplest products of the co-operative movement. When people have once learnt to combine for the taking of loans they will understand better how to combine for other purposes. There are undoubtedly cases in which combination for the supply of appliances such as improved cane mills, well-boring apparatus, rice-hulling machines, etc., would be most useful, but the difficulties of management are great, and constant supervision by the Registrar would be needed in the initial stages, so it is considered better to postpone any attempt to introduce co-operation in these matters until the advantages of co-operative credit are more generally known and appreciated. A beginning has, however, been made with societies for the supply of good seed; and for the establishment of such societies and of grain stores (which keep half their grain in hand and lend out the remainder at interest, so gradually accumulating a larger stock as a reserve against failure of crops) there appears to me to be practically unlimited scope for useful work. Provisional instructions for the establishment of such societies have been issued and can be obtained from the Registrar's office. It is very difficult, however, to make a fair start except in favourable years and owing to unpropitious seasons very little has as yet been done.

26. *Co-operation among the industrial classes.*—The recent Industrial Conference at Naini Tal laid stress on the necessity of the encouragement of co-operation among artisans and recommended that the establishment of the Registrar should be increased for this purpose. Most of the Indian artisans are terribly poor and the system under which they are supplied with raw material and with funds by middlemen who frequently take from them the finished product at an inadequate price is incompatible with any improvement in their condition. Their poverty, too, prevents them from adopting more efficient tools and instruments, such as improved hand-loom. Suggestions for the improvement of the status of any class of artisans by co-operation will be welcomed by the Registrar from persons who are acquainted with the conditions under which the industry is carried on.

27. *Conclusion.*—Copies of this pamphlet and of model bye-laws for Raiffeisen and for share capital societies with or without organisation into *pattis* can be obtained from the Registrar of Co-operative Credit Societies, Lucknow, who will be glad at any time to give advice and assistance to enquirers.

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### Research and Industrial Development in India.

In discussing Industrial Development in India, there are many factors to be considered, such as Capital, General and Special Education, etc. As regards the application of these to industrial development, there is a general consensus of opinion; there is one factor, Research, however, often prominent in such discussions, whose meaning and special applications to India, it is doubtful if there are many who clearly apprehend: an attempt is, therefore, made in this paper to deal with this subject.

The word Research is capable of very wide interpretations but has now acquired a very special meaning in connection with scientific and technical work. On analysis, however, it will be found that even in this sense it connotes two very different types of work, which should be clearly distinguished in dealing with its development in India. These may be briefly classified as follows:—

- (1) Original investigation aimed at the advancement of the boundaries of knowledge.
- (2) Original investigation aimed exclusively at the advancement of industrial conditions.

In the second type, as in the first, the advancement of knowledge is necessary, but is limited by the proviso that the knowledge is useful in a narrow material sense. It may be noted now, as will be further explained, that this proviso introduces many difficulties and causes of failure non-existent in the first type of Research. A striking contrast in this connection is provided by the exact and far-reaching generalisations

and laws due to Astronomical Research when compared with corresponding results for the sister science of Meteorology, which aims at being useful.

There is of course no exact boundary between these two types of Research but the great mass of original investigations can be allotted with fair certainty to one type or the other, the criterion being the mental standpoint of the worker. It will be convenient to have distinctive names for these types of Research and we will now restrict the term Research to the first type and class all investigations of the second type under the head Invention. This classification differs somewhat from the usage of ordinary language but will be convenient for precision.

The characteristic of Research, as compared with Invention, is that very little pecuniary reward may be expected for its results and it may be fairly claimed that this is the purest and noblest effort to which the human intellect can be directed and that the appreciation of Research marks clearly the level of culture to which any race has attained. Research is well exemplified by the sciences of Astronomy and Mathematics and in the study of the languages and history of ancient races; but in addition the vast bulk of knowledge in Sciences such as Chemistry, Physics, Geology, Zoology, etc., may be credited to Research. Though Research may be pursued for its own sake, as in many noble instances, yet for its healthy and natural development it appears that the critical appreciation of a readily accessible and cultured section of the public is necessary. Such an audience has yet to be formed in India and this probably explains the almost entire absence of Research.

In assigning a value to the results of Research the only criteria are newness or originality and scope, that is, the extent to which the investigation co-ordinates and explains ascertained facts. In this respect Invention differs strikingly from Research, as will be seen later on.

As regards Invention, the mental standpoint, environment, etc., of the worker are entirely different; the pecuniary rewards may be very great but the fact that economic principles must be rigidly applied to the investigation briefly indicates the characteristic feature that distinguishes this work from Research.

It is an indisputable fact that Invention owes a great deal to research and the latter provides much material for the former to work on. The vast bulk of research does indeed provide little of industrial importance; but from time to time there comes the means of a great industrial advance, and, as the direction from which it will come can never be foreseen, it follows that investigations must be prosecuted in all directions from the unselfish point of view of research. As a result in Western Countries, such as England, Germany, America, etc., where the struggle for industrial supremacy is very keen, Research must be actively pursued for the sake of the industrial advantage it may give: in India, however, it is not a question of leading in industrial progress

but rather of making up some of the great distance lost. When, therefore, we consider the limited financial resources of the country, economic principles would appear to indicate that it is to Invention at present that our available energy should be turned so as to start on as direct a line of progress as possible.

The rewards for successful Invention in Western Countries are so great and accessible that it can be safely left to commercial enterprise; this is not at all the case in India and it will perhaps be granted that a special effort should be made to promote invention, as there is such ample scope for it. Some general considerations regarding Invention will now be discussed which may help to define and elucidate how this can be done.

For certain Industries the problems for Invention are much the same in India as in Europe and America and under these circumstances, when economic principles are taken into consideration, it is evident that at present the work of Invention, so far as it is identical, should be left to those countries where the conditions are immensely more favourable to success. What could be more foolish than Invention directed towards improving, say, the design of Steam Engines or Dynamos in India, where they are not made and relatively little used? In such industries the products of Inventions of Western Countries in the shape of improved processes and machinery should be freely imported and made accessible by Technical and Industrial Education. For the success of some Industries, however, indigenous conditions may be of paramount importance and as the results of Invention for these cannot be imported, the work of Invention should be directed towards these industries.

The first step in Industrial Development, therefore, would be a survey of the field for industrial success in India so as to determine the conditions. Invention should then be directed towards those industries in which indigenous conditions are of great importance, while the development of the other industries would be mainly a matter of Education and Capital, not Invention. A slight outline of some possible results of such a survey may be indicated and it will be convenient to divide Invention into Engineering, Chemical and Agricultural for this purpose.

As regards Engineering generally, indigenous conditions are of relatively little importance: thus for instance in Mechanical and Electrical Engineering, the machinery and methods of working are identical with those of Europe and America and any indigenous conditions, such as excessive temperature and moisture at times, are very simply dealt with. The greatest scope for Engineering Invention in India is probably in connection with Irrigation and Sanitation, though in the latter the Invention required is perhaps mostly in the Chemical category. If we take machinery generally under Engineering, the only far-reaching indigenous condition appears to be the cheapness of manual labour. This condition tends to throw more on the human agency and less on the

machine and indicates that, from the point of view of Economics, India should follow at a certain distance rather than lead or even keep abreast of engineering development in the West. This state of things hardly calls for Invention but requires the exercise of sound judgment and thorough knowledge in importing Engineering methods into India, which points to Engineering Education as the desideratum. As regards Chemical Invention there is probably a very wide and rich field in connection with the effective utilisation of many natural and cultivated products: these will provide many special problems for Invention which must be solved in India. For Agricultural Invention also on account of the indigenous conditions such as climate, soil, etc., the same opportunity for Invention exists probably on a much greater scale.

It has been pointed out that the standards for valuing Research are originality and scope alone; but although these also refer to Invention, other economic standards are of fundamental importance and we must judge the results of invention by such tests as Appearance, Durability, Convenience in use, etc., and finally all work must be referred to the test of *f.s.d.* The application of the last has often made useless much otherwise excellent work in the way of Invention. As a result of the difference in the standards to which the work is referred, the environment which is suitable to Research and Invention is entirely different: we associate Research mostly with the Laboratories of Educational Institutions and the work has been largely effected by the staff and students of these, while on the other hand Invention has come mostly from what may be termed Works, in contradistinction to Laboratories, since these are so much better adapted for the application of the economic standards referred to above. In the case of both Research and Invention also splendid results have been gained by private workers often under the most unfavourable conditions of poverty and sickness, but these are exceptional cases and not at all characteristic of modern work. It would seem, therefore, that when an Industry has been selected as a suitable field for Invention, according to the principles discussed previously, Pioneer Works should be organised under the supervision of an expert having had a thorough practical and scientific training and that this should be the *modus operandi* of pioneering an Industry. It may be remarked that in Laboratories sometimes an attempt is made to realise the conditions of such a Works but in so far as the special features of a Laboratory are present, such as for instance the accommodation and other provision for teaching classes and the architectural conditions due to association with an Educational Institute and other Laboratories, these are distinctly unfavourable to the economic requirements of a Works. As a result we see that the organisation for Invention and Industrial Education would be practically separate to secure efficiency in the former.

It will be found probably in many industries where indigenous conditions have a very important influence, that the call on the actually inventive capabilities for

successful working is not very great but well within the capabilities of an ordinary well educated man who has the direct facilities of a Works at his command. The difficulty to be reckoned with is to get a man of energy and initiative who has a thorough practical knowledge of the industry as developed in Western Countries, i.e., an expert, and who at the same time fully understands Indian conditions. This combination of knowledge is the most essential for the success of the works, and is peculiarly difficult to procure: the methods by which this difficulty might be met may be briefly outlined as follows:—

(1) The services of an European expert may be procured if a sufficient salary is offered. The special defect in this case is that it is extremely difficult for such a man to thoroughly understand Indian conditions and he would certainly have to be a considerable time in India before he would be fit to direct a Pioneer Works.

(2) A suitable Indian may be sent to Europe for training. The special defect of this is that it is extremely difficult for such a man to become an expert; even if he spends several years it is obvious he must depend practically on the generosity of European firms, etc., for what he learns, as his services cannot be of any great value to them, and these firms well understand that they have nothing to gain but much to lose generally by the development of industries in India. A course of training of this kind often degenerates into a round of visits of inspection to Works, permission for which is easily obtained. This is useful and interesting but in no way qualifies a man as an expert.

(3) An attempt may be made to associate a European expert and one or more Indians in the management of the Works. The Indians should thoroughly understand the local conditions, such as habits and power of the workmen and the peculiarities of the market which has to be supplied. This would seem the most promising arrangement, if such association could be made to work smoothly and efficiently.

A full discussion of this matter would be more lengthy than can be attempted here and the conclusion arrived at would depend largely on individual conditions in each case.

The characteristic of such a Pioneer Works would be that the Staff, Buildings, Fittings, etc., would be directly suited to the work in hand in the most economical fashion, though this result would not be attained till after much expenditure on experimental investigation. The Works should also be placed where the greatest industrial advantage can be gained, taking all facilities into account.

The inauguration of such a Works can be confidently recommended to a public-spirited Indian who has sufficient capital at his command. A good lead in this direction has been given by Mr. Tata and others. The carrying through of such a venture, as it should be done, would require, besides Capital, much patient and watchful interest in the work and a generous and

sympathetic treatment of the Staff. If on the other hand, the care of the venture is left to drop into the hands of interested dependents, failure is bound to result: in many cases a considerable pecuniary reward may be obtained eventually, but it were infinitely better that the results of the Pioneering Works should be made freely accessible rather than exploited for the benefit of the individual.

One aspect of Research remains, which may be mentioned now, and that is its educational one. Research develops the mental faculties of "imagination" and "criticism," which are essential for both Research and Invention and are in fact an invaluable asset for any work. The educational value of Research is, therefore, of the greatest importance and from a general point of view much greater than that of Invention, as the mental faculties given above are exercised by it in a more simple and direct manner. Students, however, require a very thorough preparation before they can undertake such advanced work as Research; but the spirit of Research can be carried through their training and they may be taught to investigate for themselves in a Laboratory from quite an elementary stage, thus embodying the educational features of Research to a considerable extent, though no advancement of the boundaries of human knowledge results.

In order to make Research general in Indian Colleges a considerable advancement in the standard of school education is probably necessary in order that the College Course may be able to prepare students for it: otherwise Research becomes a blind following of the directions of a Professor with little or no educational value, and very little result for the Professor's time and energy; since a supply of well-prepared students is very important for successful Research.

The importance of Invention and its relationship to industrial progress is little emphasised even among the educated public of Western Countries; very little is published about it, except Patent Office records never read by the public, and few names are honoured in connection with Invention as compared with Research; in fact, the rewards for the former, though substantial, are strictly in cash. The voluminous records of the Patent offices of Western Countries with their thousands of Patents annually do indeed give some idea of the Inventive activity which prevails, but even they are not at all completely representative, as many industrially valuable inventions are not at all suitable for patenting. To give even a history of, say, the evolution of the modern bicycle, that marvel of cheapness, lightness, durability, and ease in running, with the myriads of ideas of which it is the outcome during a time which many of us can remember, would require several large volumes, and such instances could be multiplied indefinitely. These considerations may lead us to doubt whether a few Professors doing Research with their students would provide a serviceable substitute for the inventive activity of the West, as some optimistic writers seem to think.

Finally, it must be noted that invention is not a Government product in the West and does not even lead direct to State Honours, such as Peerages, Knight-hoods, etc. The most that Government has done for it is in the way of Education. The inventive energy as represented by the expenditure of mind and money has come from the people.

This paper does not treat of industrial development as a whole but of only one of its several factors. It, however, helps to rouse and define an interest in the form of Research called Invention, its purpose has been fully accomplished.

F. W. SEDGWICK, M. A.,

*Professor, Thomason Engineering College, Roorkee*

### The Metal Industry.

When your genial Secretary asked me only a few days back for a paper on the Metal Industry for this Conference, I naturally felt some hesitation in complying with his kind request. The subject is a vast one, and my practical acquaintance is limited to only a small branch of it. I can, therefore, do no more than express a few stray thoughts on the subject which are uppermost in my mind at the present moment.

I took the Lucknow Iron Works in hand some 15 years ago from a syndicate. I have to import all raw material, namely, Cast Iron, Wrought Iron, which are manufactured into articles largely for the use of the Railways and the Municipalities.

My chief difficulty has been as regards the supply of labour, both trained and untrained. The unskilled workmen are illiterate and without much sense of responsibility and therefore make, with some exceptions, very inefficient workmen as a rule. Before they have hardly learnt the rudiments of the work (of course at my expense), they go away elsewhere on better wages. In the local Railway Workshop particularly they easily get almost double the wages, irrespective of their skill and efficiency. Even skilled hands have been tempted away by the offer of higher wages which are more than their proper market value. This is a form of unfair competition which we have to face here. It not only handicaps the employers of labor in their work but also interferes with the proper training of the workmen themselves, who appear to be anxious to earn too soon, and thus their training remains defective. It were well if some means could be devised to protect private enterprise with necessarily limited resources against such a form of unfair competition on the part of a State Department of practically limitless resources.

On the cheapness or otherwise of the coal fuel the success of the industries depends to a great extent. With the object of encouraging the Indian Industries our generous Government, therefore, was pleased to obtain an appreciable reduction in the freight rates of



coal. But its object, I am sorry to say, is being more than neutralised by the selfishness of the Colliery proprietors and coal agents in substantially raising the prices of coal. The law of supply and demand must of course be left to have its free and natural operation. But I feel that the rate at which shipments are going on bode no good to the home industries. Could not a countervailing export duty be levied on coal exported to other countries as offering at least some check to the present unrestricted export of this commodity, as this is believed to be the chief explanation of the exorbitant rise in the prices of coal? The scarcity of railway wagons has tended to further accentuate this difficulty.

The question of the further reduction of railway freight is also one which might be taken up in this connection as tending to encourage the industry.

I would now bring this short paper to a close by bringing to the notice of the Conference a few points of general interest which would have a practical bearing on this as well as on other industries:—

1. I am not aware whether a proper survey has been undertaken in recent years with a view to exploit the mineral resources of these provinces, both metallic and non-metallic. An exhaustive survey might be undertaken of selected local areas likely to yield good results. If Government aid can be obtained to this extent, probably it will not be difficult to form a syndicate to work the industry discovered.

2. I would also advocate the appointment of a Director of Industries by Government to give expert advice free or on moderate charges to enterprising Indian Capitalists as to the industries that might be profitably taken up, indicating the best and most economical way of proceeding in the matter. Seeing the excellent results that the creation of such an appointment in Madras has produced, I cannot but too strongly recommend it here. For the present the Principal of the Thomason Civil Engineering College at Roorkee and perhaps also the Director of Land Records and Agriculture might be entrusted with this work with the co-operation and valuable assistance of yourself, Sir, as the Special Officer who has made an extensive survey of the industrial possibilities of these provinces and has made a close and thoughtful study of the subject.

3. The establishment of free Industrial night schools would, in my humble opinion, go a great way to improve the chances of the proper and efficient training of the workmen. If necessary, scholarships might be given. I look for appreciably good results from the adoption of this course. The employers of labour are naturally unwilling to take this responsibility upon their shoulders, as very few can afford to undertake this additional responsibility, and even those who can afford to do so do not feel inclined, as, in the present circumstances, the services of such trained workmen cannot be assured to them, as these latter can go away elsewhere at any moment

they like. The establishment of such schools would not only supply the demand for skilled workmen by private firms but also by railways and will thus put an end to the unfair competition complained of above.

4. The Government being the largest consumer of most of the iron and brass manufactures at present, the best way of encouraging them would be for the Government to get these locally as much as possible for its requirements. I do not for a moment mean to suggest that competition, which is the very life of all business, should be altogether done away with. All that I claim is that an opportunity should be given to the local manufacturers to tender on all possible occasions for Government requirements. This will tend to encourage and put heart into the proprietors of the existing industries, and thus induce them to extend their business on improved business lines and also induce others to come into the field. This object can be easily secured by a more strict observance of the existing rules whose scope has been further expanded by the recommendation of the Macdonald Committee on Government Stores, appointed some two years ago. These lay down, for instance, that only such articles as are not manufactured in India should be obtained from England and it is required to be certified in respect of each indent not only that the article indented for from England is necessary but that it cannot be advantageously procured of local manufacturers. If any indent on England contains items which it is possible to obtain of Indian manufacture or of indigenous origin it must be explained why it has been indented for from England, and not procured in India, otherwise the indent will be liable to be cancelled.

By the adoption of these and similar measures Government can foster existing industries and encourage new ones to be started. But much will still depend on our own exertions. We should try to profit by past failures and avoid those causes of it, such as want of experience, technical skill, business aptitude, and sufficient funds, which brought them about. We must not be overhasty or over-sanguine, take expert advice and time to mature our schemes, and then and then only float new companies. Success will be assured in such a case, capital will be less and less shy in coming forward, and an era of industrial revival will have dawned under the fostering care of a generous Government.

PRAG NARAYAN BHARGAVA,  
Proprietor, Lucknow Iron Works,  
and  
Director, Lucknow Paper Mills.

### Combination of Agriculture with Manufacturing Industry.

My attention has, during the past two years, been attracted to the great help to improvement of Agriculture which can be effected by combining with it Manufacturing Industry. Rich and well-to-do

landholders have been exhorted to open demonstration farms and to adopt up-to-date methods of agriculture in their home-farms. They are good things, no doubt, but mean extended knowledge of those methods and also willingness to spend money without much immediate return, two things which are not by any means to be found in abundance amongst the richest landholders anywhere. It has, however, struck me that the money-making instinct among all rich landholders may induce them, for example, to open small and large factories right in the midst of their tenantry in those products of their lands which can be then and there manufactured into marketable commodities. For example, in the United Provinces, a vast amount of sugarcane is grown and many rich landholders have the command both of the tenantry and the capital to start profitable sugar factories, if they will only be a little enterprising and not lie content and luxurious on the balance received from the rent rolls after payment of the Government demand and the cost of collection. Similarly, a vast amount of raw cotton is exported out of the country; a landholder possessing, say, a number of villages can easily command enough produce for a most profitable ginning and spinning and weaving mill, planted right in the midst of the producing fields. Similarly for oilseeds and other agricultural produce.

Such a combination appears to me to be the immediate need of our present economic situation. The factories will work profitably and continue to be prosperous with the help of the agricultural produce, simultaneously with improvement in such produce rendered imperative by the necessities of the factories. The profits of agriculture will help the profits of the factory and the losses, if any, in one may be covered by the gains of the other. For instance, better kinds of seeds of cotton, Egyptian or American, will naturally be used for the purpose of finding improved staple for the factory, and must be distributed for cultivation among the tenantry for their benefit as well as to supply one uniform quality to the factory. Thus improvement in both will result and the landholder will be the gainer in many ways out of the combination. The present methods of investment generally adopted by rich landholders is money-lending to their own tenantry or their poorer brethren, or lending to Government by purchase of Government paper. If, however, they adopt this combination, by first ascertaining the kind of agricultural produce available in a given place and then establishing factories for their manufacture into marketable products right in the midst of villages which produce them, they will soon find the immense profits which can be made for themselves as well as the wide openings for work and profit for their tenantry.

And in this vast country of ours we have in different parts of it almost every kind of land capable of producing any and every crop and tree known on this globe. It can be said with confidence that possessing, as we do, the Arctic cold of the Himalayas and the Equatorial heat of the Sahara in Rajputana, no tree

or shrub exists in any part of the world but can be grown in some one or other part of the Indian Empire.

Nor can the inhabitants of our country be classed as inferior in intelligence to the denizens of other parts of the world. Thanks to British authority and influence, we have now the liberty and security in engaging in any trade and manufacture we please, even if it were dependent on distant communications and markets. Thanks to the vast system of Post and Telegraph, Roads and Canals, every part of India is easily accessible, and the seaport towns are nearer to us now than a ten mile distant village in the last century.

I advocate the establishment of factories right in the midst of the fields and villages which produce wheat or cotton or oilseed, which the factory is to manufacture; and roads and railways are so plentiful that no difficulty whatever exists for the transportation of the products of the factory to the markets, however distant.

In spite of the efforts made by Government in its agricultural and commercial department by publication of pamphlets and establishment of Agricultural schools and colleges and experimental farms, no visible improvement in our old time-honoured methods of agriculture has resulted, because the landholders and the actual cultivators have not been approached and not been leavened with the new knowledge and experience and enthusiasm. The establishment of such factories in villages is sure to be followed by establishment of practical demonstration farms in the particular produce with which they deal, and will thus provide many an institution where the information collected by Government in the Agricultural and Commercial Department may well fructify to the benefit of both the owner of the factory, the landholder and of the tiller of the soil.

A writer in the *Indian World* of October 1907, deplores that the great noblemen of Bengal, possessors of immense areas of land and long rent rolls, "evince no practical interest in the improvement of their estates," and advocates "Agricultural Associations" and "introduction of scientific methods of Agriculture" by co-operative bodies scattered all over the country. He portrays vividly how land is diminishing in productive capacity and how immediate efforts should be made by landholders to increase that capacity and says that an increase of 2 annas per bigha in the 916 considerable estates, measuring 40 million acres, will increase the gross annual wealth of Bengal by one and a half crore rupees.

The premier living poet of Bengal in his profoundly thoughtful and statesmanlike address as President of the Pabna Conference, has, the other day, suggested that in order to take advantage of machinery in cultivation and in smaller manufactures, villagers should combine their lands and combine their callings; for example, all cultivating cane or jute should put their lands together, so that machinery imported from their joint funds may be used in their fields, and also to press all their cane-juice, to bale all their jute,

together and so on. Weavers may likewise combine in their own villages, and import machinery to suit them, and increased produce of their own labour will result. That is to say, a general spirit of co-operation is advocated.

The idea of establishing factories and mills right in the midst of villages and among the homes of the cultivator and the labourer serves a double purpose, economical and social. The moral and social deterioration of large numbers of working men and women torn from their homes and indiscriminately huddled together round a capitalist's large factory in towns is well known. This could be avoided if such mills and factories were established near the homes of those who produce the raw material and who naturally will be working men in it.

But who is to lead the way? Who has the requisite enterprise and capital and knowledge to show practically what can be done?

I emphatically advocate the combination in one and the same hand of both agriculture and manufacture. And the motive power I claim to be prospects of immediate and large profits. What the writer in the *Indian World* proposes is almost academic and lacks the strong incentive of immediate gain; and I am afraid the poet's idea is almost a dream, for the ignorant and uneducated ryots and weavers and milkmen can hardly be expected to form companies or conjointly work a spinning or dairy factory. On the contrary those who are owners of long rent rolls have the land at their command, which, even if they do not cultivate themselves, may be easily made available for the purposes of their factory which deals with their produce. It is doubtless easier for rich land-owners to start and work such combinations than for poor uneducated ryots.

It may be said that the great majority of our richer land-owners are too satisfied with their wealth to work for new projects, they lack the enterprise and energy which such combinations mean, and the pioneer's work has not been yet commenced.

Well then, it lies with the educated middle class to form the pioneer companies, to work such combinations and to present the object-lesson—required to stimulate our large land-owners into activity. I have during the past two years been trying to work such a company.

In these provinces as well as in Bengal and the Punjab, most of the culturable land is under the plough, and rights have grown up round each field which perhaps it is undesirable to disturb, even if it could be, for the purposes of such a combination. Some large tracts exist in Eastern Bengal and Assam and the Punjab which are at present uninhabited wastes and the cultivation of which, and the establishment of factories in which, means an expenditure of capital and also waiting for many years for any return, quite unsuitable for making a feasible place where to start such a combination. Looking elsewhere in India, we find in the Malwa Territories of His Highness the

Maharaja Scindia of Gwalior a most suitable and convenient country. There large numbers of villages are available on favourable terms to a company whose object is cultivation as well as manufacture. The land is what is known as black cotton soil. There are five large districts of it as big as British Districts, viz., Ujjain, Shajapur, Amjhara, Mandssaur, Neemuch and Bheela. Except in the southern part of Amjhara, the climate is very good, much better than many parts of Bengal, and less hot than most parts of these Provinces, and in Ujjain and Neemuch the climatic conditions are ideal. There are no extremes of heat and cold and the water everywhere is sweet and wholesome. The nights of Malwa in hot weather are cool and pleasant, and the rainy weather in Malwa, in fact, is colder than the cold of the winter season. Unlike other parts in the plains of this vast country of ours, rainy weather in Malwa, as in Rajputana, is quite enjoyable. There are great rivers in Malwa, the Chambal, the Sipra (the Ganges of the Deccan), the great Kal Sindh, the Betwa, the Parvati, the Vaisali, the Retam, the Bamni; and other streams of smaller dimensions, which, however, are liable to be dried up if sufficient rain does not fall in season. There are many bends in these rivers which pass hilly and uneven country, admitting of the erection of large lifting machinery for the irrigation of wide expanses of country. In our old books, Malwa is described as full of grain and as never having suffered from famine or scarcity. In point of fertility and resources the land of Malwa is pre-eminent in all India from an agricultural point of view, producing the best wheat, cotton and opium; it requires only a little moisture to grow all sorts of produce, plants, trees, shrubs and grain luxuriantly. Sir William Hunter, in his *Gazetteer*, says, "Malwa is the richest part of Central India and has never in historical times suffered from famine caused by drought." Lord Curzon, in his speech at the public meeting in the Town Hall of Calcutta on the 16th February 1900, to organize charitable relief for famine sufferers, said, "In Central India even fertile Malwa which has *always* been an asylum for famine-stricken wanderers from other parts has itself been stripped bare, etc."

Ujjain is the central part of Malwa and forms the first plateau of the Vindhya Mountains, which run parallel to the Nerbudda, and below 10 to 30 feet of the soil of Malwa exists the Deccan Trap, the hardest rock which holds all the rain water like an underground reservoir and keeps the soil moist, though on the surface it may be hard and dried. Only 26 inches of rain in season is enough to ensure bumper crops.

Such is the land which the severe famines of 1897-98 and 1900-1902 has left badly affected, and there are large numbers of villages which His Highness the Maharaja Sir Madhava Rao Scindia is offering to settlers of education, experience and position on favourable terms, who organize themselves into a co-operative body to combine agriculture with manufacturing industry.

As to communications by rail and pucca road, the following lines of railway pass through Malwa :—

1. The G. I. P. Railway from Itarsi *via* Bhopal northwards through Bhelsa, Bina, Jhansi and Gwalior to Agra and the north.
2. The Rajputana-Malwa Railway (the B. B. C. I. Railway) from Khandwa *via* Indore and Mhow to Fatehabad and Ratlam to Mandasaur and Neemuch and north-westwards to Ajmere.
3. Fatehabad to Ujjain.
4. Bina-Goonna Railway.
5. Bhopal-Ujjain Railway.
6. Nagda-Muttra Railway.

As to pucca roads there are many already, and His Highness' Roads Department is actively engaged in adding new ones every year since his accession to full powers, twelve years ago.

His Highness' terms, shortly stated, are that the company will be granted lease for 20 years, the annual lease money being the average of the *annual realizations* to the State during the past five years less 8 per cent. for the first ten years, and 15 per cent. less than the rental for the remaining ten years. The lease is liable to renewal and all buildings of the company will be their permanent property, who will also have power to sub-lease any villages to persons other than His Highness' subjects. Permanent proprietary heritable and transferrable rights will be given on recommendation of the company to individual shareholders.

Now the actual realizations to the State during the past five years have been from 40 to 70 per cent. of the Settlement recorded revenue, so that the margin of profit, to all intents and purposes from the management of villages on a large scale, is almost sure of being large: besides giving the company unlimited scope for extension of cultivation over thousands of acres of good land at a continuous stretch. I have observed the conditions existing in the villages in Malwa and have no doubt that an organised body can engage on these terms in the management of villages alone with the minimum of capital and of chances of loss and have the maximum of probabilities of success and profit. And further many groups of villages exist where wheat and cotton are grown and where ginning mills and flour mills can, with advantage and with every prospect of success, be planted. The shareholders have, *firstly*, the profits from the management of the villages, *secondly*, the profits from the advances made to the tenants in cash and in seed and plough cattle, *thirdly*, the profits from dairy farming, from cattle breeding and other incidental incomes connected with zamindari, and *fourthly*, the profits of mills and factories of their own, with which no other factory or mill will be able to compete or the company will own both the lands and its own factory and thus have practical command of the supply of raw material, even from neighbouring villages not belonging to it. For example, a cotton mill, not possessing its own villages, has to buy its cotton in

the open market, where the supply is usually of different kinds, and sometimes insufficient or not available at proper working time. The company, by advancing one particular kind of seed to its tenantry, may easily obtain, in lieu of its advances and of the rents realizable, cotton of one uniform quality, and may easily regulate the quantities required to proper times of working of the factories and have sufficient material to ensure working for a full period of the season. *Fifthly*, the company, having the command of the villages, can engage in new ventures in cultivation to supply new ventures in manufactures.

These are the prospects in Malwa and the immense opportunities available in that part of our country. Instead of emigrating to ungrateful Transvaal or to inhospitable Canada or Australia, I urge upon the attention of my countrymen the advantages which His Highness the Scindia offers in a salubrious part of our own country.

A corporation has already been formed and has started working by taking possession of 81 villages in the Districts of Mandasaur and Ujjain. People of education from the Berars, from Gujarat, from Bengal and the Punjab and these Provinces already are there, though working individually small tracts without any organization or combination. What is however requisite, to open out the yet vast tracts available, is a strong syndicate possessing skill and knowledge, technical and professional, of all kinds, and experience of the various matters connected with land management and manufactures and machinery, and possessing influence if not vast capital; to fructify, as an object lesson to all India, the idea of *Combination* of agricultural and manufacturing industry, which alone can bring about the economic salvation of our country.

K. P. Bosa,

*Pleader, Meerut.*

### Outlook of the Paper Industry in India.

Having been asked to contribute a short paper on the Paper Industry in India, I have much pleasure in responding to the request.

The above Industry at the present time is passing through a period of depression, owing to a variety of causes, not the least important of which are the following :—

I. *Shortness of Raw materials*, such as Rags, Patmal and Hemp. Plague may have interfered with supplies of the above to a certain extent, but the real cause may probably be due to the want of enterprise. These are materials which may be found in plenty in every locality if only people would organise and exploit on business lines. If this work were done in these Famine times, it would provide work for a large number of starving people, and to capitalists it would mean a profitable return. Often and again I have looked round and tried to find other materials

which could take the place of these, but so far I have not been able to hit upon any. In better classes of paper we have to use more expensive materials, such as Baib Grass, also wood pulp, but beyond a certain limit, it does not pay to use these, especially wood pulp, on which we have to pay prohibitively high freight rates. It is gratifying to note that Government is doing something to encourage the manufacture of wood pulp in this country. We have all read with interest Mr. Sindall's report on the experiments he made with Bamboo and species of wood available in Burma. But even if the experiments are successful they will not help us much in this part of the country on account of the difficulties of getting it here all the way from Burma at reasonable rates. I am also informed that the local Government have sent samples of wood from these provinces to England for experiment. We wait with interest to hear the result. Even should these samples prove suitable for Paper Manufacture, we have to find out if the wood can be had in sufficiently large quantities and within easy reach.

II. *Chemicals* for the use of Paper Manufacture have to be imported and cost us much when laid down at the Mills. The same is the case, more or less, with all English stores which cannot be procured in this country. Some of the chemicals that are available in this country we have tried, *viz.*, Alum and Resin, but they have not been successful, owing to the very low quality, thus making them more expensive in the long run than the imported articles. Indian Sujji (Fuller's earth) at one time we used a large quantity, to take the place of imported English Caustic for boiling, but on account of the increased rates we found it more profitable to use English Caustic.

III. *Coal*.—Our coal bill is also a very heavy item. Although in order to encourage the Industries, Government has got railway freights substantially reduced, yet the advantage has not reached the Industries, owing to the high rise in the prices of coal.

IV. *Labor Difficulty*.—The Labor question is another difficult matter we have to deal with. The ordinary workman likes nothing better than to stay away from work. This is specially noticeable a few days after their wages are paid. Another thing I have noticed is as we increase wages the worse they are in the above respect. Apart from his irregular attendance, the Indian workman is not nearly so efficient as the European workman of the same class, and shows very little disposition to improve himself. Want of education may partly account for this, but the habit of indolence ingrained in him has also, I am afraid, a great deal to do with it. The sense of responsibility has yet to be developed in him.

V. *Indian young men as Apprentices*.—With a view to encourage Indian young men of respectable families to be trained in the art of Paper Making, we have adopted the apprentice system, whereby they have every facility given them for learning the business, and a fairly liberal scale of wages had been fixed, but I am sorry to say, even with these young men, I find the same difficulty. Those moral qualities

of punctual attendance, dogged perseverance and intelligent interest in the work which make for success in these cases are sadly lacking. We hear nowadays a good deal about sending young men to foreign countries to learn the art of Paper Making. This is a course I do not agree with at all. My opinion is that they should rather qualify themselves here, where they have every opportunity of doing so. Should it be thought necessary, after they have completed their training here, they may be sent abroad with a view to expand their knowledge and broaden their outlook, with special reference to the improvements that are being daily made, both in machinery and processes of Paper Making. I myself consider that Indian young men have much better facilities for learning the art of Paper Making in an Indian Mill than in a great many European Mills, because the conditions of work are so different. The materials alone, for instance, which we use in the manufacture of our paper here, are all to be found in the country, whereas a large number of Mills in European countries use nothing but imported wood pulp. Consequently in Mills like these only one half the business can be learnt, there being no preparation of materials needed, wood pulp being all ready prepared.

Seeing that we still annually import more than 8,000,000 worth of Paper and Paste Board and this amount is increasing every year, we cannot say that the Industry has not a good outlook before it, but we have to guard against certain difficulties and dangers.

1. New mills to be started should be sufficiently apart from the existing ones or otherwise the already existing difficulty about raw materials is bound to greatly increase. The result will be that competition will set up for these, increasing their price, and consequently the cost of manufacture; and as we have already to compete with cheap foreign papers, it will inevitably result in injuring both the existing as well as the proposed new mills.

2. Great care should be taken to locate the new mills, in places where raw materials can be had in plenty, also water.

3. Before launching in an enterprise of this description, expert advice should be obtained and a scheme prepared accordingly in consultation. It will always pay to go in for new up-to-date machinery, so as to insure large outturns, which would have the effect of reducing the average cost.

4. We should have these mills at places where we could command plenty of labour, both skilled and unskilled.

5. Direct railway communication with sidings running into the mills, is also a question to be studied, as freight forms a large item of expenditure, and an endeavour should be made to get it reduced as much as possible. The less we have to do with transshipments on rail the better, for we incur heavy losses in shortage, breakage and sometimes even in total loss.

These are a few hasty notes which I had time to jot down and I trust the same will give some idea of the numerous difficulties we work under, apart from the prices of almost every single material going up by leaps and bounds without anything like corresponding increase in the price of paper, so that the prospects of the Industry are not at this moment particularly hopeful and, with the unrestricted import of cheap foreign paper, the position has become still worse. Probably the only solution of all this difficulty would be found when cheap wood pulp can be made in this country. As I have already mentioned, the matter is engaging the attention of the Government, but till then we cannot be too guarded in venturing on the establishment of a new Paper Mill. Certainly I would not recommend lightly launching upon such a course without paying heed to my above suggestions.

JAMES IMMS,

Manager, Upper India Couper (Paper) Mills, Lucknow.

### The Dairy Industry in the United Provinces.

India being an agricultural country, the dairy industry, which is connected with agriculture, is carried on in almost every village and town from time immemorial; but dairying on the improved European system is of very recent growth. Speaking generally, the native method of treating the milk for making ghi, which is more commonly used than any other dairy product, is first to boil it for the purpose of purifying it. Then sour curd is added and the milk is allowed to stand for twelve hours at least before it is churned. Warm water is then added and when the butter begins to break, cold water is added. The butter is then gathered and is put into a vessel and boiled over the fire until the water is evaporated and the curd is deposited at the bottom of the vessel; but care is exercised at the last stage, as, if the deposited curd is allowed to burn at all, the ghi would be spoilt. This system of first boiling the milk to purify it and then to artificially sour it with curd is quite on a par with the best European modern system and secures a maximum yield of butter from the milk provided the boiling process is not continued too long. The weak point in it is that the milk, after being so treated, becomes butter milk and is of a low value for sale. In ghi-making we get only two products of the milk, *viz.*, ghi and *mattha*. According to the improved European methods, the cream which the separator takes out of the milk contains all the ghi and the separated milk contains all that is required for drinking purposes and for use in making curds and cheeses and also sweetmeats. The cream being only about a twelfth part of the whole not only reduces the labour in dealing with it but reduces the cost of fuel in making the ghi. The milk being taken away reduces the curd in the ghi and thus improves the quality. Under the ordinary system of dairying and the treatment of milk it is difficult to manage any

quantity of milk in the hot season, but by means of the separator the difficulties are at once overcome; the cream being taken away from the milk as soon as it comes from the cattle, places the products absolutely under control. The cream can be kept and ripened for butter and ghi-making and the separated milk is suitable for drinking purposes.

Dairying has recently assumed a very important place in all Western countries; and the measures which were taken by Government with a view to improve the dairy industry in this country were briefly these. In 1889 at the suggestion of the Government of Bombay the Dairy Supply Company sent Mr. Howman to India to make enquiries into the dairy industry, to ascertain by trials whether the cream separator was needed in India and whether it could be profitably utilized in the manufacture of ghi. After an extended tour in several provinces and after having made various trials he reported in favour of the adoption of the separator. On his leaving the country the services of his assistant, Mr. E. Keventer, were retained by the Bombay Government with a view to organize improved dairy arrangements in that Presidency. In 1891, the Government of these provinces secured the services of Mr. Keventer. He at first commenced his work at Cherat, four miles from Aligarh, where a number of cattle belonging to the Agricultural Department were kept on a *usar* reserve and where dairy operations on a small scale had already begun. By the beginning of the cold weather public interest in the dairy began to be awakened and the demand for butter increased steadily. It then became necessary to purchase milk from the *Ahirs* in neighbouring villages. Next year, in 1892, a dairy was started at Lucknow in connection with the jail and the necessary cattle were purchased from Hissar, Batesar, Muttra and Etawah, where good milch cows and buffaloes are procurable. The experiments made by Mr. Keventer both at Aligarh and Lucknow showed that good butter can be made at all seasons of the year, that it can be transported fresh to considerable distances even in the hottest weather and that it could command a remunerative price. In Aligarh the amount of milk required to produce one lb of butter was 18.48 lbs. In Lucknow the proportion of butter to milk was 1 lb of butter to 15.16 lbs of milk. The difference is due to the fact that at Aligarh the milk was chiefly bought; at Lucknow it was all the produce of the dairy cattle. The analyses of the butter from Lucknow and Aligarh showed it to be excellent both as regards aroma and keeping qualities. A quantitative experiment was carried on at Aligarh to compare the amount of butter obtained by the European and native methods, respectively. The results were as follows:—With European appliances 74 lbs cows' milk gave 3 lbs 6½ oz. butter or 1 lb of butter from 21.72 lbs of milk. So again 43 lbs of buffalo's milk gave 3 lbs. 1 oz. of butter or a ratio of 1 : 14.29. With native appliances 37 lbs. of cow's milk gave 1 lb. 7 oz. of butter or a ratio of 1 : 25.74 and 11 lbs. 12 oz. of buffalo milk gave 10½ oz. of butter or a ratio of 1 : 17.49. Thus by means of the European methods a larger outturn of

butter was obtained both from cows' and buffaloes' milk. These butters were each analysed by the Chemical Examiner and the result showed that the quality of the butter made by European methods was distinctly superior. It contained considerably less water and curd than that obtained by native methods. Owing to climatic conditions, which in India differ so much from those in Europe, the experiments with cheese were not attended with quite the same success as the other dairy operations. At Aligarh the skim or separated milk was nearly unsaleable and most of it was fed to the cattle; but in Lucknow when the dairy got better known purchasers for this milk were found and the supply was insufficient to meet the demand. Mr. Keventer was much impressed with the necessity for the more careful selection and breeding of milch cattle and for the growing of the best fodder crops. Cows and buffaloes are unable to produce milk on the scanty and dry food they are commonly fed with, but if properly fed with green crops the output of milk increases. The dairy at the Lucknow jail was subsequently closed on the representation of the Inspector-General of Prisons and that at Aligarh was later on sold to Mr. Keventer, as its continuance under Government management would have interfered with private enterprise.

The success of Mr. Keventer's experiments did much to stimulate dairying on the improved system and dairy farms were started by military authorities in several cantonment stations. Owing, however, to the distance from Aligarh station the situation of the dairy at Cherat was not convenient for private persons who desired instruction in butter-making. Still several apprentices visited the dairy to learn the method of working, which resulted in the opening of private dairies in places. In Aligarh there are two or three small dairies which make butter on the improved system, but which depend for their supply of milk on neighbouring villages. Here in Lucknow we have two good private dairies, the Diamond Dairy and the Star Dairy. The development in these provinces of this industry according to the improved system has nevertheless been rather slow and in his University Convocation address of 1903 Sir James La Touche had to refer to the subject thus:—

"Of all these the most hopeful perhaps for this province are the industries connected with agriculture. It has always been a regret to me that a successful industry like that of the farm for dairy produce in this station and in Aligarh has not been taken up by the people of this province. There is an unlimited demand for ghi and other dairy produce. The process of manufacture is capable of immense improvement; the study of suitable fodder plants has great economic value but modern science is of no avail unless there is an industry to which it can be applied."

The demand for good dairy products is daily increasing. In larger towns it is now practically impossible to ensure a supply of pure milk. The stalls where cows and buffaloes are kept by *Ahirs* and *Ghosias* are always saturated with the manurial matter; in the rainy season they become quagmires. The supply of milk from such places is a fruitful source of diseases to those who drink it. All the larger towns should, therefore, have one or two good dairies managed by

private persons on the improved system. If they can work successfully at Lucknow, where there is also a dairy farm worked by the military authorities, there seems no reason why they should not work profitably in other large stations also. Good butter is sold at the rate of 12 to 14 annas per pound; and the margin of profit in making it is greater than in ghi which is usually sold at eight annas per pound. At the outset about Rs. 5,000 are enough for the purchase of cows, buffaloes and dairy appliances and for making sheds. If a regular supply of good milk can be arranged from neighbouring villages small dairies for butter making can profitably be worked on a much less initial cost. No difficulty is ever felt in disposing of the dairy products. Ghi, butter, cream and milk, whether whole or separated, are readily sold locally in all the seasons of the year and in the cold weather butter can be sent to distant places like Calcutta and Bombay where it is in good demand.

The case of ghi requires some special notice. It is one of the chief articles of export from these provinces. Ordinarily its annual exports amount to about 2½ lakhs of maunds, the value of which at Rs. 40 per maund comes to one crore of rupees. Its consumption inside the province is much larger. The manufacture of ghi is carried on in almost every village according to the system already described. In Rohilkhand and Oudh the produce is just enough for local requirements; but in Meerut, Agra and Allahabad divisions, especially the four Bundelkhand districts of Banda, Hamirpur, Jhansi and Jalaun, the industry is important and the exports of ghi are chiefly drawn from these tracts. Calcutta takes about 1½ lakhs of maunds a year partly for local consumption and partly for re-export to Burma and other countries; the rest goes to Bombay and other places. The question of the supply of pure ghi in larger towns is more pressing than that of milk, as ghi is more commonly used. The ghi which is offered for sale in the bazars is of very poor quality, being adulterated with fat and vegetable oils. If in the larger towns shops were opened for the sale of pure ghi they would be welcomed by the public and if they were worked on an organised scale the export trade also might be stimulated. No risk whatever is involved in this trade and as the price of ghi does not much fluctuate, a moderate amount of profit can always be secured.

SYED HOSSAIN,

Department of Land Records  
and Agriculture, U. P.

### Agricultural Improvements in the United Provinces.

The bulk of the people of India belong to the agricultural class. In these provinces this class forms quite two-thirds of the entire population. Agriculture here is the chief source of the wealth of the people and the revenue of the Government. And yet until

a comparatively recent date there was practically no Imperial or Provincial Department of Agriculture worthy of the name.

It was not until the great famine of 1877 that a beginning was made on the report of the Famine Commission with what has since been styled the Department of Land Records and Agriculture, of which even the name suggests that Agriculture formed merely a secondary object.

The idea of an Experimental Farm at Cawnpore had been conceived by the late Sir John Strachey in 1874, but it was Mr. (now Sir Bampfylde) Fuller, who as an Assistant Director of the Department actually started the Farm in 1881, with a small workshop for making and repairing agricultural implements and a seed store, and worked hard to give it a firm foundation. To this the Department subsequently added a staff of trained well-sinkers available to the public at a fixed salary and also a branch for cattle-breeding. In the early nineties a small Agricultural School was also opened at Cawnpore, of which the main object was to train candidates for the post of Kanungos, and about the same period occasional bulletins in English and a monthly journal in Urdu called *Mufeed-ul-mazareen* began to be published by the Department for the dissemination of useful agricultural information and Agricultural Shows and Demonstrations began to be held. But until the beginning of the present century, the Department did not find much scope for development and the work was done only on a small scale owing chiefly to the small funds provided for it and the comparatively little interest which the Imperial and Local Governments evinced in the matter.

Happily since the last few years a better state of things has come into existence. Although the divorce of the Department of Agriculture from that of Land Records, which our representative, the Honorable Babu Sri Ram, pressed in the Imperial Council, has not yet been made in form and the two Departments are still united, the principle has been adopted, and an officer of the Indian Civil Service has recently been appointed as a Deputy Director, to relieve the Director of Land Record's work, and the latter is now practically a whole-time Director of Agriculture. A scheme has been sanctioned under which a central institution for scientific research and for education has been established at Cawnpore by converting the Agricultural school of that place into a college, and local organizations for Agricultural investigations and for assistance to the public have been started at various places and more are to be started at others.

The college, which was started last year, has a three years' course to give instructions in the theory and practice of agriculture as well as in several branches of science, such as physics, chemistry, botany, entomology, zoology and agricultural engineering, in so far as they are required for the purposes of agriculture, besides other useful subjects. The object of the education given in the college is mainly threefold, viz., (1)

to train candidates for the revenue service of the Government among whom a knowledge of the agricultural conditions is very desirable, (2) to train candidates for the staff of the Agricultural Department without which its proper development is impossible, and (3) to train young men, chiefly of the landholding classes, to be qualified to act as land agents to the Court of Wards and the Zemindars, or to carry on the profession of farming.

European specialists are being appointed, under whose direction and supervision Indian professors will carry on the teaching, while the former will devote the greater part of their time to the work of scientific enquiry and research into the agricultural problems specially concerning these provinces. To enable this to be properly done, well-equipped laboratories are being attached to the agricultural college.

Turning to the local organizations we find many forms in which the activities of the Department are displayed. The most important of these is the multiplication of Agricultural Stations with experimental farms, one or more of which it is proposed to establish in each distinct region of these provinces for purposes which may be classified under four heads: (1) to make a detailed study of the agricultural conditions and difficulties of each region, (2) to spread the knowledge of successful investigations by demonstrating the value of ascertained improvements, (3) to supply, by sale or loan, the best available seeds and the most improved agricultural implements to the public and (4) to give advice and information to all applicants, whether tenants or landholders.

It is at present proposed to have ten such agricultural stations in these provinces. The Farm at Cawnpur had already existed since a quarter of a century. Commencement was made with another, the Orai Farm (in Jalaun) in June 1905, and within a year after that the Partabgarh and Aligarh Farms were started. Last year sites were also acquired for a Farm at Banda and another at Benares. The Government contemplates to place these agricultural stations under trained expert supervision of four Superintendents of Farms who should all be Indians in future, though at present this is not considered possible owing to the lack of so many properly qualified men in these provinces.

The important work of the supply of seeds and agricultural implements from the agricultural stations is increasing and may soon become difficult to cope with. Already arrangements have been made to establish other centres and private agencies to distribute them in view of the growing wants of the public. Particular interest is taken with regard to seeds and last year credit sales of the Department @ 25 per cent. interest rose from 2,000 to 10,000 maunds. The Government is also encouraging the formation of co-operative seed societies, of which 10 are now in existence, 7 of which buy their seeds from the Agricultural Department.



As to the work of giving advice and information to the public, reference may be made to the fact that correspondence is freely exchanged between the different agricultural stations and private gentlemen, and encouragement is given to private persons to carry on their farming on the improved lines which experience has approved, and at present six farms are working in consultation with the department, *viz.*,

- (1) Meerut Farm of Sheikh Wahiduddin.
- (2) Jatau (Agra) Farm of Kunwar Dhianpal Singh.
- (3) Kharauli (Meerut) Farm of Babu Jagannath Prasad, a diploma-holder of Cawnpore Agricultural School.
- (4) Ghazibad (Meerut) Farm of Babu Ram Chandra Gupta, another diploma-holder of the same school, the leading feature of which is the free teaching in agriculture given to sons of agriculturists.
- (5) Tajpur (Bijnor) Farm of Kunwar Sheonath Singh.
- (6) Samrauta (Rai Bareilly) Farm of Raja Chandrachur Singh.

In this connection I might mention that as a means of giving information to the public, the system of issuing Bulletins, of publishing the vernacular Agricultural Journal, *Mufsed-ul-masasen*, of which 1,000 copies were sold last year, of holding agricultural shows, and demonstrations, particularly Sugar Demonstrations, has been kept up with earnestness and even improved.

Another form of local organisation now being developed is the scheme to attach to each Tahsil, where there is a demand, a specially trained well-sinking staff available to the public at fixed rates to render assistance in locating sites for new spring wells by making trial borings, and in rendering existing spring wells more efficient by boring to a lower spring in a cheap and effective way. A well survey of the whole Province, village by village, has been accomplished to ascertain what villages require more wells, where Kacha wells serve the purpose, where masonry wells are needed and what are the reasons for want of masonry wells in those places, whether the opposition, apathy or poverty of the landholder or the great depth of the spring levels or other engineering difficulty. This well survey will greatly assist the Government in the encouragement and assistance which is now proposed to be given to the increase of well-irrigation in the Province as a measure of protection against drought.

Up to this time 28 districts, which urgently required it, have been supplied each with a district staff of well-sinkers. As more men are trained and as the demand grows, the full scheme will be gradually worked out.

Still another form of local organization which is being developed under the Civil Veterinary Department is a system of veterinary establishments to deal with outbreaks of cattle disease and depôts for rearing and supplying bulls in tracts where facilities for breeding exist.

For all these improvements we must acknowledge our gratitude to Government. And first of all, our thanks are due to the Local Government and the Provincial Department of Agriculture which have laboured from the beginning in initiating and keeping up and improving the various forms of their activities for the promotion of Agriculture, in spite of the small funds placed at their disposal for the purpose. In the next place, we must thank the Government of Lord Curzon whose interest in Agriculture and whose energy and comparative generosity, which I would take leave here briefly to detail, have rendered the re-organisation of the Agricultural Department on a large scale possible, and we cannot but associate with him in this matter the late Sir Denzil Ibbetson, his Secretary in the Revenue Department.

As I have already stated, before the time of Lord Curzon very little interest was taken by the Government of India in the development of Agriculture and very little money was allotted for that purpose. In 1901, for the first time an expert head under the title of Inspector-General of Agriculture was appointed to the Imperial Agricultural Department, and since then both the Imperial and Provincial Departments have been gradually strengthened by the appointment of experts in different branches. In 1903, the scheme of the Pusa Institute of Agriculture was sketched by the late Sir Denzil Ibbetson and it has since been inaugurated and an Advisory Board of Agriculture has been constituted upon which both Imperial and Provincial officers are represented. The advance made in the development of the Agricultural Department since 1903 was most remarkable: in the Imperial Department the expenditure actually doubled itself in three years from about 10 lakhs per annum in 1903 to about 20 lakhs per annum in 1906.

But so far as our Provincial improvements are concerned the most remarkable step taken was in March 1905, when in the Budget Statement of the Government of India the substantial sum of 20 lakhs per annum was allotted for a scheme of Agricultural research, experiment, and instruction to be undertaken by Local Governments.

Now mark the rapidity with which this scheme was pushed through. In the very next month (April 1905) the late Sir Denzil Ibbetson on behalf of the Government of India called for an early report of the manner in which Provincial Governments desired to develop their Agricultural Departments. Sir James La Touche submitted in May a scheme of development prepared by our Director, Mr. Moreland, and this scheme, with certain reservations, was sanctioned in July by the Government of India which in August made a grant of 3 lakhs to meet the expenditure of the then current financial year in connection with it. In September 1905 the Resolution of the Local Government announcing the scheme to the public was published and since then its development has proceeded apace on the lines which I have explained above. There is, however, still a great lack of qualified Indians both for the superior and the subordinate staff of the Department

which is hampering its more speedy realisation, but it is hoped that the Cawnpore Agricultural College and the existing and proposed Agricultural stations will be able to educate and train such men before long.

I think I have said enough to explain the first part of my motion. The second part suggests an addition to the scheme sanctioned by Government, which I have no doubt will commend itself to you as well as to the Government without the need of much reasoning and persuasion. The full benefit of Agricultural Stations cannot be realised, unless the experiments carried on there and their results as well as the lessons to be learned from the attached demonstration farms are orally explained in a fixed regular manner to those who attend to learn them and at the same time some primary agricultural education is given there in the vernacular in order to enable them better to profit by those lessons. It seems that our Director of Agriculture is himself alive to the advantages of such an addition, for in his last report he notices with approval the attempts made by private farms in this direction.

I must now address myself to the third part of the motion, and here I am rather sorry that the wording of the Resolution is limited. I should like to explain briefly what the people themselves should do to improve the condition of our Agriculturists, while as it stands, it merely affirms one of these things to be undertaken by a particular class.

The distribution of good seeds and improved implements as well as the demonstration of the value of ascertained agricultural improvements are duties in which the public should come to the assistance of the Government. What is at present required is co-operative seed societies or seed depôts for seeds, and private agencies and, if possible, private factories for implements, distributed largely throughout the Provinces, where the cultivators could purchase or borrow them and also a separate organization to induce the ignorant cultivators to try the new seeds and implements. The enlightened and well-to-do zamindars could assist very largely in this way as well as by opening or continuing their private farms on improved methods that Government experience has proved successful, thereby setting an example to their tenants. Educated and enlightened gentlemen, who are not zamindars, could assist by exercising such influence as they possess over the zamindars, to prompt them to action, and by encouraging and, if possible, joining the organizations to which I have referred.

For the prosperity of the Agricultural Classes enormous possibilities exist in these matters. As an illustration, I may refer to Muzaffarnagar wheat. It has been demonstrated that if good seeds of this variety are sown in Oudh in place of the ordinary seeds used here, and at the harvest time the price of wheat is 16 seers for a rupee, the increase in the quantity and the quality of the crop, under ordinary circumstances, would be such as to produce an extra profit of Rs. 8 per acre to the cultivator. Now in Oudh 20 lakhs of acres of wheat are ordinarily sown and

thus, simple arithmetic would tell us, that if all Oudh cultivators were induced to sow only Muzaffarnagar seeds in their wheat fields, they would be richer by one crore and sixty lakhs each year. Is this figure not astounding? And yet what notice has been taken of the publication of the results of the experiment on Muzaffarnagar wheat by the general public? It is a great pity, really a shame, that while a foreign Government is doing so much, the public should be doing so little, in a matter of such paramount importance as Agriculture. I cannot refrain from stating, though I assure you that I do so without meaning any offence to any person or to any party or class, that the attention of the public seems to me to be distracted by other more exciting, but less profitable, topics and our leaders and their subordinate workers have not sufficient time and energy left to spare for the unfortunate agriculturist.

ZAHUR AHMAD.

### Our Artisan Classes and the Industrial Movement.

Efforts are being made in almost all Provinces to revive the dying industries of India and to introduce new industries, by adopting and using modern scientific methods and machinery. But not much is being done to interest our agricultural and artisan classes, the sugar-manufacturers, the blacksmiths, the weavers, the dyers, the chamars (shoemakers and tanners), &c., in the movement. Whatever may take place in the distant future, in the immediate future we cannot expect large numbers of Brahmans, Kayasthas and other classes to take to industrial careers. And even if they did, the loss to the industrial castes of their ancestral occupations for ever, will be a national disaster. The poverty of India is not a little due to the throwing of almost all artisans on the land. This should be remedied, but it cannot be done by sending a few high caste youths to foreign countries for technical education. Moreover, by neglecting to give the artisan castes higher technical education, we are allowing the hereditary skill, aptitude, and inclinations of these men to run to waste, which is a great national loss. It is true that the few Government and private technical institutions in the country are open to the artisan castes as much as to others. But they are too poor, too ignorant, too apathetic to take advantage of these institutions. It is, therefore, our bounden duty to provide special facilities for these classes for technical education. We think special schools should be opened for them in chosen centres for teaching them the three R's, drawing, clay-modelling, commercial geography and commercial history. The courses should be simple and short. These courses should be common to pupils of all artisan classes, and additional special training should be given in different industries according to the hereditary professions, or aptitudes of the pupils. To specially gifted boys

should be imparted a working knowledge of present-day English, and every attempt made to send them abroad for technical education. If the higher castes show the way in not excommunicating their young men trained abroad, the artisan classes, too, will follow suit. Their travelled young men will be pioneers among them of new industrial methods.

The founding of schools of the kind suggested above may and will take time. In the meantime we should try to find out educated young men of the industrial classes (and there are some such) possessed

of the requisite qualifications and send them abroad for education. One such young man on his return would do more to make the industrial movement a success than several similarly trained young men of non-industrial classes. In short, our conviction is that unless we can secure the co-operation of the industrial castes and enlist their best minds in the service of the cause, the industrial movement will not be a national movement and will fail to achieve its object.

RAMANANDA CHATTERJEE.

which is hampering its more speedy realisation, but it is hoped that the Cawnpore Agricultural College and the existing and proposed Agricultural stations will be able to educate and train such men before long.

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PROCEEDINGS  
OF  
**THE SECOND**  
**UNITED PROVINCES INDUSTRIAL CONFERENCE**

HELD IN  
**LUCKNOW, ON MARCH 1ST, 1908.**

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ALLAHABAD:

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# THE SECOND UNITED PROVINCES INDUSTRIAL CONFERENCE

1908

ON Sunday, the 1st March, at 11 a.m., the Industrial Conference was held in the Conference Pandal, in Lucknow. Raja Rampal Singh, C.I.E., proposed Mr. A. C. Chatterji to the Chair, and Pandit Moti Lal Nehru seconded the proposal. Mr. A. C. Chatterji then read his address.

The Chairman informed the Conference that papers contributed by several gentlemen would be incorporated in the report. The following resolutions were passed:—

## I. TECHNICAL EDUCATION.

(a) That this Conference thanks the Government of the United Provinces for the action taken by them with a view to introduce a fairly comprehensive system of Technical Education in these Provinces and it expresses the earnest hope that the Government of India and the Secretary of State would sanction the scheme recommended by the Naini Tal Industrial Conference and provide funds for giving effect to it in the next financial year.

(b) That this Conference urges on the public the necessity of founding stipends to enable deserving young men without private means to take full advantage of the instruction provided in technical colleges and factories in India and abroad.

Proposed by the Hon. Pandit Sundar Lal.  
Seconded by Rai Baij Nath Bahadur.  
Supported by Mr. B. N. Sinha.

## II. AGRICULTURE.

(a) That this Conference notes with pleasure the gradual development in various directions in the Agricultural Department of these Provinces and offers thanks to the Government for the liberal scheme that has been sanctioned for its re-organisation on a large scale.

(b) That this Conference is of opinion that wherever possible, small classes for giving instruction in the improved methods of agriculture in the vernacular, should be attached to the Agricultural stations which the Government is now establishing in different centres in these Provinces.

(c) That this Conference urges the enlightened and well-to-do Zamindars of these Provinces to adopt in their private farms the improvements which the

experience of the Government Farms has conferred and to demonstrate their usefulness to their tenants.

Proposed by Syed Zahur Ahmad.  
Seconded by Mr. K. P. Bose.  
Supported by Sha. Faiyaz Ali.

## III. THE CO-OPERATIVE CREDIT MOVEMENT.

That this Conference notes with satisfaction the progress made by the Co-operative Credit Movement in these Provinces in both rural and urban areas and records its appreciation of the efforts that are being made by Government to foster industrial co-operation. And this Conference wishes to impress on the people in the districts the great desirability of extending the scope and helping in the further spread of the movement by starting associations of artisans and working men, and of small producers and traders, stores for the sale of indigenous goods, and urban industrial banks on the co-operative system.

Proposed by the Hon. Pandit Madan Mohan Malaviya  
Seconded by M. Nizam-ud-din Ahmad.

## IV.—HAND-LOOM WEAVING.

(a) That this Conference is pleased to find that the Government have maintained several weaving schools at important weaving centres and that the Bara Banki District Board supported by the Taluqdars of Bara Banki have established a well-equipped weaving school in that district;

(b) That this Conference draws the attention of small capitalists to the success of private hand-loom factories in the Madras Presidency and would urge them to start similar factories in these Provinces;

(c) That this Conference desires that the local bodies and landholders in other districts should follow the example of Bara Banki and establish similar schools in their localities;

(d) And that to supplement the work done by weaving schools already established this Conference desires that the Zamindars and the general public should help the weavers to buy improved looms and other appliances on a system of easy payments.

Proposed by M. Eh'tsham Ali.  
Seconded by Mr. C. Y. Chintamani.  
Supported by Pt. Shew Behari Lal,  
and Babu Banarsi Lal.

## MR. A. C. CHATTERJI'S PRESIDENTIAL ADDRESS.

Gentlemen, I thank you most cordially for electing me President of the second session of the United Provinces Industrial Conference. I am not vain enough to imagine that it means any personal compliment to me, for I have no first-hand knowledge of industries, and I am fully conscious that there are amongst you many eminent men in the professions or in commerce and industry as well as in public life who would have more worthily filled the chair to-day. I take it however that in offering me this honour you recognise that the interests of the people and the Government are identical so far as the objects of your Conference are concerned and also that you appreciate the endeavours that have been and are being made by Government to ameliorate the industrial condition of the province to evoke an industrial spirit in the community. It is in this belief that I have accepted the chair.

It is nearly a year since the first session of your Conference met at Allahabad. After a masterly survey of the industrial condition of the province by the Chairman, Lala Baij Nath Rai Bahadur, there was a discussion on a number of important subjects and several resolutions were passed. The most hopeful and distinctive feature of the meeting was, however, the determination to form a company to work a particular branch of one of the most important industries of the Province and a very fair amount of capital was immediately promised by some of the gentlemen present. We congratulated ourselves that the first session of the U. P. Conference had achieved something definitely practical, thus setting an example to all other provinces. It has been to me a matter of the deepest regret that nothing tangible followed the speeches and the resolution on the subject at the last Conference. I also recollect that an Industrial Association for the Provinces was constituted at the same time but I have not heard if this Association or its Committee has ever met since or done anything. I can find no reference to its proceedings in the recently issued report of the All-India Industrial Conference. I have no desire to deprecate the good work that is done at an annual Conference but I am inclined to the opinion that steady work all through the year is likely to be fruitful of more solid results.

I am not making these observations in any captious or fault-finding spirit. It is to my mind one of the healthiest signs of the times that we have progressed from the stage when we talked only of our past industrial glory to a period when we talk of what we shall do in the future; but, gentlemen, I think it is nearly time that we took another step forward and instead of merely talking, began to act as well. We in these provinces have always taken credit to ourselves for preferring the gold of silence to the silver of speech, but every one will admit that it is the silence of action and not of vacuity which the philosopher referred to in his figure of speech. So far as industrialism is concerned we have to admit with shame and sorrow that we are being outstripped by

the inhabitants of other parts of India, whom we have hitherto been in the habit of considering visionary and impractical people. The chapters of the report of the Indian Industrial Conference for the last two years which describe the industrial activity of the people in different parts of India are not pleasant reading for those of us who are gifted with the undoubted virtue of provincial pride. During the course of the last few months, it has been my duty to travel through parts of Madras and Bengal. It has been fashionable for many decades to look upon Madras as the benighted Presidency. I saw, however, everywhere the dawn of genuine industrial enterprise, and the most hopeful sign was that the educated and professional classes also were permeated with the true industrial spirit. I do not wish to refer to large joint-stock enterprises but during the few weeks of my sojourn in the Province I was astonished to find how many small industrial undertakings owed their existence to the efforts of educated gentlemen acting by themselves. A number of very promising hand-loom factories have been started in various parts of the Province and several of the owners assured me they had found it a good business, commercially speaking. I may in passing state that the apprehensions entertained in some quarters that the development of the factory system for hand-loom is like to depress the weaver socially and morally or destroy his artistic temperament are entirely chimerical. The conditions of life for the workmen prevailing in the factories I visited are in no way inferior to the conditions obtaining in the home of the weaver and there is nearly as much scope for the display of his art in the factory as in the cottage industry. The word factory is really a misnomer for these collections of hand-loom under one roof, for there is no resemblance whatever between such a concern and a power-loom factory. I must apologise for this digression. Turning again to the industries of Madras I would recommend all of you to visit the Minakshi silk cloth factory of Madura or the many houses established in that ancient and sacred town, for the dyeing of yarn. Indeed, the Turkey red yarn dyed at Madura finds its way as far as the homes of the cottage weavers of this province. I need hardly refer to the many factories in and round Madras which tan hides and skins. Small chrome leather tanneries are now being started in several towns in the Presidency. Even in the matter of the adoption of up-to-date inventions and improvements in agricultural farming, very useful lessons might be learned from the farm belonging to a private resident of Tanjore.

So also in Bengal. During the last few years the people of Bengal have not only embarked to an appreciable extent in coal and mica mining, but have taken over and are managing a large Cotton Spinning and Weaving Mill, and have started many smaller industries. Thus a fair number of soap and perfume factories run on modern lines have sprung up. Chrome tanneries have been established in Calcutta and Cuttack and a large, fully equipped

tannery and leather manufactory is projected. A match factory has already started work, as also a pottery. Arrangements are in active progress for a hosiery factory on a fairly large scale. A wealthy and enterprising young man has established in Calcutta a factory run by electric power which turns out excellent pens and pen-holders of local materials. It is not necessary to refer to the many oil and flour mills in the vicinity of Calcutta belonging to native capitalists.

Even in the Punjab, a visit to Delhi, Amritsar, Lahore or Ambala will at once bring home to us the industrial spirit and enterprise of the people of that Province. It is useless to compare ourselves with the residents of Bombay or Gujarat in this respect.

In this Province, on the other hand, with the exception of a few Cotton Gins and Presses here and there, one finds practically no instances of large industrial undertakings during the last year or two on the part of Indian capitalists. Honourable mention must, however, be made of the two sugar factories established in the vicinity of Cawnpore. Not that there are no examples to be followed. In the city of Lucknow, we have the Paper Mills and Mr. Pragnarain's Iron Works. A Cotton Spinning Mill is also now being worked by Indian enterprise. Successful Cotton Mills have also existed for sometime at Hathras and Mirzapur. Flourishing Flour Mills are to be found in various towns in the Province. The Cotton Gins and Presses have almost always done well.

Why is not there a more rapid expansion? I feel certain there is no lack of capital, and as I shall presently show, there is no want of raw materials either for many promising ventures. So far as I have been able to gather from a study of the causes of our failures in the past and from conversation with capitalists in different parts of the Province, four factors have usually militated against large industrial enterprises on the part of Indians. None of these obstacles, however, seem to be insuperable. In the first place, most of our ventures in the past have been started with insufficient fluid capital. We have obtained estimates from experts and machinists and fixed our total capital at a sum only slightly exceeding the estimate. Now it is not the peculiar experience of Government that estimates are apt to be much exceeded when the actual work is undertaken. Moreover we have usually forgotten to make adequate provision for working capital. In order to secure a margin of profit, raw materials have to be purchased in large quantities in particular seasons of the year, and finished products similarly have to wait for a favourable turn of the market. In a highly organised industrial community, banks come to the aid of industries. We have, however, very few industrial banks here to cater for the Indian community. This difficulty has also been experienced in other provinces and banks with substantial capitals have been established within recent years in Bombay, Calcutta, Madras and the Punjab. We are also waking up to the necessity of industrial banks. So long, however, as banking facilities are

not perfect we should take care in our enterprises to have enough fluid capital for working purposes. The neglect of this precaution has been fatal in several most promising enterprises in this province. The second great difficulty has arisen in connexion with securing skilled supervision in technical matters. European capitalists undertaking industries in this country are able to select their men on the spot from similar factories in Europe or America. Native capitalists are naturally shy of entrusting their venture to inexperienced men belonging to this country or to imported managers with whom they have had no previous acquaintance. There are, however, nowadays for ordinary industries sufficient men to select from among those employed in the mills in Calcutta and Bombay. The bonds of caste are also not so rigorous as in former days, and it ought to be possible for one of the promoters to visit a seat of the industry in Europe and choose a man. In this connexion I may refer to the movement to send young men abroad to learn various arts and industries. The idea is a most excellent one provided the young man thus sent to a foreign country possesses all necessary equipment, secures adequate facilities for his particular work and is carefully supervised during his residence abroad. I am not, however, entirely satisfied with the actual results in many cases that have come under my personal observation. To take an imaginary instance: a young lad of twenty, knowing nothing whatever of, say, pottery work, is sent to Japan to study the pottery industry. He stays there for three years and returns to India professing to be an expert in the pottery industry. Now, I believe Japanese is a fairly stiff language and it would take the youth eighteen months to two years with hard work to acquire a working knowledge of the language. He has probably no powerful friends to introduce him into a really good factory. He may join some technical school and spend a few hours a week at a factory which serves as an adjunct to the school. What can you expect the youth to learn during a total period of three years in Japan? It is sheer folly and extremely unfair to the young man himself to entrust him, as is sometimes proposed and actually done, with the charge of new pottery works in this country. The industrial scholarship system was largely adopted in Japan and was admirably successful but the circumstances, so far as I am aware, were entirely different. The Japanese, when they found that raw materials existed in the country, and there was a local market for the goods, established a factory and obtained the best technical expert they could get in any part of the world to run it, with the stipulation that he was to train local talent also. A few smart youths were apprenticed under him, learnt the business locally and were then sent out with scholarships to centres of the industry in other parts of the globe. The diplomatic representatives of Japan were as a rule successful in securing ample facilities for the training of these scholars in various factories and institutions. When after a prolonged stay in a foreign country, these scholars returned to Japan, they were not at once placed in charge of the factories



but had to be content with posts at the lowest rung of the ladder and rose gradually as they displayed industry and business capacity. The scheme of the technical scholarships awarded by the Government of India is based on similar principles but will be fully successful only when the people start factories where the scholars can receive their initial training. I have dwelt on the subject at some length because I have often encountered much misconception in the matter. It is nothing but placing the cart before the horse when we send boys to learn a new industry in a foreign country and expect them to pioneer such industries immediately on their return to India. The third obstacle in the path of a rapid extension of our industries is the want of trained labour. It is true that unskilled labour of a sort is cheap in this country. It is, however, cheap only in a sense. Many economists hold that he is the best captain of industry who pays the highest wages. Even in industries like cotton spinning and weaving, where it is not essential for the hands to have any extensive technical knowledge before joining the mill, things would be much easier if they were trained to habits of industry, regularity and discipline. In some industries, e.g., manufacture of glassware, you must have considerable technical skill in the artisans. Such is the dearth of skilled labour in the province that even in the ordinary handicraft of carpentry, most large employers have to engage either Chinese or Punjabi carpenters. To remedy this state of things would take several years. His Honour the Lieutenant-Governor has been giving particular attention to this problem and it formed one of the main subjects of discussion at the Naini Tal Conference. I feel confident that the measures now being initiated by the Local Government to introduce a better state of things will bear fruit at no distant date. Meanwhile our undertakings must make the best use of existing material and, where necessary, import skilled labour from outside. It has to be remembered that in this respect the Indian capitalist is no worse off than the European. On the other hand, his knowledge of the country and the people should give him a distinct advantage.

I now come to the last difficulty which has to be contended with by us, *viz.*, our lack of knowledge of business methods. This is really the difficulty that dominates all others. Hereditary specialisation due to the caste system has unfitted most of us whose ancestors were not in trade or industry for all business excepting agriculture and landholding. It is a drawback which can be cured only by time. Much can be done by giving a more practical turn to our education in the early stages and I am glad to see steps are being taken in this direction. At the same time the trading and commercial castes amongst us have usually keen business instincts and it ought to be our endeavour whenever launching in any important venture to associate ourselves with already experienced members of the business world. It is a matter of secondary importance whether such gentlemen have any knowledge of the industry we are taking in hand. One who has proved his capacity in a particular line of

business will probably repeat his success in other branches as well.

I said a little time ago that there were many unoccupied or only partially occupied fields for large ventures in this province. Take the industry of cotton spinning and weaving. I do not wish to weary you with many detailed figures or statistics, but in the western districts of these provinces more than a million acres are, in a normal year, under cotton. Most of the cotton thus produced is exported. In the Agra and Meerut divisions there are only four cotton spinning mills, of which one is owned by native capitalists. There is not a single weaving mill. That the climate of this tract of country is no bar to the development of a successful mill industry is proved by the examples of Cawnpore on one side, Beawar in Rajputana on another and Delhi in a third direction. You have only to study the wonderful expansion of the cotton spinning and weaving industry in the Bombay Presidency during the last three or four years to be convinced that it is good business, if properly managed.

We may next turn our attention to Silk. It is true we do not produce very much silk ourselves but a very fair quantity of tasar silk is collected in Mirzapur, most of which is probably exported to Sambalpur and Bilaspur in the Central Provinces. Benares, Azamgarh, Agra, Lucknow and Jhansi, have for centuries been famous for the fine silk fabrics woven there and the hereditary skill of the silk artisans of these towns is a distinct asset in our favour. In the silk mills in Calcutta belonging to a firm of Musalman capitalists I found the best artisans were drawn from the centres of the silk industry of these parts. Why is there no attempt made to manufacture silk fabrics on a fairly large scale in these provinces? I may also mention the subsidiary industry of gold thread making, which at one time supported thousands of workmen in the cities of Benares, Lucknow and Agra. The competition of gold thread imported from Lyons in France threatens to extinguish our local industry in a very short time. Enterprising capitalists can do worse than study the methods in vogue in Lyons and try to introduce them in this country.

Look again at the industry of woollen manufactures of the cheaper grades. Although Indian wool is inferior in quality and limited in quantity still a fair supply is available in the Punjab and Rajputana which could be profitably utilised for the manufacture of blankets and rugs and mixtures of wool and cotton or wool and fibre. The woollen mills at Cawnpore and Dhariwal appear to be in a flourishing condition but their example has not stimulated the enterprise of a single Indian capitalist.

There is then the industry of tanning and leather manufacture. I am glad to say there is very little social prejudice now against this industry but in spite of the enormous export from the province of raw hides and skins, and the greatly increased local demand for boots and shoes and leather articles generally there is not a single tannery run on modern lines with the aid of Indian capital. The large

European tanneries of Cawnpore are unable to supply leather for the local market. Consequently the native shoemaker or saddler has to use leather imported from Calcutta or abroad. It should be perfectly feasible to start a fairly large tannery at some suitable site in this province where a good supply of hides as well as of bark would be available. I would also draw attention to the new process of chrome-tanning. It is very little more expensive than bark tanning and produces a leather which has been proved to stand wetting better than bark-tanned leather. It is, therefore, an ideal article for irrigation buckets. The fluid capital required for a chrome tannery is smaller than for a bark tannery, and adequate instruction in the technical processes is now given at the Government Chrome Tannery in Madras.

There is a possibility of the development of a large industry in this province in the manufacture of goods made out of sann hemp. Immense quantities of the raw material are now exported from the Benares, Agra and Rohilkhand Divisions to Europe. There seems to be no reason why a part of it at least should not be worked up locally on modern lines. Even the sann hemp matting manufactured by the rudest primitive processes in the villages of the Partabgarh district are sent as far as Calcutta and Bombay.

The paper-mill of this city is unable to supply the total demand of this province and a very large quantity of imported paper specially of the cheaper lines is used here. There would seem to be room for another well conducted mill in a locality with a good supply of fibrous grass. The prohibitive cost of wood pulp which is one of the principal ingredients of good paper has hitherto been a stumbling block in the way of enterprise in this direction. There is an abundant supply of spruce and silver fir in some of the forests of the province. It is believed that excellent wood pulp could be manufactured at a profit out of this timber. The Government is at present investigating the question and I hope when the results are obtained and published, capital will be at once forthcoming to take up such a promising enterprise.

Another industry, still untried in this province but holding forth much promise, is the business of crushing cotton seed. The cake will be found to be excellent cattle food while the oil can be used as a substitute for ghi and also for the manufacture of soap and similar substances. More than a hundred thousand tons of cotton seed are available every year in the province and a large industry can be developed. To those of you who are likely to feel an interest in the subject I would recommend the paper contributed by Mr. Whitenack of the Baroda service to the Surat Industrial Conference and a very able series of articles dealing exhaustively with the subject which appeared in recent issues of the Indian Trade Journal and have, I believe, since been reproduced in pamphlet form.

There are many other industries which one hopes will sooner or later be taken up in this province. I need only refer to the manufacture of matches, of

pencils and pen-holders, of paints and varnishes (the raw materials of which are available in the forests of the province.) Similarly there are many industries which are at the present moment represented by one or two factories in the province but are capable of greater development. I may mention the manufacture of sugar by modern methods, glass making, rice, flour and oil mills, manufacture of chemicals out of locally obtainable materials, etc.

The question may be pertinently asked, these are all large ventures which can be undertaken only by joint-stock enterprise. Where is there room for the small capitalist wishing to run his own business? If the small capitalist will look about, he will also find plenty of occupation but he too must bring to his business a certain amount of training not only in general industrial methods but also in the particular industry he wishes to adopt. Experience in any line of business is always useful but it is not much good, say, for a man starting a tannery to do so without learning to differentiate between the various kinds of raw hides, available in the market. There is, however, usually very little difficulty in obtaining the requisite training either in an institution or at a similar factory on payment of a premium. The expense of such an education does not compare unfavourably with the expense one incurs in a training for the professions of law, medicine or teaching, and should not, therefore, be grudged. As regards the industries themselves, I would draw attention in the first place to small hand-loom factories for the weaving of cotton, silk and wool. There is a resolution on the subject among the Agenda of this meeting, and I need not enlarge on it. Among other industries I may mention dyeing and calico-printing, small tanneries, sugar refineries on the model of Mr. Hadi, perfume and soap factories, hand-power hosiery factories, furniture and cabinet-making, button and comb-making and carpet factories. No useful purpose will be served by discussing at once the prospects of each of these industries. Persons desirous of taking them up should study carefully the conditions prevailing in their own locality and also in a centre where the industry already occupies an assured position and then come to a decision.

Gentlemen, at the beginning of this address I had ventured to suggest that steady work all through the year by an Industrial Conference or association like yours was likely to be more effective than an annual meeting which contented itself with passing a few pious resolutions. For fear I may be taken to task as a mere destructive critic, I would crave the indulgence of your attention for a few minutes more while I indicate very briefly some of the things that an industrial association may accomplish. I concede that it is not the duty of an industrial association to start industries itself and that its proper function is to foster the industrial spirit and to give indirect aid to the development of industries. A powerful impetus would be given to your ideas in this respect by the existence in every popular centre of a good library

containing a sound and up-to-date collection of economic, industrial and commercial books, periodicals and publications. I do not think there is a single institution of this sort now in this province. Is it too much to hope that your Association will attempt to organise a library of this kind at one centre at least in this province? Then again proper industrial museums are a great want in the province. I am not speaking of art museums but a place in every district head-quarters where a representative collection can be made of all the industrial products of the locality and specially of the handicrafts. The work will take time but is worth attempting. Another desideratum is a journal written in simple easy language, in Hindi and Urdu, dealing with industrial and commercial topics, particularly those of special interest to the province. There is every likelihood that a really well conducted paper will soon pay its own way. You may also emulate the good example set by the Indian Industrial Conference and hold exhibitions of agricultural and industrial products. It is not necessary to organise these exhibitions on an ambitious scale. I think they are productive of more good if each exhibition is limited to a few allied industries and held at different small places. You can also institute competitions in the handicrafts like the Hand-loom competition now in progress in Madras. A committee of the association can also devote its time to a consideration and ventilation of the difficulties of the industrial and trading classes—for instance, the questions of railway rates, want of communications between different places of business, postal and telegraph facilities, uniformity of weights and measures and similar points. Other spheres of activity for an industrial association could easily be enumerated but I do not desire to try your patience too long.

Gentlemen, as you are all well aware the Government of these provinces has embarked on a comprehensive and well considered scheme of technical and industrial education. The Lieutenant-Governor is also devising means to encourage industries in many other ways. But as he said in the course of his speech at the Naini Tal Conference last year,

"If the Government does its part, if it trains up skilled workmen and foremen capable of managing industrial business the people must do their part; they must make up their minds to invest their capital in the development of the country. If the youth of the country is trained up for industrial employment, and after they have been trained, it is found that there is no employment for them, the last state of things will be worse than the first. Government cannot do everything. The main effort must be made by the people themselves."

I do hope the people of these provinces will seize this splendid opportunity of falling into line with more advanced industrial communities. The opportunity once lost may never come again. That is why I entreated you at the very commencement of this address to begin real earnest work, and I can not do better than repeat the same entreaty before I sit down.

### Co-operative Credit Societies in the United Provinces.

1. *What is a co-operative credit society?*—A co-operative credit society is a collection of persons requiring credit who combine in order to obtain that credit on more favourable terms. Its first and principal function, therefore, is to provide its members with cheap and easy credit. A true co-operative society, however, does more than this. Experience shows that the mere provision of cheap credit unless at the same time the people are educated to a proper knowledge of its use tends to make them more indebted and is, therefore, a very doubtful benefit. For a man who owes Rs. 1,000 at 12½ per cent. is in no way better off than one who owes Rs. 500 at 25 per cent. The second function, therefore, of co-operative credit societies may be said to be the exercise of such control over the loans to its members as may discourage improvident borrowing while making full provision for real wants. Such societies may also be said to have a third function, i. e., to teach an improvident people how by the exercise of thrift and self-denial and business-like habits capital may be gradually accumulated sufficient for all the ordinary needs of production. The efficiency of a society may, therefore, be judged by the extent to which the second and third functions are recognised and by the success which has been obtained in carrying them out.

2. *The need for co-operative banks in India.*—India has long been known as the home of usury. A large portion of the population, both industrial and agricultural, must borrow to carry on their business and do borrow at a high rate. Their state is frequently one of chronic indebtedness. Besides this, the character of the people is unbusiness-like and there are practically no banking facilities except in a few large towns. What more favourable soil could be found for sowing the seed of co-operative banking?

3. *The scope for them in agricultural districts.*—Large Farms are almost unknown in India. The land is divided into small holdings owned or rented by the peasantry and all the expenses of cultivation fall on their heads. Few of them have sufficient money for the proper conduct of agricultural operations. "They require money to purchase seed, manure, and plough-bullocks, to pay for hired labour, for irrigation, and for many other purposes. There are very few who can meet all these expenses from their own capital. They are consequently forced to borrow, and borrowing, they have as a rule to pay very high rates of interest. The poorer a cultivator is, the higher rate of interest will he have to pay. In some districts the usual rate of interest on agricultural loans is half an anna in the rupee per month (*taka rupaiya*). This rate is increased in the cases of the poorer cultivators, until sometimes as much as an anna a month is charged. The reason for these high rates of interest lies partly in the necessity of the borrower who has to take the money, no matter what interest may be demanded, and partly in the inferiority of the security offered. The money-lender fears

that in many cases he may lose the principal of his loans, and so attempts to ensure himself by obtaining as large a return as possible in the way of interest." Occasionally the money-lender refuses to advance at all except with the proviso of a certain amount of grain being delivered at harvest in addition to the return of his money or a condition for the sale of produce at a low price is inserted in the bond. In such cases the rate of interest works out to a very high figure. If grain for sowing is advanced and, owing to a calamity of the season, not recovered from the crop, the crop of the following year is burdened with such a load of debt that payment is almost impossible. The ryot pays what he can and interest being added to the balance he probably sinks further and further into debt. "The rate of interest charged on loans varies, as is well-known and for reasons which are obvious, in accordance with the security offered by the investment. The security of Government, which controls the revenue of the country, being unquestioned, it is able to borrow money at 3½ per cent. The larger municipalities can obtain loans at 4 or 4½ per cent. They have to pay more because the security they offer is not quite so good as Government security. A large land-owner borrowing on the security of his property can obtain money at 5½ or 6 per cent. A smaller zamindar may get loans on the security of his smaller property at 12 annas per month or Rs. 9-0-0 per cent. per annum. The substantial cultivator who desires a loan will probably have to pay at least one rupee per month or 12 per cent. per annum. It is clear that where 10 or 12 men become jointly and severally responsible for a loan, the security that they offer is better than the sum of the security which each of them could offer, were they to borrow separately. If they borrowed separately the principal might in one or two cases prove irrecoverable. Where they borrow jointly, if one borrower fails to pay up the amount of his loan, the creditor can recover from the remainder. The creditor has additional advantages in dealing with a body of men rather than with a number of individuals. For instance, in the case of default, in place of being compelled to institute a number of suits, he has only to institute one. Again instead of having to keep a number of accounts in his books he has only to keep one. If the body is registered as a co-operative credit society, the creditor is in a still better position, for he knows that the society will be regularly inspected and its accounts audited by a Government department."

4. *The scope for co-operative credit societies among the industrial classes.*—The Indian artisan is generally poor and he is almost always improvident. In some trades he buys his raw material from and is supplied with funds by a middleman who takes from him the finished product at an inadequate price. In others he borrows on the *ugahi* system, Rs. 10 repayable by twelve monthly instalments of Re. 1 or Rs. 8 repayable by 9 monthly instalments of Re. 1 or again he borrows small sums at an interest of 25 per cent. for 6 months. Even when he earns good wages he

is extraordinarily improvident. The Cawnpore Mill-hand scoffs at saving money when, as he says, he can well afford to borrow, and borrow he does, the usual terms for an advance of Rs. 10 being the repayment of Rs. 12 by 6 monthly instalments of Rs. 2. Here the rate of interest works out at nearly 70 per cent. per annum. Co-operative credit societies would not only provide loans, when required, for necessary purposes at a reasonable rate of interest, but they would gradually imbue the industrial population with the habits of thrift and self-reliance.

5. *Objections which have been urged.*—Some persons, though they admit the great success achieved by co-operative credit societies on the continent of Europe, dispute their suitability for this country on the ground that Indian peasants and artisans will not trust one another and will not, therefore, co-operate satisfactorily. Possibly this opinion is due to the comparative failure of Indian capitalists to form successful joint-stock companies, but there is no reason why this should disturb us—for the cases are by no means similar. Professor Marshall points out in his *Principles of Economics* how in the earlier stages of material civilisation, the standard of fairness and honesty is lower than in later times in dealing with strangers, but higher in dealing with neighbours and relations. And in fact in ordinary village life co-operation and combination take a considerable part. In many parts of the country villages are owned by communities and the cultivators of neighbouring fields constantly co-operate for ploughing and irrigating their land, for cutting of sugarcane and many other purposes. The Agricultural Department now advances its seed and Government its *takavi* to groups of borrowers on their joint responsibility and experience of societies already started shows that the principle of joint liability is well-understood and willingly accepted by the members.

6. *The different forms of societies.*—There are two main types of societies. The Schultz Delitzsch society is one in which each member takes at least one share which can, if necessary, be paid up by small yearly, half-yearly or monthly instalments. Such a society distributes profits as soon as a share is fully paid up, but the rate of dividend is carefully limited by the bye-laws, so that the main object of the society—the provision of cheap credit—may not be lost sight of. The second main type of society is that called after Raiffeisen. In it there are no (or merely nominal) shares and unless they have wealthy members ready to make deposits, they are financed entirely by borrowed capital. Such societies distribute no profits, all profits go to the reserve which is used to increase the working capital of the bank and to provide a sinking fund for repayment of debt and ultimately to reduce the rate of interest on loans.

7. *Societies with share capital.*—Societies with share capital are well-suited for formation among artisans in towns and among the lower ranks of Government and private servants. A small monthly contribution of 4 annas, 8 annas or 1 rupee should be

provided for until the full amount of the share of Rs. 10, 20, 50 or 100 is paid up. The richer members should be encouraged to take more than one share. All profits will at first be treated as a reserve which may, however, be used in the business of the bank. Thus no interest will be payable until the shares are fully paid up which may be from 2 to 10 years after subscriptions have been begun. When the shares are fully paid up they will be a valuable property. Profits may then be divided but there are the following restrictions, first, that one-fourth of the profits must be credited to reserve and secondly, that the rate payable as dividend must not in any case exceed 10 per cent. nor may it exceed by more than, say 2 per cent., the rate at which a society can borrow. Thus if 6 per cent. is the rate allowed on deposits 8 per cent. is the highest dividend admissible. If further profits are made they must be applied

- (a) To further building up of the reserve fund.
- (b) To paying off borrowed capital.
- (c) To reducing the rate of interest on loans.

The important matter to keep in mind is that the society must be managed primarily with a view to benefit its borrowing members.

Societies on similar principles with shares payable by instalments of Rs. 2, 5 or Rs. 10 each half-year may also be formed among prosperous agriculturists and are especially suitable for peasant proprietors whose holdings are fairly large and whose crops are secured by irrigation. Such men can well afford to invest Rs. 2 or Rs. 5 every spring and autumn harvest. In unfavourable seasons the contributions may be postponed. It should be noted that according to Act X of 1904 rural societies are not permitted to divide profits until certain conditions are satisfied, but it is anticipated that, if the shares are made payable by subscriptions extending over 10 years, the societies will be able to fulfil the necessary conditions by the time the shares are fully paid up and will, therefore, be able to divide profits as urban societies do. In rural societies, therefore, it is necessary to fix a term of 10 to 12 years before the expiry of which profits cannot be divided.

8. *Limited or unlimited liability.*—Societies with share capital may have either limited or unlimited liability. The former is better and simpler as the mere possession of a share is sufficient to induce members to interest themselves in the working of the bank and if liability is limited to the actual value of the shares the result should be that the richer members will take up more than one share and so supply the society with larger funds. On the other hand there may be some danger of a prominent shareholder acquiring power in the bank and (having only the small stake in it represented by his share) exerting that power to ruin the bank while benefiting himself—and this he could not do with unlimited liability. So concentration of power in the hands of one man is to be avoided. With true democratic management by the members for the members such concentration

is impossible and on the whole limited liability appears in this as in other countries to be the better system for a share capital bank.

9. *Societies without share capital.*—These are merely collections of members who combine to borrow money on their joint security. The responsibility is of course unlimited. They are generally named after Raiffeisen and they are suited for establishment among the poorer classes of cultivators and artisans who are too poor to subscribe for shares while owing to their lack of substantial security and the small sums they require they have now to borrow individually at very high rates of interest. It is, therefore, profitable to such societies to borrow on their joint security at a fair rate of interest and to advance to their members at a slightly higher rate the balance being the profit of the bank. But owing to the difficulties connected with the management of such societies which will be discussed later on the type of society in which a share capital is gradually paid up appears to be preferable except among the very poorest classes of the people.

10. *Large and small societies.*—A society according to the Act must consist of at least 10 persons and there are many societies formed on Raiffeisen lines which have only very few members. These very small societies have been preferred in some quarters because it was found that it is only in a small and homogeneous body that the principle of joint liability though everywhere well-understood has any practical force. In the societies first started with a large, varied and scattered clientele the principle of joint responsibility was altogether too remote, i. e., no member had any idea of bringing pressure to bear on another member to induce him to pay up punctually. Hence default where it did occur as it frequently did was difficult to deal with. In a small society composed of a few members of similar status and generally of the same caste joint responsibility is effective and loans are as a rule punctually repaid. But it is obvious that small and homogeneous societies have considerable disadvantages. Firstly, the members will probably all be wanting loans at the same time and wish to repay at the same time so that there is danger of money lying idle. Secondly, if the members are all of much the same status and therefore require to borrow money no one will be ready to deposit money in the bank and it will have to rely entirely on borrowed capital. This is not objectionable in itself but it prevents well-to-do persons who are willing to deposit money in the bank if they are allowed some control of it being members of the bank and they cannot therefore take that prominent share in the management which their position, education and the extent of their interest in it would otherwise entitle them to, and so the services of a most useful class of persons are lost to the societies. Thirdly, it is certain that a large society controlled by substantial persons can borrow with less difficulty than a small society of poor men and fourthly, it is obvious that the control by the Registrar, which is

required in the early stages of the movement, can be more easily exercised over a few large societies than over a great number of small ones.

Now these disadvantages of small societies can be to some extent remedied by the formation of a number of small societies into a co-operative union combined with a central bank, the chief function of which would be to raise money and distribute it to the branch societies, but this plan has disadvantages of its own, for the organization and control of a number of independent societies by a central union and bank is a very difficult matter. For this reason a new form of society has been started in the United Provinces and is now being most successfully worked in the Unao district. In that district the members are distributed into *pattis* or divisions of 10 to 30 members living in one locality and preferably of the same or similar castes, each of whom is jointly responsible for the loans advanced by the bank to every member of his *patti*. Each *patti* is represented by a head man who is primarily responsible for all loans advanced to the members of his *patti* and assists in their realisation. The head men elect the committee of the bank. The *pattis* are as far as possible homogeneous so that joint liability is an active force, and as a rule no loan is advanced to any member of a *patti* until all loans due by the other members have been repaid to the bank. The members of one *patti* generally take loans at the same time and for the same purpose and repay on the same date, and this very much simplifies the accounts of the bank and enables it to deal with a large body of members. The largest of these societies, Sufipur, in Unao, has about 4,000 members with a capital of about Rs. 40,000.

In societies which work with share capital every member has from the first an interest in the success of the bank and there is not the same risk of unpunctuality and default. Hence there has been no tendency to form small societies with share capital.

In any case whether societies are large or small it is important that the number of members be not increased without reference to the amount of working capital likely to be available. The only result of electing members for whom no or merely nominal loans are available is to expose the society to ridicule and to discredit the movement.

11. *The area in which societies should work.*—Where small societies on Raiffeisen lines have been established it is obvious that they should work in a small area. The members should all be residents of the same village or hamlet.

With larger societies formed on the *patti* system or based on share capital the area will, of course, be larger but care should be exercised to keep it within reasonable limits. Where villages are large a village should as a rule be a sufficiently large area in which to work. When they are small and cannot provide efficient management more extensive limits must be allowed but it is only in very exceptional cases that members should live more than 3 or 4 miles from the headquarters of the bank.

12. *Working capital is necessary.*—The first function of co-operative credit societies is to supply its members with loans and it is, therefore, obvious that whether a society is organised on a share basis or on Raiffeisen lines most of its working capital will have to be provided from sources outside the bank. In every locality, whether in Europe or in India, at the first starting of societies difficulty has been experienced in providing the initial capital. As time went on and the efficient management of the earlier societies inspired confidence these difficulties were overcome and in Europe ample funds are now forthcoming either in the form of deposits from local residents or as loans from joint stock banks. But at first the societies were largely dependent on philanthropic persons who either lent the money themselves or guaranteed to the society credit up to a certain sum at the market rate of interest with a local bank. In India societies are still in the initial stage. They are as yet little known to the monied class and their management has not yet inspired such confidence as to enable them to raise money for themselves locally. At this stage to give the societies a fair start outside assistance is indispensable.

13. *How working capital should be provided.*—The question is frequently asked why does not the Government with its ample resources provide whatever assistance is necessary? Now Government has aided the societies to some extent, for it has sanctioned a sum of Rs. 50,000 in each province as a loan to rural societies, the amount lent in each case not to exceed the amount actually deposited by the members. It is obvious, however, that from this concession the poorer societies, the members of which can deposit little or nothing, gain but little advantage. But beyond this the best authorities are agreed that State aid is to be deprecated as far as possible. In India, it is specially dangerous. The obvious result of Government financing the early societies would be that they would be regarded as a department of Government and its officers would be expected to assist in the recovery of loans and even in their distribution. The members would never learn to control the societies and there would be an end to all hope of the spread of the movement. The first help to a nascent society should be given by friends and neighbours who are willing and able to watch over the affairs of the society. It is not of course intended that dōles of money should be given as a free gift. The assistance should be in the form of a loan at a fair rate of interest—6, 7, 8 or even 9 per cent.—or it may be in the form of a guarantee for a loan provided by some capitalist—and the interest should be regularly demanded. Such conditions may be attached to the loan as appear sufficient to ensure its safety. The lender may well have the right to be present at all meetings of the committee to satisfy himself that his money is being usefully laid out and the right to withdraw it at 6 months' or one year's notice. His advice will no doubt be readily listened to, but he should guard himself carefully against monopolising or even taking a prominent part in the actual management of the society, for if he does this

the sense of responsibility of the members will be greatly lessened and they will very likely leave it to him to recover his money as best he may.

14. *The administration of societies.*—In share capital banks where every member has in the society a stake, which may be large or small, but which will generally be approximately in proportion to his status and where he has the hope of ultimately sharing in the profits, there is little difficulty in inducing the members to feel an interest in the society and to take part in its administration. But it is far otherwise in the Raiffeisen form of society. For here the borrower has as a rule nothing of his own in the bank and beyond the fact that it supplies him with loans at easy rates he feels little interest in it. It is true that in course of time the profits fund will increase and benefit will accrue to the members in the form of larger loans at more convenient times and at still lower rates of interest, but these benefits are so remote that it is difficult even to explain them to the members and almost impossible for ignorant men to appreciate them. It is not, therefore, surprising that in Raiffeisen societies the general body of members show but very little interest in their ultimate success. The general meeting of all the members, in which by the rules of all systems of co-operative banking the general direction of affairs is vested, is not held at all or is a mere formality and the whole control gets into the hands of a committee of two or three men. There is no great harm in this if the committee is fairly representative of the members though it is essential that once a year at least the members be taken into the confidence of the committee—the year's transactions and the pecuniary results obtained being intelligibly laid before them in order to stimulate their interest in the society. But frequently matters go much further than this and one man, the *Sarpanch* or President of the committee, concentrates all power in his own hands. This is a very dangerous state of affairs. In some cases he misuses that power in order to benefit himself or his friends. Even if he uses it well the result must be that he alone as responsible for the work of the bank will be considered interested in its success, that borrowers will not feel it incumbent on them to repay their loans as a duty they owe to their own bank and they will only do so if the *Sarpanch* happens to be a man of great local influence and energetic habits. If the *Sarpanch* have not these qualities default will undoubtedly occur and if having these qualities he dies or leaves the neighbourhood the society will very probably have to cease work. So every effort should be made to induce the members to consider the society to be their own concern. The committee should be as representative as possible; they should meet regularly on a fixed day of the week or month and at a fixed hour and record their proceedings in the vernacular of the district. Everything should be done as publicly as possible and at the annual general meeting, as already indicated, care should be taken to present to the members a really intelligible report on the transactions of the year and the position of the

society. The accounts should be as simple as possible and in a small society no payment for services should be necessary, but in large societies the account work is sufficient to take up the whole time of one man and a regular salary will have to be paid him.

15. *Loans—their objects.*—Loans can only be made to members of the society. In share capital societies every member must take up at least one share but in the Raiffeisen type of societies a man becomes a member simply by being elected and paying his entrance fee.

It is an essential part of the system of European co-operative credit societies that they make loans only for productive objects, and as a general rule this restriction is undoubtedly sound, but in India, where social obligations compel the expenditure of large sums on family ceremonies, it was very soon perceived that little interest would be taken in a society providing funds for productive purposes if the borrower who requires a loan for a marriage in his family were refused accommodation. It was also felt that expenditure on family ceremonies being admittedly necessary the provision of funds through a co-operative credit society might have a good effect in restricting the tendency to expenditure beyond a man's status and recent experience shows that in some cases this result has been actually attained. Loans then may be given for unproductive as well as for reproductive objects provided that the object is necessary and the amount of the loan demanded is a reasonable amount. Among other permissible objects of loans is the repayment of old debts. But in the earlier days of a society, where capital is scarce and no experience of punctuality of repayments has been gained, it is as well to restrict loans to directly reproductive objects—such as the digging of wells, the purchase of bullocks, implements and seeds, the payment of labour for irrigation and weeding of crops, and in artisan societies the purchase of raw material and improved implements. It is also permissible to advance a loan to a cultivator for payment of rent on the security of his produce provided that the loan is repaid when he sells the produce. But in any other case the payment of rent is not as a rule a proper object for borrowing. Rent should be paid from the proceeds of the crop and not by a draft on that of the following year. Thus a loan for payment of rent (unless repaid by sale of the produce) should only be made on the same conditions as a loan for repayment of debt—to wit—the cultivator's whole financial position should be brought under review and the society should consider whether it can afford and risk the taking over of the whole of his liabilities. If it is not prepared to do this the matter had better be left alone. It may sometimes be justifiable in cases of short crops to help tenants who are pressed to pay their rent but it should be distinctly recognised that the loan is allowed only in special circumstances and will not be given in ordinary seasons. It is above all things necessary that the object of every loan given should be carefully recorded. It is also essential in a co-operative bank that care be taken to see that a loan is applied to the purpose for

which it is granted. In European societies there is a special body of men—the committee of supervisors—charged with this duty—and in the case of the larger societies this example might well be followed in India. But for the majority of loans which are given for seed and the expenses of cultivation at the proper season it may be assumed that they are applied to these purposes and it is, therefore, unnecessary to make special enquiries. It is when larger sums are given for purchase of cattle or for repayment of old debts that the matter assumes importance and in such cases enquiries should be made into the use to which the loan has been put and if found to have been misused it should be re-called.

16. *Loans—their conditions.*—A loan issued for productive purposes should naturally be repaid from the produce raised with its assistance. Thus loans for seed or expenses of cultivation should be repaid from the crop and loans to weavers for purchase of yarn from the price of the cloth manufactured—and the date of repayment should therefore be fixed to correspond with the season at which the crops are cut or the time at which the cloth is sold. Societies should not endeavour to save trouble in account keeping by granting loans for six or twelve months without considering whether the date fixed for repayment is otherwise suitable.

For the larger loans granted for purchase of bullocks, for repayment of debt or for family ceremonies no definite term can be laid down but the practice of some well-managed societies may be quoted with approval. Loans for bullocks are made repayable in 4 half-yearly instalments (to correspond with the harvests) of Rs. 3 each for every Rs. 10 advanced. Loans for repayment of debt are recoverable in 6, 8 or 10 half-yearly instalments. Loans for marriage may be recovered from the *neta* or by instalments. Loans to servants of Government or private persons are realised by monthly payments extending over 6 or 12 months. (Thus Rs. 11 is advanced and recovered by 12 monthly instalments of Re 1). In all cases the principle is the same—to fix the conditions of repayment so that the borrower may be able to meet his engagements without incurring debt elsewhere.

17. *Loans—their rate of interest.*—In the earlier societies started in the United Provinces the rate of interest on loans was fixed very low, at 9, 8 or even 7 per cent. and the societies were only enabled to make a profit because the funds lent to them were provided by philanthropists at the low rate of 4 or 5 per cent. and even sometimes without interest. It was, however, soon understood that if the co-operative credit movement is to expand and grow, it must be based on business principles and not on philanthropy. Its institutions must be able to afford to borrow at the market rate of interest, i.e., that rate at which capitalists will be ready to lend from business and not from philanthropic motives to an institution in whose stability they feel confidence. At present capital is not attracted by a rate of less than 9 per cent. so the rate at which a society advances to

members must not be less than 12½ per cent. With this rate the society can make a fair profit.

18. *Loans—their amount.*—It is not necessary to say much on this score. The *panchayat* are responsible that the amount of the loan given is reasonable considering the status of the borrower and the object of the loan and if care has been taken only to elect a number of members proportionate to the amount of capital likely to be available, the loans will be sufficient for the ordinary purposes of cultivation. In course of time as capital increases larger loans for purposes not directly productive such as repayment of old debts and family ceremonies may be granted.

19. *Loans—their security.*—As a general rule one or two sureties should be demanded from every applicant for a loan. In small and homogeneous groups of which some Raiffeisen societies and the *pattis* of banks constituted on the Unao principle consist, it might appear unnecessary to demand further security than that provided by the joint liability of the members of the groups—but even in such cases it is as well to have one or two persons besides the borrower more directly responsible for the loan than the general body of the members. Such person will probably take care to see that the amount and purpose of the loan is reasonable and that it is actually applied to the purpose for which it is given. If owing to imprisonment, illness or death without adult male heirs the borrower is incapacitated from discharging his debt they may (and have in some cases) take charge of his affairs in order to protect themselves and satisfy the demands of the bank.

20. *Savings Deposits.*—In most of the Raiffeisen societies in these Provinces the system of compulsory deposits has been introduced. A sum of 8 annas per plough per harvest is taken from each borrower or 2 pice in the rupee are deducted from each loan taken by him. The amount in either case is credited to the member's accounts as a deposit and carries interest of 6½ per cent. on each whole rupee at the end of the year. These compulsory deposits have three objects, first to enforce saving, secondly to lead the member to take an interest in the affairs of the bank by giving him a definite if small stake therein and thirdly, they serve to test the popularity of the bank. When some of the societies were first started the *asamis* were suspicious of the object of Government and were unwilling to take loans. That they now are eager to do so even though they have to make a small deposit is evidence that they appreciate the advantages which they derive from the society. The contributions so made are at present treated as deposits withdrawable after three or five years. When this period expires it may perhaps be found advisable to convert them into shares or some other means of disposing of them may be found preferable. Meanwhile they serve to augment though slowly the capital of the society besides fulfilling the other objects mentioned above and they should be insisted on in all societies which are without share capital. In bad seasons they may well be remitted.



21. *Assistance from Government.*—Government realising the usefulness of co-operative credit societies has passed an Act (X of 1904) laying down how they may be constituted, registered, and managed and how they may be dissolved, if unsuccessful. The Act too gives them the following special privileges which are detailed below:—

1. Exemption from income-tax, stamp duty on documents and registration fees.
2. Exemption from attachment in Court of the amount subscribed to a society by a member.
3. A first claim on crops raised from seed purchased with money lent by the society and on cattle and implements similarly purchased.
4. Permission to open a public account in the nearest post office savings bank.
5. The services of a Government officer to help and advise the societies and to audit their accounts yearly so that the public may have full confidence in them.

Government has also, as already stated, made a grant of Rs 50,000 for loans to societies on easy terms. This grant is now almost exhausted and it is not proposed at present to apply for further funds for the reasons already given. Government has done its part. In more than half the districts of the United Provinces one or more efficient societies are now at work, ready to provide object lessons to the neighbourhood of the methods and aims of co-operative banking. It remains for the people and especially for the educated classes to carry on the work.

22. *Assistance from the educated classes.*—The lines on which societies can be formed have been indicated above and also the best method by which financial assistance can be afforded. Without such assistance of course nothing can be done. In some districts banks have been formed with the direct object of financing the societies—and here gentlemen who wish to further the movement can easily do so by taking up shares or debentures or making fixed deposits in the district bank and also by taking a share in its administration. District co-operative banks have been formed in Mainpuri, Meerut, Bulandshahr, Gorakhpur, Kasia, Basti, Unao, Rai Bareilly, Hardoi and Fyzabad and, it is proposed to institute them in several other districts. Investments in such banks are perfectly safe as the shares are held in great part by the wealthiest and most prominent men in the district, their reserves are growing fast and their operations are conducted to a great extent in consultation with the Registrar, who periodically audits their accounts. Such investments are also lucrative, as debentures carrying 6 or 7 per cent. interest can usually be obtained while 6 per cent. is generally payable on one year's deposits. In the absence of a district bank they can either lend money themselves at 7 or 8 per cent. or guarantee a loan at similar interest to societies in which they are interested. But this financial assistance alone is not enough. Experience has shown that efficient societies cannot be formed simply by providing a loan, furnishing a set

of bye-laws and leaving the people to themselves. Until the principles and methods of working of societies are better known, it is absolutely necessary that there should be some one constantly present who has sufficient education to be able to acquaint himself with and to appreciate the accepted principles and methods of working and is willing to exercise some control in the initial stages. As the members themselves acquire this knowledge the organiser himself may well gradually retire from the direct control and leave the management of the affairs of the society to the members. But it will be long before a society will be able to stand alone.

In any district where there are rural societies the services of the Honorary Organisers who would visit societies in their villages and give them advice and assistance would be invaluable and Government has agreed to the grant of travelling allowance to such persons. The Registrar would be glad to hear from any gentleman who is willing to take up such a post.

23. *The safety of investments.*—It has already been shown that deposits in district co-operative banks are safe enough. The primary security is the share capital and reserves but the ultimate security is the stability of the local societies financed by the district banks. These are under the close control of the Registrar and his staff who audit the accounts at least once a year. It is six years since rural societies were started and though owing to want of control in the early stages before the appointment of a Registrar the importance of punctual repayments was not understood and default has frequently occurred, none of the money lent to the societies has ever been lost. When, as sometimes happens, the committee of the society is unable to prevent default or embezzlement occurs there is no resource but to dissolve the society. In that event the Registrar appoints a liquidator who recovers the dues of the society and discharges its liabilities. In no case hitherto have the liabilities exceeded the assets. There has always been a profit which has been applied to some public object. It is not distributed because the chance of sharing in the profits might tempt some of the members to scheme for the dissolution of the society.

24. *New Societies.*—Before a new society is formed the circumstances of the proposed members should be carefully considered: they should themselves be consulted and the form of society best suited to their needs and the area in which it should work should be decided on in correspondence with the Registrar. As already stated that area should not be too wide and wherever it extends to more than one village the organization by *patti* should be made use of. It is best if possible to keep the village as a unit. The next step is to make the list of members and in doing so, especially in Raiffeisen societies, it is essential that only such persons should be included as are wholly acceptable to the other members of the *patti* or society as men for whose debts they are willing to be responsible. Persons whose reputation is bad should be rigorously excluded.

In share capital societies the matter is not of such importance but even here as a member's liabilities to the bank usually exceed his payments towards a share it is important that persons likely to default be not elected as members. The criterions by which a man should be judged are not his wealth and status but his reputation for honesty. Default is more frequently caused by recusancy than by poverty. As already stated the number of members should be regulated by the amount of the capital likely to be available. The capital having been obtained, business may be begun and loans granted in accordance with the principles already laid down. The most important of these is that each loan should be granted for a definite object. Punctuality of repayments should be insisted on from the first. If this is done the habit of punctuality will be easily acquired and loans will come in of themselves on due date but if unpunctuality is allowed at first it will be very difficult subsequently to enforce regular habits and it will only be possible to recover loans by the exercise of constant pressure. Thus both in financing and in organising societies the help of influential and educated men is indispensable. Most aid can perhaps be afforded by retired civil and military officers of Government who retire to their homes in receipt of pension. Their training enables them to appreciate the objects of Government in forwarding the movement and the accepted principles of co-operation while they have the necessary local influence and the leisure to enable them to control the society in its initial stages. It is by the co-operation of these gentlemen that the most useful results should be produced.

25. *Co-operation in agriculture.*—The history of co-operation in European countries shows that institutions for obtaining credit are the first and simplest products of the co-operative movement. When people have once learnt to combine for the taking of loans they will understand better how to combine for other purposes. There are undoubtedly cases in which combination for the supply of appliances such as improved cane mills, well-boring apparatus, rice-hulling machines, etc., would be most useful, but the difficulties of management are great, and constant supervision by the Registrar would be needed in the initial stages, so it is considered better to postpone any attempt to introduce co-operation in these matters until the advantages of co-operative credit are more generally known and appreciated. A beginning has, however, been made with societies for the supply of good seed; and for the establishment of such societies and of grain stores (which keep half their grain in hand and lend out the remainder at interest, so gradually accumulating a larger stock as a reserve against failure of crops) there appears to me to be practically unlimited scope for useful work. Provisional instructions for the establishment of such societies have been issued and can be obtained from the Registrar's office. It is very difficult, however, to make a fair start except in favourable years and owing to unpropitious seasons very little has as yet been done.

26. *Co-operation among the industrial classes.*—The recent Industrial Conference at Naini Tal laid stress on the necessity of the encouragement of co-operation among artisans and recommended that the establishment of the Registrar should be increased for this purpose. Most of the Indian artisans are terribly poor and the system under which they are supplied with raw material and with funds by middlemen who frequently take from them the finished product at an inadequate price is incompatible with any improvement in their condition. Their poverty, too, prevents them from adopting more efficient tools and instruments, such as improved hand-looms. Suggestions for the improvement of the status of any class of artisans by co-operation will be welcomed by the Registrar from persons who are acquainted with the conditions under which the industry is carried on.

27. *Conclusion.*—Copies of this pamphlet and of model bye-laws for Raiffeisen and for share capital societies with or without organisation into *pattis* can be obtained from the Registrar of Co-operative Credit Societies, Lucknow, who will be glad at any time to give advice and assistance to enquirers.

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### Research and Industrial Development in India.

In discussing Industrial Development in India, there are many factors to be considered, such as Capital, General and Special Education, etc. As regards the application of these to industrial development, there is a general consensus of opinion; there is one factor, Research, however, often prominent in such discussions, whose meaning and special applications to India, it is doubtful if there are many who clearly apprehend: an attempt is, therefore, made in this paper to deal with this subject.

The word Research is capable of very wide interpretations but has now acquired a very special meaning in connection with scientific and technical work. On analysis, however, it will be found that even in this sense it connotes two very different types of work, which should be clearly distinguished in dealing with its development in India. These may be briefly classified as follows:—

- (1) Original investigation aimed at the advancement of the boundaries of knowledge.
- (2) Original investigation aimed exclusively at the advancement of industrial conditions.

In the second type, as in the first, the advancement of knowledge is necessary, but is limited by the proviso that the knowledge is useful in a narrow material sense. It may be noted now, as will be further explained, that this proviso introduces many difficulties and causes of failure non-existent in the first type of Research. A striking contrast in this connection is provided by the exact and far-reaching generalisations

and laws due to Astronomical Research when compared with corresponding results for the sister science of Meteorology, which aims at being useful.

There is of course no exact boundary between these two types of Research but the great mass of original investigations can be allotted with fair certainty to one type or the other, the criterion being the mental standpoint of the worker. It will be convenient to have distinctive names for these types of Research and we will now restrict the term Research to the first type and class all investigations of the second type under the head Invention. This classification differs somewhat from the usage of ordinary language but will be convenient for precision.

The characteristic of Research, as compared with Invention, is that very little pecuniary reward may be expected for its results and it may be fairly claimed that this is the purest and noblest effort to which the human intellect can be directed and that the appreciation of Research marks clearly the level of culture to which any race has attained. Research is well exemplified by the sciences of Astronomy and Mathematics and in the study of the languages and history of ancient races; but in addition the vast bulk of knowledge in Sciences such as Chemistry, Physics, Geology, Zoology, etc., may be credited to Research. Though Research may be pursued for its own sake, as in many noble instances, yet for its healthy and natural development it appears that the critical appreciation of a readily accessible and cultured section of the public is necessary. Such an audience has yet to be formed in India and this probably explains the almost entire absence of Research.

In assigning a value to the results of Research the only criteria are newness or originality and scope, that is, the extent to which the investigation co-ordinates and explains ascertained facts. In this respect Invention differs strikingly from Research, as will be seen later on.

As regards Invention, the mental standpoint, environment, etc., of the worker are entirely different; the pecuniary rewards may be very great but the fact that economic principles must be rigidly applied to the investigation briefly indicates the characteristic feature that distinguishes this work from Research.

It is an indisputable fact that Invention owes a great deal to research and the latter provides much material for the former to work on. The vast bulk of research does indeed provide little of industrial importance; but from time to time there comes the means of a great industrial advance, and, as the direction from which it will come can never be foreseen, it follows that investigations must be prosecuted in all directions from the unselfish point of view of research. As a result in Western Countries, such as England, Germany, America, etc., where the struggle for industrial supremacy is very keen, Research must be actively pursued for the sake of the industrial advantage it may give: in India, however, it is not a question of leading in industrial progress

but rather of making up some of the great distance lost. When, therefore, we consider the limited financial resources of the country, economic principles would appear to indicate that it is to Invention at present that our available energy should be turned so as to start on, as direct a line of progress as possible.

The rewards for successful Invention in Western Countries are so great and accessible that it can be safely left to commercial enterprise; this is not at all the case in India and it will perhaps be granted that a special effort should be made to promote invention, as there is such ample scope for it. Some general considerations regarding Invention will now be discussed which may help to define and elucidate how this can be done.

For certain Industries the problems for Invention are much the same in India as in Europe and America and under these circumstances, when economic principles are taken into consideration, it is evident that at present the work of Invention, so far as it is identical, should be left to those countries where the conditions are immensely more favourable to success. What could be more foolish than Invention directed towards improving, say, the design of Steam Engines or Dynamos in India, where they are not made and relatively little used? In such industries the products of Inventions of Western Countries in the shape of improved processes and machinery should be freely imported and made accessible by Technical and Industrial Education. For the success of some Industries, however, indigenous conditions may be of paramount importance and as the results of Invention for these cannot be imported, the work of Invention should be directed towards these industries.

The first step in Industrial Development, therefore, would be a survey of the field for industrial success in India so as to determine the conditions. Invention should then be directed towards those industries in which indigenous conditions are of great importance, while the development of the other industries would be mainly a matter of Education and Capital, not Invention. A slight outline of some possible results of such a survey may be indicated and it will be convenient to divide Invention into Engineering, Chemical and Agricultural for this purpose.

As regards Engineering generally, indigenous conditions are of relatively little importance: thus for instance in Mechanical and Electrical Engineering, the machinery and methods of working are identical with those of Europe and America and any indigenous conditions, such as excessive temperature and moisture at times, are very simply dealt with. The greatest scope for Engineering Invention in India is probably in connection with Irrigation and Sanitation, though in the latter the Invention required is perhaps mostly in the Chemical category. If we take machinery generally under Engineering, the only far-reaching indigenous condition appears to be the cheapness of manual labour. This condition tends to throw more on the human agency and less on the

machine and indicates that, from the point of view of Economics, India should follow at a certain distance rather than lead or even keep abreast of engineering development in the West. This state of things hardly calls for Invention but requires the exercise of sound judgment and thorough knowledge in importing Engineering methods into India, which points to Engineering Education as the desideratum. As regards Chemical Invention there is probably a very wide and rich field in connection with the effective utilisation of many natural and cultivated products: these will provide many special problems for Invention which must be solved in India. For Agricultural Invention also on account of the indigenous conditions such as climate, soil, etc., the same opportunity for Invention exists probably on a much greater scale.

It has been pointed out that the standards for valuing Research are originality and scope alone; but although these also refer to Invention, other economic standards are of fundamental importance and we must judge the results of invention by such tests as Appearance, Durability, Convenience in use, etc., and finally all work must be referred to the test of £.s.d. The application of the last has often made useless much otherwise excellent work in the way of Invention. As a result of the difference in the standards to which the work is referred, the environment which is suitable to Research and Invention is entirely different: we associate Research mostly with the Laboratories of Educational Institutions and the work has been largely effected by the staff and students of these, while on the other hand Invention has come mostly from what may be termed Works, in contradistinction to Laboratories, since these are so much better adapted for the application of the economic standards referred to above. In the case of both Research and Invention also splendid results have been gained by private workers often under the most unfavourable conditions of poverty and sickness, but these are exceptional cases and not at all characteristic of modern work. It would seem, therefore, that when an Industry has been selected as a suitable field for Invention, according to the principles discussed previously, Pioneer Works should be organised under the supervision of an expert having had a thorough practical and scientific training and that this should be the *modus operandi* of pioneering an Industry. It may be remarked that in Laboratories sometimes an attempt is made to realise the conditions of such a Works but in so far as the special features of a Laboratory are present, such as for instance the accommodation and other provision for teaching classes and the architectural conditions due to association with an Educational Institute and other Laboratories, these are distinctly unfavourable to the economic requirements of a Works. As a result we see that the organisation for Invention and Industrial Education would be practically separate to secure efficiency in the former.

It will be found probably in many industries where indigenous conditions have a very important influence, that the call on the actually inventive capabilities for

successful working is not very great but well within the capabilities of an ordinary well educated man who has the direct facilities of a Works at his command. The difficulty to be reckoned with is to get a man of energy and initiative who has a thorough practical knowledge of the industry as developed in Western Countries, i.e., an expert, and who at the same time fully understands Indian conditions. This combination of knowledge is the most essential for the success of the works, and is peculiarly difficult to procure: the methods by which this difficulty might be met may be briefly outlined as follows:—

(1) The services of an European expert may be procured if a sufficient salary is offered. The special defect in this case is that it is extremely difficult for such a man to thoroughly understand Indian conditions and he would certainly have to be a considerable time in India before he would be fit to direct a Pioneer Works.

(2) A suitable Indian may be sent to Europe for training. The special defect of this is that it is extremely difficult for such a man to become an expert; even if he spends several years it is obvious he must depend practically on the generosity of European firms, etc., for what he learns, as his services cannot be of any great value to them, and these firms well understand that they have nothing to gain but much to lose generally by the development of industries in India. A course of training of this kind often degenerates into a round of visits of inspection to Works, permission for which is easily obtained. This is useful and interesting but in no way qualifies a man as an expert.

(3) An attempt may be made to associate a European expert and one or more Indians in the management of the Works. The Indians should thoroughly understand the local conditions, such as habits and power of the workmen and the peculiarities of the market which has to be supplied. This would seem the most promising arrangement, if such association could be made to work smoothly and efficiently.

A full discussion of this matter would be more lengthy than can be attempted here and the conclusion arrived at would depend largely on individual conditions in each case.

The characteristic of such a Pioneer Works would be that the Staff, Buildings, Fittings, etc., would be directly suited to the work in hand in the most economical fashion, though this result would not be attained till after much expenditure on experimental investigation. The Works should also be placed where the greatest industrial advantage can be gained, taking all facilities into account.

The inauguration of such a Works can be confidently recommended to a public-spirited Indian who has sufficient capital at his command. A good lead in this direction has been given by Mr. Tata and others. The carrying through of such a venture, as it should be done, would require, besides Capital, much patient and watchful interest in the work and a generous and

sympathetic treatment of the Staff. If on the other hand, the care of the venture is left to drop into the hands of interested dependents, failure is bound to result; in many cases a considerable pecuniary reward may be obtained eventually, but it were infinitely better that the results of the Pioneering Works should be made freely accessible rather than exploited for the benefit of the individual.

One aspect of Research remains, which may be mentioned now, and that is its educational one. Research develops the mental faculties of "imagination" and "criticism," which are essential for both Research and Invention and are in fact an invaluable asset for any work. The educational value of Research is, therefore, of the greatest importance and from a general point of view much greater than that of Invention, as the mental faculties given above are exercised by it in a more simple and direct manner. Students, however, require a very thorough preparation before they can undertake such advanced work as Research; but the spirit of Research can be carried through their training and they may be taught to investigate for themselves in a Laboratory from quite an elementary stage, thus embodying the educational features of Research to a considerable extent, though no advancement of the boundaries of human knowledge results.

In order to make Research general in Indian Colleges a considerable advancement in the standard of school education is probably necessary in order that the College Course may be able to prepare students for it; otherwise Research becomes a blind following of the directions of a Professor with little or no educational value, and very little result for the Professor's time and energy; since a supply of well-prepared students is very important for successful Research.

The importance of Invention and its relationship to industrial progress is little emphasised even among the educated public of Western Countries; very little is published about it, except Patent Office records never read by the public, and few names are honoured in connection with Invention as compared with Research; in fact, the rewards for the former, though substantial, are strictly in cash. The voluminous records of the Patent offices of Western Countries with their thousands of Patents annually do indeed give some idea of the Inventive activity which prevails, but even they are not at all completely representative, as many industrially valuable inventions are not at all suitable for patenting. To give even a history of, say, the evolution of the modern bicycle, that marvel of cheapness, lightness, durability, and ease in running, with the myriads of ideas of which it is the outcome during a time which many of us can remember, would require several large volumes, and such instances could be multiplied indefinitely. These considerations may lead us to doubt whether a few Professors doing Research with their students would provide a serviceable substitute for the inventive activity of the West, as some optimistic writers seem to think.

Finally, it must be noted that invention is not a Government product in the West and does not even lead direct to State Honours, such as Peerages, Knight-hoods, etc. The most that Government has done for it is in the way of Education. The inventive energy, as represented by the expenditure of mind and money, has come from the people.

This paper does not treat of industrial development as a whole but of only one of its several factors. If, however, it helps to rouse and define an interest in the form of Research called Invention, its purpose has been fully accomplished.

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### The Metal Industry.

When your genial Secretary asked me only a few days back for a paper on the Metal Industry for this Conference, I naturally felt some hesitation in complying with his kind request. The subject is a vast one, and my practical acquaintance is limited to only a small branch of it. I can, therefore, do no more than express a few stray thoughts on the subject which are uppermost in my mind at the present moment.

I took the Lucknow Iron Works in hand some 10 years ago from a syndicate. I have to import all raw material, namely, Cast Iron, Wrought Iron, which are manufactured into articles largely for the use of the Railways and the Municipalities.

My chief difficulty has been as regards the supply of labour, both trained and untrained. The unskilled workmen are illiterate and without much sense of responsibility and therefore make, with some exceptions, very inefficient workmen as a rule. Before they have hardly learnt the rudiments of the work (of course at my expense), they go away elsewhere on better wages. In the local Railway Workshop particularly they easily get almost double the wages, irrespective of their skill and efficiency. Even skilled hands have been tempted away by the offer of higher wages which are more than their proper market value. This is a form of unfair competition which we have to face here. It not only handicaps the employers of labor in their work but also interferes with the proper training of the workmen themselves, who appear to be anxious to earn too soon, and thus their training remains defective. It were well if some means could be devised to protect private enterprise with necessarily limited resources against such a form of unfair competition on the part of a State Department of practically limitless resources.

On the cheapness or otherwise of the coal fuel the success of the industries depends to a great extent. With the object of encouraging the Indian Industries our generous Government, therefore, was pleased to obtain an appreciable reduction in the freight rates of

coal. But its object, I am sorry to say, is being more than neutralised by the selfishness of the Colliery proprietors and coal agents in substantially raising the prices of coal. The law of supply and demand must of course be left to have its free and natural operation. But I feel that the rate at which shipments are going on bode no good to the home industries. Could not a countervailing export duty be levied on coal exported to other countries as offering at least some check to the present unrestricted export of this commodity, as this is believed to be the chief explanation of the exorbitant rise in the prices of coal? The scarcity of railway wagons has tended to further accentuate this difficulty.

The question of the further reduction of railway freight is also one which might be taken up in this connection as tending to encourage the industry.

I would now bring this short paper to a close by bringing to the notice of the Conference a few points of general interest which would have a practical bearing on this as well as on other industries:—

1. I am not aware whether a proper survey has been undertaken in recent years with a view to exploit the mineral resources of these provinces, both metallic and non-metallic. An exhaustive survey might be undertaken of selected local areas likely to yield good results. If Government aid can be obtained to this extent, probably it will not be difficult to form a syndicate to work the industry discovered.

2. I would also advocate the appointment of a Director of Industries by Government to give expert advice free or on moderate charges to enterprising Indian Capitalists as to the industries that might be profitably taken up, indicating the best and most economical way of proceeding in the matter. Seeing the excellent results that the creation of such an appointment in Madras has produced, I cannot but too strongly recommend it here. For the present the Principal of the Thomason Civil Engineering College at Roorkee and perhaps also the Director of Land Records and Agriculture might be entrusted with this work with the co-operation and valuable assistance of yourself, Sir, as the Special Officer who has made an extensive survey of the industrial possibilities of these provinces and has made a close and thoughtful study of the subject.

3. The establishment of free Industrial night schools would, in my humble opinion, go a great way to improve the chances of the proper and efficient training of the workmen. If necessary, scholarships might be given. I look for appreciably good results from the adoption of this course. The employers of labour are naturally unwilling to take this responsibility upon their shoulders, as very few can afford to undertake this additional responsibility, and even those who can afford to do so do not feel inclined, as, in the present circumstances, the services of such trained workmen cannot be assured to them, as these latter can go away elsewhere at any moment

they like. The establishment of such schools would not only supply the demand for skilled workmen by private firms but also by railways and will thus put an end to the unfair competition complained of above.

4. The Government being the largest consumer of most of the iron and brass manufactures at present, the best way of encouraging them would be for the Government to get these locally as much as possible for its requirements. I do not for a moment mean to suggest that competition, which is the very life of all business, should be altogether done away with. All that I claim is that an opportunity should be given to the local manufacturers, to tender on all possible occasions for Government requirements. This will tend to encourage and put heart into the proprietors of the existing industries, and thus induce them to extend their business on improved business lines and also induce others to come into the field. This object can be easily secured by a more strict observance of the existing rules whose scope has been further expanded by the recommendation of the Macdonald Committee on Government Stores, appointed some two years ago. These lay down, for instance, that only such articles as are not manufactured in India should be obtained from England and it is required to be certified in respect of each indent not only that the article indented for from England is necessary but that it cannot be advantageously procured of local manufacturers. If any indent on England contains items which it is possible to obtain of Indian manufacture or of indigenous origin it must be explained why it has been indented for from England and not procured in India, otherwise the indent will be liable to be cancelled.

By the adoption of these and similar measures Government can foster existing industries and encourage new ones to be started. But much will still depend on our own exertions. We should try to profit by past failures and avoid those causes of it, such as want of experience, technical skill, business aptitude, and sufficient funds, which brought them about. We must not be overhasty or over- sanguine, take expert advice and time to mature our schemes, and then and then only float new companies. Success will be assured in such a case, capital will be less and less shy in coming forward, and an era of industrial revival will have dawned under the fostering care of a generous Government.

PRAG NARAYAN BHARGAVA,  
Proprietor, Lucknow Iron Works,  
and  
Director, Lucknow Paper Mills.

### Combination of Agriculture with Manufacturing Industry.

My attention has, during the past two years, been attracted to the great help to improvement of Agriculture which can be effected by combining with it Manufacturing Industry. Rich and well-to-do

landholders have been exhorted to open demonstration farms and to adopt up-to-date methods of agriculture in their home-farms. They are good things, no doubt, but mean extended knowledge of those methods and also willingness to spend money without much immediate return, two things which are not by any means to be found in abundance amongst the richest landholders anywhere. It has, however, struck me that the money-making instinct among all rich landholders may induce them, for example, to open small and large factories right in the midst of their tenantry in those products of their lands which can be then and there manufactured into marketable commodities. For example, in the United Provinces, a vast amount of sugarcane is grown and many rich landholders have the command both of the tenantry and the capital to start profitable sugar factories, if they will only be a little enterprising and not lie content and luxurious on the balance received from the rent rolls after payment of the Government demand and the cost of collection. Similarly, a vast amount of raw cotton is exported out of the country; a landholder possessing, say, a number of villages can easily command enough produce for a most profitable ginning and spinning and weaving mill, planted right in the midst of the producing fields. Similarly for oilseeds and other agricultural produce.

Such a combination appears to me to be the *immediate need* of our present economic situation. The factories will work profitably and continue to be prosperous with the help of the agricultural produce, simultaneously with improvement in such produce rendered imperative by the necessities of the factories. The profits of agriculture will help the profits of the factory and the losses, if any, in one may be covered by the gains of the other. For instance, better kinds of seeds of cotton, Egyptian or American, will naturally be used for the purpose of finding improved staple for the factory, and must be distributed for cultivation among the tenantry for their benefit as well as to supply one uniform quality to the factory. Thus improvement in both will result and the landholder will be the gainer in many ways out of the combination. The present methods of investment generally adopted by rich landholders is money-lending to their own tenantry or their poorer brethren, or lending to Government by purchase of Government paper. If, however, they adopt this combination, by first ascertaining the kind of agricultural produce available in a given place and then establishing factories for their manufacture into marketable products right in the midst of villages which produce them, they will soon find the immense profits which can be made for themselves as well as the wide openings for work and profit for their tenantry.

And in this vast country of ours we have in different parts of it almost every kind of land capable of producing any and every crop and tree known on this globe. It can be said with confidence that possessing, as we do, the Arctic cold of the Himalayas and the Equatorial heat of the Sahara in Rajputana, no tree

or shrub exists in any part of the world but can be grown in some one or other part of the Indian Empire.

Nor can the inhabitants of our country be classed as inferior in intelligence to the denizens of other parts of the world. Thanks to British authority and influence, we have now the liberty and security in engaging in any trade and manufacture we please, even if it were dependent on distant communications and markets. Thanks to the vast system of Post and Telegraph, Roads and Canals, every part of India is easily accessible, and the seaport towns are nearer to us now than a ten mile distant village in the last century.

I advocate the establishment of factories right in the midst of the fields and villages which produce wheat or cotton or oilseed, which the factory is to manufacture; and roads and railways are so plentiful that no difficulty whatever exists for the transportation of the products of the factory to the markets, however distant.

In spite of the efforts made by Government in its agricultural and commercial department by publication of pamphlets and establishment of Agricultural schools and colleges and experimental farms, no visible improvement in our old time-honoured methods of agriculture has resulted, because the landholders and the actual cultivators have not been approached and not been leavened with the new knowledge and experience and enthusiasm. The establishment of such factories in villages is sure to be followed by establishment of practical demonstration farms in the particular produce with which they deal, and will thus provide many an institution where the information collected by Government in the Agricultural and Commercial Department may well fructify to the benefit of both the owner of the factory, the landholder and of the tiller of the soil.

A writer in the *Indian World* of October 1907, deplores that the great noblemen of Bengal, possessors of immense areas of land and long rent rolls, "evince no practical interest in the improvement of their estates," and advocates "Agricultural Associations" and "introduction of scientific methods of Agriculture" by co-operative bodies scattered all over the country. He portrays vividly how land is diminishing in productive capacity and how immediate efforts should be made by landholders to increase that capacity and says that an increase of 2 annas per bigha in the 916 considerable estates, measuring 40 million acres, will increase the gross annual wealth of Bengal by one and a half crore rupees.

The premier living poet of Bengal in his profoundly thoughtful and statesmanlike address as President of the Pabna Conference, has, the other day, suggested that in order to take advantage of machinery in cultivation and in smaller manufactures, villagers should combine their lands and combine their callings; for example, all cultivating cane or jute should put their lands together, so that machinery imported from their joint funds may be used in their fields, and also to press all their cane-juice, to bale all their jute,

together and so on. Weavers may likewise combine in their own villages, and import machinery to suit them, and increased produce of their own labour will result. That is to say, a general spirit of co-operation is advocated.

The idea of establishing factories and mills right in the midst of villages and among the homes of the cultivator and the labourer serves a double purpose, economical and social. The moral and social deterioration of large numbers of working men and women torn from their homes and indiscriminately huddled together round a capitalist's large factory in towns is well known. This could be avoided if such mills and factories were established near the homes of those who produce the raw material and who naturally will be working men in it.

But who is to lead the way? Who has the requisite enterprise and capital and knowledge to show practically what can be done?

I emphatically advocate the combination in one and the same hand of both agriculture and manufacture. And the motive power I claim to be prospects of immediate and large profits. What the writer in the *Indian World* proposes is almost academic and lacks the strong incentive of immediate gain; and I am afraid the poet's idea is almost a dream, for the ignorant and uneducated ryots and weavers and milkmen can hardly be expected to form companies or conjointly work a spinning or dairy factory. On the contrary those who are owners of long rent rolls have the land at their command, which, even if they do not cultivate themselves, may be easily made available for the purposes of their factory which deals with their produce. It is doubtless easier for rich land-owners to start and work such combinations than for poor uneducated ryots.

It may be said that the great majority of our richer land-owners are too satisfied with their wealth to work for new projects, they lack the enterprise and energy which such combinations mean, and the pioneer's work has not been yet commenced.

Well then, it lies with the educated middle class to form the pioneer companies, to work such combinations and to present the object-lesson—required to stimulate our large land-owners into activity. I have during the past two years been trying to work such a company.

In these provinces as well as in Bengal and the Punjab; most of the culturable land is under the plough, and rights have grown up round each field which perhaps it is undesirable to disturb, even if it could be, for the purposes of such a combination. Some large tracts exist in Eastern Bengal and Assam and the Punjab which are at present uninhabited wastes and the cultivation of which, and the establishment of factories in which, means an expenditure of capital and also waiting for many years for any return, quite unsuitable for making a feasible place where to start such a combination. Looking elsewhere in India, we find in the Malwa Territories of His Highness the

Maharaja Scindia of Gwalior a most suitable and convenient country. There large numbers of villages are available on favourable terms to a company whose object is cultivation as well as manufacture. The land is what is known as black cotton soil. There are five large districts of it as big as British Districts, viz., Ujjain, Shajapur, Amjhera, Mandasaur, Neemuch and Bhelsa. Except in the southern part of Amjhera, the climate is very good, much better than many parts of Bengal, and less hot than most parts of these Provinces, and in Ujjain and Neemuch the climatic conditions are ideal. There are no extremes of heat and cold and the water everywhere is sweet and wholesome. The nights of Malwa in hot weather are cool and pleasant, and the rainy weather in Malwa, in fact, is colder than the cold of the winter season. Unlike other parts in the plains of this vast country of ours, rainy weather in Malwa, as in Rajputana, is quite enjoyable. There are great rivers in Malwa, the Chambal, the Sipra (the Ganges of the Deccan), the great Kali Sindh, the Betwa, the Parvati, the Vaisali, the Retam, the Bamni; and other streams of smaller dimensions, which, however, are liable to be dried up if sufficient rain does not fall in season. There are many bends in these rivers which pass hilly and uneven country, admitting of the erection of large lifting machinery for the irrigation of wide expanses of country. In our old books, Malwa is described as full of grain and as never having suffered from famine or scarcity. In point of fertility and resources the land of Malwa is pre-eminent in all India from an agricultural point of view, producing the best wheat, cotton and opium; it requires only a little moisture to grow all sorts of produce, plants, trees, shrubs and grain luxuriantly. Sir William Hunter, in his Gazetteer, says, "Malwa is the richest part of Central India and has never in historical times suffered from famine caused by drought." Lord Curzon, in his speech at the public meeting in the Town Hall of Calcutta on the 16th February 1900, to organize charitable relief for famine sufferers, said, "In Central India even fertile Malwa which has *always* been an asylum for famine-stricken wanderers from other parts has itself been stripped bare, etc."

Ujjain is the central part of Malwa and forms the first plateau of the Vindhya Mountains, which run parallel to the Nerbudda, and below 10 to 30 feet of the soil of Malwa exists the Deccan Trap, the hardest rock which holds all the rain water like an underground reservoir and keeps the soil moist, though on the surface it may be hard and dried. Only 26 inches of rain in season is enough to ensure bumper crops.

Such is the land which the severe famines of 1897-98 and 1900-1902 has left badly affected, and there are large numbers of villages which His Highness the Maharaja Sir Madhava Rao Scindia is offering to settlers of education, experience and position on favourable terms, who organize themselves into a co-operative body to combine agriculture with manufacturing industry.



As to communications by rail and pucca road, the following lines of railway pass through Malwa:—

1. The G. I. P. Railway from Itarsi *via* Bhopal northwards through Bhelsa, Bina, Jhansi and Gwalior to Agra and the north.
2. The Rajputana-Malwa Railway (the B. B. O. I. Railway) from Khandwa *via* Indore and Mhow to Fatehabad and Ratlam to Mandasaur and Neemuch and north-westwards to Ajmere.
3. Fatehabad to Ujjain.
4. Bina-Goonna Railway.
5. Bhopal-Ujjain Railway.
6. Nagda-Muttra Railway.

As to pucca roads there are many already, and His Highness' Roads Department is actively engaged in adding new ones every year since his accession to full powers, twelve years ago.

His Highness' terms, shortly stated, are that the company will be granted lease for 20 years, the annual lease money being the average of the *annual realisations* to the State during the past five years less 8 per cent. for the first ten years, and 15 per cent. less than the rental for the remaining ten years. The lease is liable to renewal and all buildings of the company will be their permanent property, who will also have power to sub-lease any villages to persons other than His Highness' subjects. Permanent proprietary heritable and transferrable rights will be given on recommendation of the company to individual shareholders.

Now the actual realizations to the State during the past five years have been from 40 to 70 per cent. of the Settlement recorded revenue, so that the margin of profit, to all intents and purposes from the management of villages on a large scale, is almost sure of being large: besides giving the company unlimited scope for extension of cultivation over thousands of acres of good land at a continuous stretch. I have observed the conditions existing in the villages in Malwa and have no doubt that an organised body can engage on these terms in the management of villages alone with the minimum of capital and of chances of loss and have the maximum of probabilities of success and profit. And further many groups of villages exist where wheat and cotton are grown and where ginning mills and flour mills can, with advantage and with every prospect of success, be planted. The shareholders have, *firstly*, the profits from the management of the villages, *secondly*, the profits from the advances made to the tenants in cash and in seed and plough cattle, *thirdly*, the profits from dairy farming, from cattle breeding and other incidental incomes connected with zamindari, and *fourthly*, the profits of mills and factories of their own, with which no other factory or mill will be able to compete, or the company will own both the lands and its own factory and thus have practical command of the supply of raw material, even from neighbouring villages not belonging to it. For example, a cotton mill, not possessing its own villages, has to buy its cotton in

the open market, where the supply is usually of different kinds, and sometimes insufficient or not available at proper working time. The company, by advancing one particular kind of seed to its tenantry, may easily obtain, in lieu of its advances and of the rents realizable, cotton of one uniform quality, and may easily regulate the quantities required to proper times of working of the factories and have sufficient material to ensure working for a full period of the season. *Fifthly*, the company, having the command of the villages, can engage in new ventures in cultivation to supply new ventures in manufactures.

These are the prospects in Malwa and the immense opportunities available in that part of our country. Instead of emigrating to ungrateful Transvaal or to inhospitable Canada or Australia, I urge upon the attention of my countrymen the advantages which His Highness the Scindia offers in a salubrious part of our own country.

A corporation has already been formed and has started working by taking possession of, 81 villages in the Districts of Mandasaur and Ujjain. People of education from the Berars, from Gujarat, from Bengal and the Punjab and these Provinces already are there, though working individually small tracts without any organization or combination. What is however requisite, to open out the yet vast tracts available, is a strong syndicate possessing skill and knowledge, technical and professional, of all kinds, and experience of the various matters connected with land management and manufactures and machinery, and possessing influence if not vast capital; to fructify, as an object lesson to all India, the idea of *Combination* of agricultural and manufacturing industry, which alone can bring about the economic salvation of our country.

K. P. ROSS,  
Pleader, Meerut.

### Outlook of the Paper Industry in India.

Having been asked to contribute a short paper on the Paper Industry in India, I have much pleasure in responding to the request.

The above Industry at the present time is passing through a period of depression, owing to a variety of causes, not the least important of which are the following:—

I. *Shortness of Raw materials*, such as Rags, Patmal and Hemp. Plague may have interfered with supplies of the above to a certain extent, but the real cause may probably be due to the want of enterprise. These are materials which may be found in plenty in every locality if only people would organise and exploit on business lines. If this work were done in these Famine times, it would provide work for a large number of starving people, and to capitalists it would mean a profitable return. Often and again I have looked round and tried to find other materials

which could take the place of these, but so far I have not been able to hit upon any. In better classes of paper we have to use more expensive materials, such as Baib Grass, also wood pulp, but beyond a certain limit, it does not pay to use these, especially wood pulp, on which we have to pay prohibitively high freight rates. It is gratifying to note that Government is doing something to encourage the manufacture of wood pulp in this country. We have all read with interest Mr. Sindall's report on the experiments he made with Bamboo and species of wood available in Burma. But even if the experiments are successful they will not help us much in this part of the country on account of the difficulties of getting it here all the way from Burma at reasonable rates. I am also informed that the local Government have sent samples of wood from these provinces to England for experiment. We wait with interest to hear the result. Even should these samples prove suitable for Paper Manufacture, we have to find out if the wood can be had in sufficiently large quantities and within easy reach.

II. *Chemicals* for the use of Paper Manufacture have to be imported and cost us much when laid down at the Mills. The same is the case, more or less, with all English stores which cannot be procured in this country. Some of the chemicals that are available in this country we have tried, *viz.*, Alum and Resin, but they have not been successful, owing to the very low quality, thus making them more expensive in the long run than the imported articles. Indian Sujji (Fuller's earth) at one time we used a large quantity, to take the place of imported English Caustic for boiling, but on account of the increased rates we found it more profitable to use English Caustic.

III. *Coal*.—Our coal bill is also a very heavy item. Although in order to encourage the Industries, Government has got railway freights substantially reduced, yet the advantage has not reached the Industries, owing to the high rise in the prices of coal.

IV. *Labor Difficulty*.—The Labor question is another difficult matter we have to deal with. The ordinary workman likes nothing better than to stay away from work. This is specially noticeable a few days after their wages are paid. Another thing I have noticed is as we increase wages the worse they are in the above respect. Apart from his irregular attendance, the Indian workman is not nearly so efficient as the European workman of the same class, and shows very little disposition to improve himself. Want of education may partly account for this, but the habit of indolence ingrained in him has also, I am afraid, a great deal to do with it. The sense of responsibility has yet to be developed in him.

V. *Indian young men as Apprentices*.—With a view to encourage Indian young men of respectable families to be trained in the art of Paper Making, we have adopted the apprentice system, whereby they have every facility given them for learning the business, and a fairly liberal scale of wages had been fixed, but I am sorry to say, even with these young men, I find the same difficulty. Those moral qualities

of punctual attendance, dogged perseverance and intelligent interest in the work which make for success in these cases are sadly lacking. We hear nowadays a good deal about sending young men to foreign countries to learn the art of Paper Making. This is a course I do not agree with at all. My opinion is that they should rather qualify themselves here, where they have every opportunity of doing so. Should it be thought necessary, after they have completed their training here, they may be sent abroad with a view to expand their knowledge and broaden their outlook, with special reference to the improvements that are being daily made, both in machinery and processes of Paper Making. I myself consider that Indian young men have much better facilities for learning the art of Paper Making in an Indian Mill than in a great many European Mills, because the conditions of work are so different. The materials alone, for instance, which we use in the manufacture of our paper here, are all to be found in the country, whereas a large number of Mills in European countries use nothing but imported wood pulp. Consequently in Mills like these only one half the business can be learnt, there being no preparation of materials needed, wood pulp being all ready prepared.

Seeing that we still annually import more than 8,000,000 worth of Paper and Paste Board and this amount is increasing every year, we cannot say that the Industry has not a good outlook before it, but we have to guard against certain difficulties and dangers.

1. New mills to be started should be sufficiently apart from the existing ones or otherwise the already existing difficulty about raw materials is bound to greatly increase. The result will be that competition will set up for these, increasing their price, and consequently the cost of manufacture; and as we have already to compete with cheap foreign papers, it will inevitably result in injuring both the existing as well as the proposed new mills.

2. Great care should be taken to locate the new mills, in places where raw materials can be had in plenty, also water.

3. Before launching in an enterprise of this description, expert advice should be obtained and a scheme prepared accordingly in consultation. It will always pay to go in for new up-to-date machinery, so as to insure large outturns, which would have the effect of reducing the average cost.

4. We should have these mills at places where we could command plenty of labour, both skilled and unskilled.

5. Direct railway communication with sidings running into the mills, is also a question to be studied, as freight forms a large item of expenditure, and an endeavour should be made to get it reduced as much as possible. The less we have to do with transshipments on rail the better, for we incur heavy losses in shortage, breakage and sometimes even in total loss,

These are a few hasty notes which I had time to jot down and I trust the same will give some idea of the numerous difficulties we work under, apart from the prices of almost every single material going up by leaps and bounds without anything like corresponding increase in the price of paper, so that the prospects of the Industry are not at this moment particularly hopeful and, with the unrestricted import of cheap foreign paper, the position has become still worse. Probably the only solution of all this difficulty would be found when cheap wood pulp can be made in this country. As I have already mentioned, the matter is engaging the attention of the Government, but till then we cannot be too guarded in venturing on the establishment of a new Paper Mill. Certainly I would not recommend lightly launching upon such a course without paying heed to my above suggestions.

JAMES LUMS,

Manager, Upper India Couper (Paper) Mills, Lucknow.

### The Dairy Industry in the United Provinces.

India being an agricultural country, the dairy industry, which is connected with agriculture, is carried on in almost every village and town from time immemorial; but dairying on the improved European system is of very recent growth. Speaking generally, the native method of treating the milk for making ghi, which is more commonly used than any other dairy product, is first to boil it for the purpose of purifying it. Then sour curd is added and the milk is allowed to stand for twelve hours at least before it is churned. Warm water is then added and when the butter begins to break, cold water is added. The butter is then gathered and is put into a vessel and boiled over the fire until the water is evaporated and the curd is deposited at the bottom of the vessel; but care is exercised at the last stage, as, if the deposited curd is allowed to burn at all, the ghi would be spoilt. This system of first boiling the milk to purify it and then to artificially sour it with curd is quite on a par with the best European modern system and secures a maximum yield of butter from the milk provided the boiling process is not continued too long. The weak point in it is that the milk, after being so treated, becomes butter milk and is of a low value for sale. In ghi-making we get only two products of the milk, *viz.*, ghi and *mattha*. According to the improved European methods, the cream which the separator takes out of the milk contains all the ghi and the separated milk contains all that is required for drinking purposes and for use in making curds and cheeses and also sweetmeats. The cream being only about a twelfth part of the whole not only reduces the labour in dealing with it but reduces the cost of fuel in making the ghi. The milk being taken away reduces the curd in the ghi and thus improves the quality. Under the ordinary system of dairying and the treatment of milk it is difficult to manage any

quantity of milk in the hot season, but by means of the separator the difficulties are at once overcome; the cream being taken away from the milk as soon as it comes from the cattle, places the products absolutely under control. The cream can be kept and ripened for butter and ghi-making and the separated milk is suitable for drinking purposes.

Dairying has recently assumed a very important place in all Western countries; and the measures which were taken by Government with a view to improve the dairy industry in this country were briefly these. In 1889 at the suggestion of the Government of Bombay the Dairy Supply Company sent Mr. Howman to India to make enquiries into the dairy industry, to ascertain by trials whether the cream separator was needed in India and whether it could be profitably utilized in the manufacture of ghi. After an extended tour in several provinces and after having made various trials he reported in favour of the adoption of the separator. On his leaving the country the services of his assistant, Mr. E. Keventer, were retained by the Bombay Government with a view to organize improved dairy arrangements in that Presidency. In 1891, the Government of these provinces secured the services of Mr. Keventer. He at first commenced his work at Cherat, four miles from Aligarh, where a number of cattle belonging to the Agricultural Department were kept on an *usar* reserve and where dairy operations on a small scale had already begun. By the beginning of the cold weather public interest in the dairy began to be awakened and the demand for butter increased steadily. It then became necessary to purchase milk from the *Ahirs* in neighbouring villages. Next year, in 1892, a dairy was started at Lucknow in connection with the jail and the necessary cattle were purchased from Hissar, Batesar, Muttra and Etawah, where good milch cows and buffaloes are procurable. The experiments made by Mr. Keventer both at Aligarh and Lucknow showed that good butter can be made at all seasons of the year, that it can be transported fresh to considerable distances even in the hottest weather and that it could command a remunerative price. In Aligarh the amount of milk required to produce one lb of butter was 18.48 lbs. In Lucknow the proportion of butter to milk was 1 lb of butter to 15.16 lbs of milk. The difference is due to the fact that at Aligarh the milk was chiefly bought; at Lucknow it was all the produce of the dairy cattle. The analyses of the butter from Lucknow and Aligarh showed it to be excellent both as regards aroma and keeping qualities. A quantitative experiment was carried on at Aligarh to compare the amount of butter obtained by the European and native methods, respectively. The results were as follows:—With European appliances 74 lbs cows' milk gave 3 lbs 6½ oz. butter or 1 lb of butter from 21.72 lbs of milk. So again 43 lbs of buffalo's milk gave 3 lbs. 1 oz. of butter or a ratio of 1:14.29. With native appliances 37 lbs. of cow's milk gave 1 lb. 7 oz. of butter or a ratio of 1:25.74 and 11 lbs. 12 oz. of buffalo milk gave 10½ oz. of butter or a ratio of 1:17.49. Thus by means of the European methods a larger outturn of

butter was obtained both from cows' and buffaloes' milk. These butters were each analysed by the Chemical Examiner and the result showed that the quality of the butter made by European methods was distinctly superior. It contained considerably less water and curd than that obtained by native methods. Owing to climatic conditions, which in India differ so much from those in Europe, the experiments with cheese were not attended with quite the same success as the other dairy operations. At Aligarh the skim or separated milk was nearly unsaleable and most of it was fed to the cattle: but in Lucknow when the dairy got better known purchasers for this milk were found and the supply was insufficient to meet the demand. Mr. Keventer was much impressed with the necessity for the more careful selection and breeding of milch cattle and for the growing of the best fodder crops. Cows and buffaloes are unable to produce milk on the scanty and dry food they are commonly fed with, but if properly fed with green crops the outturn of milk increases. The dairy at the Lucknow jail was subsequently closed on the representation of the Inspector-General of Prisons and that at Aligarh was later on sold to Mr. Keventer, as its continuance under Government management would have interfered with private enterprise.

The success of Mr. Keventer's experiments did much to stimulate dairying on the improved system and dairy farms were started by military authorities in several cantonment stations. Owing, however, to the distance from Aligarh station the situation of the dairy at Cherat was not convenient for private persons who desired instruction in butter-making. Still several apprentices visited the dairy to learn the method of working, which resulted in the opening of private dairies in places. In Aligarh there are two or three small dairies which make butter on the improved system, but which depend for their supply of milk on neighbouring villages. Here in Lucknow we have two good private dairies, the Diamond Dairy and the Star Dairy. The development in these provinces of this industry according to the improved system has nevertheless been rather slow and in his University Convocation address of 1903 Sir James La Touche had to refer to the subject thus:—

"Of all these the most hopeful perhaps for this province are the industries connected with agriculture. It has always been a regret to me that a successful industry like that of the farm for dairy produce in this station and in Aligarh has not been taken up by the people of this province. There is an unlimited demand for ghi and other dairy produce. The process of manufacture is capable of immense improvement; the study of suitable fodder plants has great economic value but modern science is of no avail unless there is an industry to which it can be applied."

The demand for good dairy products is daily increasing. In larger towns it is now practically impossible to ensure a supply of pure milk. The stalls where cows and buffaloes are kept by *Ahirs* and *Ghoasis* are always saturated with the manurial matter; in the rainy season they become quagmires. The supply of milk from such places is a fruitful source of diseases to those who drink it. All the larger towns should, therefore, have one or two good dairies managed by

private persons on the improved system. If they can work successfully at Lucknow, where there is also a dairy farm worked by the military authorities, there seems no reason why they should not work profitably in other large stations also. Good butter is sold at the rate of 12 to 14 annas per pound; and the margin of profit in making it is greater than in ghi which is usually sold at eight annas per pound. At the outset about Rs. 5,000 are enough for the purchase of cows, buffaloes and dairy appliances and for making sheds. If a regular supply of good milk can be arranged from neighbouring villages small dairies for butter making can profitably be worked on a much less initial cost. No difficulty is ever felt in disposing of the dairy products. Ghi, butter, cream and milk, whether whole or separated, are readily sold locally in all the seasons of the year and in the cold weather butter can be sent to distant places like Calcutta and Bombay where it is in good demand.

The case of ghi requires some special notice. It is one of the chief articles of export from these provinces. Ordinarily its annual exports amount to about 2½ lakhs of maunds, the value of which at Rs. 40 per maund comes to one crore of rupees. Its consumption inside the province is much larger. The manufacture of ghi is carried on in almost every village according to the system already described. In Rohilkhand and Oudh the produce is just enough for local requirements; but in Meerut, Agra and Allahabad divisions, specially the four Bundelkhand districts of Banda, Hamirpur, Jhansi and Jalaun, the industry is important and the exports of ghi are chiefly drawn from these tracts. Calcutta takes about 1½ lakhs of maunds a year partly for local consumption and partly for re-export to Burma and other countries; the rest goes to Bombay and other places. The question of the supply of pure ghi in larger towns is more pressing than that of milk, as ghi is more commonly used. The ghi which is offered for sale in the bazaar is of very poor quality, being adulterated with fat and vegetable oils. If in the larger towns shops were opened for the sale of pure ghi they would be welcomed by the public and if they were worked on an organised scale the export trade also might be stimulated. No risk whatever is involved in this trade and as the price of ghi does not much fluctuate, a moderate amount of profit can always be secured.

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### Agricultural Improvements in the United Provinces.

The bulk of the people of India belong to the agricultural class. In these provinces this class forms quite two-thirds of the entire population. Agriculture here is the chief source of the wealth of the people and the revenue of the Government. And yet until

a comparatively recent date there was practically no Imperial or Provincial Department of Agriculture worthy of the name.

It was not until the great famine of 1877 that a beginning was made on the report of the Famine Commission with what has since been styled the Department of Land Records and Agriculture, of which even the name suggests that Agriculture formed merely a secondary object.

The idea of an Experimental Farm at Cawnpore had been conceived by the late Sir John Strachey in 1874, but it was Mr. (now Sir Bampfylde) Fuller, who as an Assistant Director of the Department actually started the Farm in 1881, with a small workshop for making and repairing agricultural implements, and a seed store, and worked hard to give it a firm foundation. To this the Department subsequently added a staff of trained well-sinkers available to the public at a fixed salary and also a branch for cattle-breeding. In the early nineties a small Agricultural School was also opened at Cawnpore, of which the main object was to train candidates for the post of Kanungos, and about the same period occasional bulletins in English and a monthly journal in Urdu called *Mufeed-ul-mazareen* began to be published by the Department for the dissemination of useful agricultural information and Agricultural Shows and Demonstrations began to be held. But until the beginning of the present century, the Department did not find much scope for development and the work was done only on a small scale owing chiefly to the small funds provided for it and the comparatively little interest which the Imperial and Local Governments evinced in the matter.

Happily since the last few years a better state of things has come into existence. Although the divorce of the Department of Agriculture from that of Land Records, which our representative, the Honorable Babu Sri Ram, pressed in the Imperial Council, has not yet been made in form and the two Departments are still united, the principle has been adopted, and an officer of the Indian Civil Service has recently been appointed as a Deputy Director, to relieve the Director of Land Record's work, and the latter is now practically a whole-time Director of Agriculture. A scheme has been sanctioned under which a central institution for scientific research and for education has been established at Cawnpore by converting the Agricultural school of that place into a college, and local organizations for Agricultural investigations and for assistance to the public have been started at various places and more are to be started at others.

The college, which was started last year, has a three years' course to give instructions in the theory and practice of agriculture as well as in several branches of science, such as physics, chemistry, botany, entomology, zoology and agricultural engineering, in so far as they are required for the purposes of agriculture, besides other useful subjects. The object of the education given in the college is mainly threefold, viz., (1)

to train candidates for the revenue service of the Government among whom a knowledge of the agricultural conditions is very desirable, (2) to train candidates for the staff of the Agricultural Department without which its proper development is impossible, and (3) to train young men, chiefly of the landholding classes, to be qualified to act as land agents to the Court of Wards and the Zemindars, or to carry on the profession of farming.

European specialists are being appointed, under whose direction and supervision Indian professors will carry on the teaching, while the former will devote the greater part of their time to the work of scientific enquiry and research into the agricultural problems specially concerning these provinces. To enable this to be properly done, well-equipped laboratories are being attached to the agricultural college.

Turning to the local organizations we find many forms in which the activities of the Department are displayed. The most important of these is the multiplication of Agricultural Stations with experimental farms, one or more of which it is proposed to establish in each distinct region of these provinces for purposes which may be classified under four heads: (1) to make a detailed study of the agricultural conditions and difficulties of each region, (2) to spread the knowledge of successful investigations by demonstrating the value of ascertained improvements, (3) to supply, by sale or loan, the best available seeds and the most improved agricultural implements to the public, and (4) to give advice and information to all applicants, whether tenants or landholders.

It is at present proposed to have ten such agricultural stations in these provinces. The Farm at Cawnpur had already existed since a quarter of a century. Commencement was made with another, the Orai Farm (in Jalaun) in June 1905, and within a year after that the Partabgarh and Aligarh Farms were started. Last year sites were also acquired for a Farm at Banda and another at Benares. The Government contemplates to place these agricultural stations under trained expert supervision of four Superintendents of Farms who should all be Indians in future, though at present this is not considered possible, owing to the lack of so many properly qualified men in these provinces.

The important work of the supply of seeds and agricultural implements from the agricultural stations is increasing and may soon become difficult to cope with. Already arrangements have been made to establish other centres and private agencies to distribute them in view of the growing wants of the public. Particular interest is taken with regard to seeds and last year credit sales of the Department @ 25 per cent. interest rose from 2,000 to 10,000 maunds. The Government is also encouraging the formation of co-operative seed societies, of which 10 are now in existence, 7 of which buy their seeds from the Agricultural Department.

As to the work of giving advice and information to the public, reference may be made to the fact that correspondence is freely exchanged between the different agricultural stations and private gentlemen, and encouragement is given to private persons to carry on their farming on the improved lines which experience has approved, and at present six farms are working in consultation with the department, *viz.*,

- (1) Meerut Farm of Sheikh Wahiduddin.
- (2) Jatau (Agra) Farm of Kunwar Dhianpal Singh.
- (3) Kharauli (Meerut) Farm of Babu Jagannath Prasad, a diploma-holder of Cawnpore Agricultural School.
- (4) Ghazibad (Meerut) Farm of Babu Ram Chandra Gupta, another diploma-holder of the same school, the leading feature of which is the free teaching in agriculture given to sons of agriculturists.
- (5) Tajpur (Bijnor) Farm of Kunwar Sheonath Singh.
- (6) Samrauta (Rai Bareilly) Farm of Raja Chandrachur Singh.

In this connection I might mention that as a means of giving information to the public, the system of issuing Bulletins, of publishing the vernacular Agricultural Journal, *Mufeed-ul-mazasen*, of which 1,000 copies were sold last year, of holding agricultural shows, and demonstrations, particularly Sugar Demonstrations, has been kept up with earnestness and even improved.

Another form of local organisation now being developed is the scheme to attach to each Tahsil, where there is a demand, a specially trained well-sinking staff available to the public at fixed rates to render assistance in locating sites for new spring wells by making trial borings, and in rendering existing spring wells more efficient by boring to a lower spring in a cheap and effective way. A well survey of the whole Province, village by village, has been accomplished to ascertain what villages require more wells, where *Kacha* wells serve the purpose, where masonry wells are needed and what are the reasons for want of masonry wells in those places, whether the opposition, apathy or poverty of the landholder or the great depth of the spring levels or other engineering difficulty. This well survey will greatly assist the Government in the encouragement and assistance which is now proposed to be given to the increase of well-irrigation in the Province as a measure of protection against drought.

Up to this time 26 districts, which urgently required it, have been supplied each with a district staff of well-sinkers. As more men are trained and as the demand grows, the full scheme will be gradually worked out.

Still another form of local organization which is being developed under the Civil Veterinary Department is a system of veterinary establishments to deal with outbreaks of cattle disease and depôts for rearing and supplying bulls in tracts where facilities for breeding exist.

For all these improvements we must acknowledge our gratitude to Government. And first of all, our thanks are due to the Local Government and the Provincial Department of Agriculture which have laboured from the beginning in initiating and keeping up and improving the various forms of their activities for the promotion of Agriculture, in spite of the small funds placed at their disposal for the purpose. In the next place, we must thank the Government of Lord Curzon whose interest in Agriculture and whose energy and comparative generosity, which I would take leave here briefly to detail, have rendered the re-organisation of the Agricultural Department on a large scale possible, and we cannot but associate with him in this matter the late Sir Denzil Ibbetson, his Secretary in the Revenue Department.

As I have already stated, before the time of Lord Curzon very little interest was taken by the Government of India in the development of Agriculture and very little money was allotted for that purpose. In 1901, for the first time an expert head under the title of Inspector-General of Agriculture was appointed to the Imperial Agricultural Department, and since then both the Imperial and Provincial Departments have been gradually strengthened by the appointment of experts in different branches. In 1903, the scheme of the Pusa Institute of Agriculture was sketched by the late Sir Denzil Ibbetson and it has since been inaugurated and an Advisory Board of Agriculture has been constituted upon which both Imperial and Provincial officers are represented. The advance made in the development of the Agricultural Department since 1903 was most remarkable: in the Imperial Department the expenditure actually doubled itself in three years from about 10 lakhs per annum in 1903 to about 20 lakhs per annum in 1906.

But so far as our Provincial improvements are concerned the most remarkable step taken was in March 1905, when in the Budget Statement of the Government of India the substantial sum of 20 lakhs per annum was allotted for a scheme of Agricultural research, experiment, and instruction to be undertaken by Local Governments.

Now mark the rapidity with which this scheme was pushed through. In the very next month (April 1905) the late Sir Denzil Ibbetson on behalf of the Government of India called for an early report of the manner in which Provincial Governments desired to develop their Agricultural Departments. Sir James La Touche submitted in May a scheme of development prepared by our Director, Mr. Moreland, and this scheme, with certain reservations, was sanctioned in July by the Government of India which in August made a grant of 3 lakhs to meet the expenditure of the then current financial year in connection with it. In September 1905 the Resolution of the Local Government announcing the scheme to the public was published and since then its development has proceeded apace on the lines which I have explained above. There is, however, still a great lack of qualified Indians both for the superior and the subordinate staff of the Department

which is hampering its more speedy realisation, but it is hoped that the Cawnpore Agricultural College and the existing and proposed Agricultural stations will be able to educate and train such men before long.

I think I have said enough to explain the first part of my motion. The second part suggests an addition to the scheme sanctioned by Government, which I have no doubt will commend itself to you as well as to the Government without the need of much reasoning and persuasion. The full benefit of Agricultural Stations cannot be realised, unless the experiments carried on there and their results as well as the lessons to be learned from the attached demonstration farms are orally explained in a fixed regular manner to those who attend to learn them and at the same time some primary agricultural education is given there in the vernacular in order to enable them better to profit by those lessons. It seems that our Director of Agriculture is himself alive to the advantages of such an addition, for in his last report he notices with approval the attempts made by private farms in this direction.

I must now address myself to the third part of the motion, and here I am rather sorry that the wording of the Resolution is limited. I should like to explain briefly what the people themselves should do to improve the condition of our Agriculturists, while as it stands, it merely affirms one of these things to be undertaken by a particular class.

The distribution of good seeds and improved implements as well as the demonstration of the value of ascertained agricultural improvements are duties in which the public should come to the assistance of the Government. What is at present required is co-operative seed societies or seed depôts for seeds, and private agencies and, if possible, private factories for implements, distributed largely throughout the Provinces, where the cultivators could purchase or borrow them and also a separate organization to induce the ignorant cultivators to try the new seeds and implements. The enlightened and well-to-do zamindars could assist very largely in this way as well as by opening or continuing their private farms on improved methods that Government experience has proved successful, thereby setting an example to their tenants. Educated and enlightened gentlemen, who are not zamindars, could assist by exercising such influence as they possess over the zamindars, to prompt them to action, and by encouraging and, if possible, joining the organizations to which I have referred.

For the prosperity of the Agricultural Classes enormous possibilities exist in these matters. As an illustration, I may refer to Muzaffarnagar wheat. It has been demonstrated that if good seeds of this variety are sown in Oudh in place of the ordinary seeds used here, and at the harvest time the price of wheat is 16 seers for a rupee, the increase in the quantity and the quality of the crop, under ordinary circumstances, would be such as to produce an extra profit of Rs. 8 per acre to the cultivator. Now in Oudh 20 lakhs of acres of wheat are ordinarily sown and

thus, simple arithmetic would tell us, that if all Oudh cultivators were induced to sow only Muzaffarnagar seeds in their wheat fields, they would be richer by one crore and sixty lakhs each year. Is this figure not astounding? And yet what notice has been taken of the publication of the results of the experiment on Muzaffarnagar wheat by the general public? It is a great pity, really a shame, that while a foreign Government is doing so much, the public should be doing so little, in a matter of such paramount importance as Agriculture. I cannot refrain from stating, though I assure you that I do so without meaning any offence to any person or to any party or class, that the attention of the public seems to me to be distracted by other more exciting, but less profitable, topics and our leaders and their subordinate workers have not sufficient time and energy left to spare for the unfortunate agriculturist.

ZAHUR AHMAD.

### Our Artisan Classes and the Industrial Movement.

Efforts are being made in almost all Provinces to revive the dying industries of India and to introduce new industries, by adopting and using modern scientific methods and machinery. But not much is being done to interest our agricultural and artisan classes, the sugar-manufacturers, the blacksmiths, the weavers, the dyers, the chamars (shoemakers and tanners), &c., in the movement. Whatever may take place in the distant future, in the immediate future we cannot expect large numbers of Brahmins, Kayasthas and other classes to take to industrial careers. And even if they did, the loss to the industrial castes of their ancestral occupations for ever, will be a national disaster. The poverty of India is not a little due to the throwing of almost all artisans on the land. This should be remedied, but it cannot be done by sending a few high caste youths to foreign countries for technical education. Moreover, by neglecting to give the artisan castes higher technical education, we are allowing the hereditary skill, aptitude, and inclinations of these men to run to waste, which is a great national loss. It is true that the few Government and private technical institutions in the country are open to the artisan castes as much as to others. But they are too poor, too ignorant, too apathetic to take advantage of these institutions. It is, therefore, our bounden duty to provide special facilities for these classes for technical education. We think special schools should be opened for them in chosen centres for teaching them the three R's, drawing, clay-modelling, commercial geography and commercial history. The courses should be simple and short. These courses should be common to pupils of all artisan classes, and additional special training should be given in different industries according to the hereditary professions, or aptitudes of the pupils. To specially gifted boys

should be imparted a working knowledge of present-day English, and every attempt made to send them abroad for technical education. If the higher castes show the way in not excommunicating their young men trained abroad, the artisan classes, too, will follow suit. Their travelled young men will be pioneers among them of new industrial methods.

The founding of schools of the kind suggested above may and will take time. In the meantime we should try to find out educated young men of the industrial classes (and there are some such) possessed

of the requisite qualifications and send them abroad for education. One such young man on his return would do more to make the industrial movement a success than several similarly trained young men of non-industrial classes. In short, our conviction is that unless we can secure the co-operation of the industrial castes and enlist their best minds in the service of the cause, the industrial movement will not be a national movement and will fail to achieve its object.

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