

REPORT
OF
THE FIRST
Indian Industrial Conference
HELD AT BENARÉS
ON
Saturday, the 30th December,
1905.

The Government of India are in full sympathy with the objects of the Indian Industrial Conference.—LETTER TO THE GENERAL SECRETARY, 16th March, 1906

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APPENDIX I.

IMPROVEMENTS IN NATIVE METHODS OF SUGAR MANUFACTURE.*

By S. M. HADI, Esq., M.R.A.C., M.R.A.S.,

Assistant Director of Land Records and Agriculture, United Provinces.

I.—SUMMARY OF THE PROGRESS OF THE INVESTIGATION.

When these investigations were decided on, the Director of Land Records and Agriculture suggested certain possible improvements, among them the use of a square evaporating pan and the introduction of the centrifugal machine.

There was an old square pan in the stock of the department known as the American evaporator, which had never proved a success in our trials, nor had it been adopted by any native manufacturer. This evaporator was chosen as the groundwork for experiment, and improvements were made from time to time and demonstrated in the more important sugar manufacturing centres of Rohilkhand, free criticism being invited and indulged in. As a result of these discussions, experiments and demonstrations, a suitable system of pans substantially different from the original arrangement was elaborated, and when exhibited at work at Bareilly and Rampur in the past season received general approbation from native experts there.

With regard to the use of the centrifugal machine, it may be observed that we have in our stock several such machines of different sizes which had already been tested by my predecessors and myself. These machines were tried again systematically and exhaustively with different samples of *rab*. It was found that there were two great defects in these machines, *viz*:—

(1) That their speed was not sufficiently high and consequently the molasses could not be completely separated, especially when the *rab* was sticky, which is by no means an exceptional feature of the *bel rab*; and (2) that the perforations in the wire-gauze were a little too large to prevent the finer crystals from passing out with the molasses and the machines were consequently not suitable for Indian *rab*, the loss of the crystals in machining the *rab* being excessive. Further, the sugar (*potli*) obtained was usually moist and yellow in colour. It was therefore an article for which there is practically no market in India except for the purposes of refining. The cost of centrifuging was so high that I found it would be no achievement to introduce in the native industry hand-power centrifugal machines

* Appendix to Mr. Hadi's paper on the subject See text.

of this type merely for producing *potli*, a stuff which must be treated with *siwar* at a high cost before being fit for sale. For these reasons the machines in stock were given up.

I then explained my requirements fully to a well-known English firm of manufacturers of sugar machinery, *viz.*: Messrs. Broadbent and Sons of Huddersfield, and they constructed to my order a centrifugal hydro-extractor which was free from these defects, and which answered my purposes admirably. When this machine was first used, a high percentage of outturn of sugar was obtained and the molasses were completely separated, but the colour of the crystals remained yellow, and therefore the produce was still unsatisfactory. It was thus obvious that to make the centrifugal a success some cheap method of decolorising the produce was essential. Bone-black was of course out of the question, and a large number of substitutes were tried without success. This difficulty continued to give trouble for months, but in course of the experiments I learned that by boiling fresh cane juice as rapidly as possible in copper vessels instead of in iron pans, and with certain vegetable defecants to be used in a particular manner, I could produce a yellow *rab* which, when passed through the centrifugal, yielded a very high percentage of sugar, very much lighter in colour than that obtained with the centrifugal from ordinary *rab*, or from the *rab* that I had been making in my iron evaporator. The use of milk of lime which has often been recommended was found absolutely fatal to the quality of the sugar, and was entirely abandoned after exhaustive trials.

Success was, however, not yet complete. The sugar thus obtained was distinctly inferior to the country *khand* in colour, though superior to it in other respects, and it could not therefore be passed as *khand*. To remove this light shade of yellow was a very vexing question. The colour was slightly reduced by steaming the sugar in the centrifugal while it was in motion, but this process reduced the quantity of outturn to a certain extent, and was rather difficult for the native refiners to follow, besides being too expensive for a small factory. I therefore gave it up, and instead of steaming the sugar, I washed it with different agents and found at last that a decoction or distillate of the rind of *ritha* fruit (*Sapindus Mukorossi* or soap nut) was most useful for washing the crystals, when a suitable alkali had been added to the *rab* before putting it into the centrifugal. The alkali which answered this purpose best was bicarbonate of soda, the normal carbonate having failed to produce the desired effect.

By adopting this treatment the sugar obtained was as white as ordinary *khand*. The tedious process of treating the sugar with *siwar* was in this way dispensed with.

A system of refining deep coloured sugars obtained from ordinary *rab* and *gur* so as to produce *chini* and *qand*, the forms of refined sugar most favoured by native consumers, was then devised and experimented on. It promises success, but the experiments are not yet complete, and will probably form the subject of a separate discussion in future. The object of this pamphlet is to publish for general information a brief account of the methods elaborated and the results obtained in our experiments so far as the manufacture of *khand* is concerned.

It must be remembered that this publication is intended chiefly for the benefit of the native refiner who is ignorant of the principles of sugar manufacture followed in other parts of the world, and does not presume to instruct or enlighten scientific manufacturers. Finally it must be observed that sugar-making by this or any other process is an art which cannot be learnt thoroughly from books. While this pamphlet will serve as a general guide to the manager of a factory, it will not teach him how to produce the best sugar: the details of the different processes require a trained eye. It would therefore pay any one who wishes to adopt these methods to learn them practically from me or from the trained officials of the Agricultural Department. No tuition fees are charged.

II.—THE CANE CROP.

The crop should be mature at the time of cutting. If it is unripe the sugar will be poor in quality and the outturn low.

The best results can only be obtained from healthy canes. Plants attacked by borers at the top are not unfit for use in the factory, but crops attacked with *kari* or *lewali* are practically useless, and should not be dealt with.

The plants should be cut as close to the ground as possible. The tops should be cut off and set apart for planting, as is the custom in Rohilkhand and the western districts. This custom might well be adopted in Oudh and the eastern districts, where it is usual at present to cut up the whole cane for planting. The juice in the tops is usually more acid and less rich in sugar than in the rest of the cane, and its presence in the boiling pan favours inversion. For this reason specially it is advisable not to use tops for crushing. The tops are as good for seed as any other part of the cane. In Rohilkhand tops are not removed from *red* canes; there seems to be no sufficient reason for the exception, for in Meerut tops are cut off in the case of red canes as well as in case of other canes. When red canes have flowered the tops lose much of their sugar and must be cut off in any case. Whether they will be fit for planting is a question for future determination, but they must not be crushed for juice.

The canes should be crushed as quickly as possible after they have been cut, and should not be allowed to lie over under any circumstances for more than 24 hours, or else the yield of crystallised sugar will be low. Canes should be tied up in bundles of about one maund each before going to the crushing mill. The roots at the bottom should be washed with water by the *bhishti* before the bundle goes to the mill, so as to remove the particles of earth which usually stick to the lower portion of the cane, and which give an unsightly colour to the juice. A mat should be spread near each mill and the bundle of canes should be placed on the mat in order to avoid picking up fresh dirt. This measure will save much trouble in the subsequent process of straining and forms the first step towards obtaining a high class of raw sugar. As crushing usually begins about 3 or 4 o'clock in the morning it is desirable to cut the crop in the previous afternoon, strip the plants at once and store the cane at night.

III.—EXTRACTION OF THE JUICE.

The mills in general use in Rohilkhand are the common two-roller iron mills which extract only about 45 to 55 per cent. of juice from the cane, whereas the more efficient three- and four-roller mills have been found in actual trials to express from 55 to 65 per cent. of juice from the same cane. The loss of so much juice may not affect the *khandsari* if he is able to buy enough to keep his factory going throughout the season, but it is a serious matter for the cultivator as it reduces the price he receives for his crop by something like one-sixth. It is not the cultivator's fault, for he hires the best mill he can get; but the mills are supplied mostly by small capitalists who are not over-scrupulous as to the condition of the mills they issue, and the cultivator is at their mercy. The use of three- and four-roller mills has been objected to on the ground that the mills besides being more expensive, will be too heavy for the ordinary cattle of Rohilkhand, but in course of numerous trials that I made I found no evidence of their incapacity to work the better mills. It will undoubtedly be to the mutual advantage of the landlord and his tenants if the former keeps a stock of superior mills and lets them out at a fair rent proportionate to the amount of juice they extract.

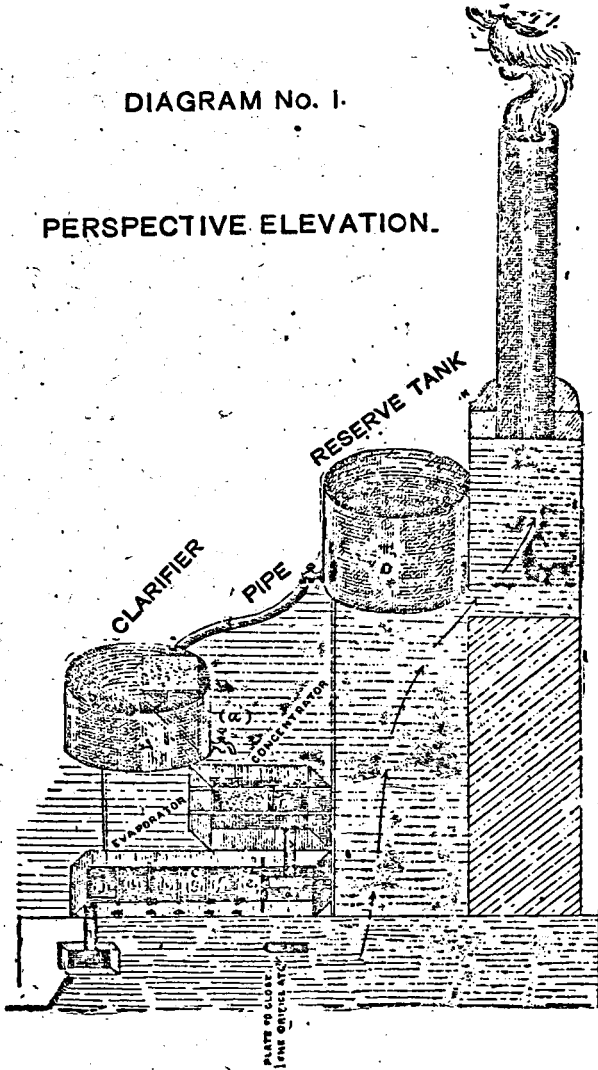
The ordinary practice of using large earthen vessels permanently sunk in the ground for receiving the expressed juice is highly objectionable. As a rule, the juice is not taken out from these receivers until several maunds of it have accumulated in the vessel, and the latter can never be kept quite clean. The kerosine oil tins now available everywhere in India answer remarkably well as receivers. These tins hold about 20 or 21 seers of juice. The time occupied in extracting this quantity is so short that there can be practically no undesirable chemical changes in the juice within that time. Immediately the tin is full it should be emptied into the clarifier or reserve tank of the boiling plant where the juice gets quickly heated and the chances of inversion are minimised. A handle should be attached permanently to the top of each tin by means of iron nails. A tin should be placed below the spout of each mill in a hole sufficiently wide to admit of free handling of the tin for putting it in when empty and taking it out when full.

A square or oblong strainer consisting of a wooden framework with a bottom made of perforated sheet iron should be placed on each tin. This will catch the smallest bits of cane that flow out from the mill with the juice, and the juice which accumulates in the tin will be pure in consequence. There are strong grounds for believing that the presence of small pieces of cane in the juice for even a short period results in considerable loss of sugar. The tins should be washed frequently during the working day and so should be the mills and the strainers. A little sulphur might be burnt, and the tin, after it has been washed, held over the smoke by the hand with its mouth downwards. The use of sulphur fumes in this manner is useful for scientific reasons, but it is not essential.

It is desirable for the sake of convenience to have two tins for each mill so that a perfectly clean one may be readily available for use when the other has been carried to the boiling yard.

DIAGRAM No. 1.

PERSPECTIVE ELEVATION.



The refuse should be removed from the mill at regular intervals and dried in the sun, any refuse sticking to the rollers being separated with an iron nail.

Crushing should be started about 3 or 4 o'clock in the morning so that boiling may commence about sunrise.

It is a good thing to stop the boiling [soon after sunset and give the staff ample time to take their meals and enjoy a refreshing sleep before taking up work the next day.

IV.—THE BOILING PLANT.

The boiling plant which has been devised specially for the purpose of producing high class *rab* consists of four pans, viz. (1) the clarifier, (2) the concentrator, (3) the evaporator, and (4) the reserve tank. The arrangement of the pans is shown in diagram No. I. The following dimensions of the various pans are suitable for a factory working up about 8,000 maunds of juice in a season.

The Clarifier.—This is a round vessel 3' 10" in diameter and about 1' 4" deep. It is capable of holding a charge of from 10 to 12 maunds of juice at a time.

A tap (a) is fixed in this pan, by opening which the clarified juice is let into the concentrator.

B. The Concentrator.—This is an oblong pan 5' long, 3' 3" broad and 10" deep. In this the clarified juice is allowed to boil before being run into the evaporator through the tap (b).

C. The Evaporator.—This is also an oblong vessel 8' 9" long, 3' 3" broad and 7" deep. It is divided into seven compartments (d), (e), (f), (g), (h), (i), and (j), by means of partition walls. The first compartment (d) is 3' 3" (i.e. the width of the evaporator) long, 2' 8" broad and 7" (the depth of the evaporator) deep. Into this compartment the juice flows from the concentrator when the tap of the latter is opened. The remaining six compartments are each 3' 3" long by 1' wide by 5" deep, the partition wall between the first compartment (d) and the second compartment (e) being 7" high. At the point *d'* in the wall of the first compartment there is an opening which can be closed by means of a plate moving freely in a slit made in the wall. The flow of juice from (d) to (e) is regulated by this plate. Should there be any leakage it is stopped by putting a piece of rag at the bottom of the opening and pressing it down with the plate. The other compartments are connected together by openings in the partition walls, closed with wooden shutters operated by handles outside the pan. The flow of juice is regulated by these shutters so that the desired quantity can be admitted to, or retained in, each compartment. As will be seen from the diagram the shutters are placed alternately at the ends of the partitions. In the last compartment (j) a pipe *j'* is soldered permanently to a hole in the wall of the compartment.

It is through this pipe that the juice when it has been completely boiled, or, in other words, when it has acquired the consistency of *rab*, is let out into the receptacle placed below, the mouth of the pipe being opened, when required, by removing a wooden plug fitted into it.

D. The Reserve Tank.—This is a round pan having a diameter of 3' 9" and a depth of 1' 10". It is used for storing juice which comes in from the mills when the clarifier is already fully charged with juice which is undergoing the process of defecation and clarification. It stands higher than the clarifier, and as soon as the latter is empty, juice is admitted from the reserve tank through a pipe *k* which connects the two pans, the diameter of the pipe being about 1".

The reserve tank and the pipe attached to it may be made of iron or galvanized iron (preferably the latter) instead of copper. The rest of the pans *must* be made of copper sheet. On each of these pans is placed a filter or strainer as shown in the diagram.

V.—THE FURNACE.

The most appropriate furnace for the system of pans just described is an underground excavation. It consists of two chambers marked *a a'* (diagram II) separated for the greater part of their length by a partition wall marked *P. W.*, which is a portion of the natural ground left in position while digging the furnace. Each of the two chambers is 3' 9" long by 2' wide at the bottom and about 2½' wide at the top. Chamber *a* is under the evaporator, while chamber *a'* is under the clarifier and concentrator.

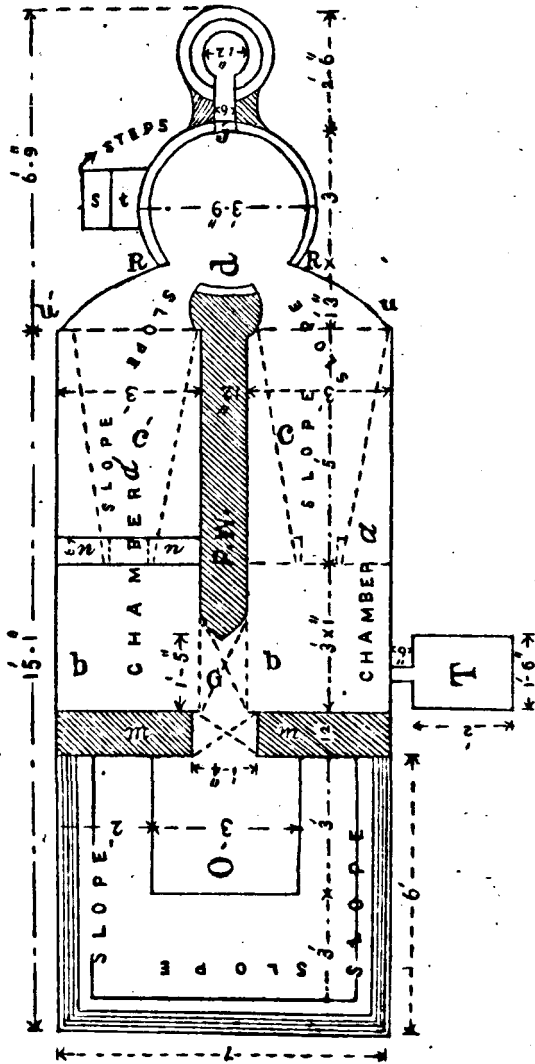
The front portions of these chambers (marked *b, b'*) have a uniform depth of 3'. In the back portions (marked *c, c'*) the floor is at first 1½' below ground level, and slopes gradually upwards to the points *u, u'*, which are about six inches below ground-level. The varying depths in different parts of the furnace can be seen in diagram III.

The front of the furnace is formed by a wall *m*, having two openings *e* and *p* visible in diagram III. The upper opening *p*, 7" in diameter, is for feeding the furnace; the lower opening *e* is an arch 15" high and is used for removing ashes. In front of these openings is an excavation *O* where the fireman works. The fire is lit at *G*, where the two chambers are joined by an arch, and the heat is carried to the back of both chambers of the furnace by the strong draught which this arrangement produces.

The four walls of part *b'* of the left chamber, over which is placed the clarifier, are 1' 10" high above the ground surface, while those of part *c*, of the same chamber on which the concentrator is placed are 10" high above the ground, so that the clarifier is about one foot higher than the concentrator. The wall *n n*, shown in diagram II, stands on two iron bars *h, h*, (shown in diagram III) placed across the chamber *a'*, 10 inches above ground level, and is 1' high and 6" thick (see line *f, f'*, diagram III). The chambers *a a'* begin to curve inwards from points *u u'* (diagram II), and the two curves open into the circular oven *d* (diagram II), over which the reserve tank is fixed. The currents of heat produced at *G* when they have passed through chambers *a* and *a'* meet together in the oven *d* and heat the reserve tank.

The circular oven *d* is 3' 9" in diameter and 3' high from the ground level which forms its bottom, no excavation being necessary

DIAGRAM NO. II.



GROUND PLAN

Scale 4 Feet-1 Inch

here. The wall of this oven is 9" thick all round. Outside this oven there are two steps *s*, *t* (diagram II), to enable the labourers to reach the reserve tank. The semi-circular space *u' R' R-u* (diagram II) between the chambers *a* and *a'* and the oven *d* is roofed with iron bars placed on the ground (section shown in diagram III), and covered over with earth.

"Smoke passes out into the chimney through the outlet *J* (diagrams II and III) made in the wall of the oven *d* 1' 8" above the ground.

The height of the chimney should be 10' and its diameter 1'. The base of the platform over which the chimney is fixed is 2 feet 6 inches wide (see diagram III). Below the spout of the evaporator at the outside corner of the right hand chamber *a* there is a pit, *T* (diagram II), to hold the receivers for collecting the *rab* coming out of the spout.

There is a slit in the front wall, *m*, into which a sliding iron plate may be inserted in order to close completely or partially the arch *G* when it is necessary to reduce or stop the supply of heat to the chamber *a* over which the evaporator is placed.

The furnace is the outcome of long investigation. The different pans require different amounts of heat at the same time for their successful working, the clarifier and the last two compartments of the evaporator usually requiring the largest amount. With the arrangements of chambers explained above each pan receives a constant supply of the requisite amount of heat, although the furnace is fed only at one place, usually with the dry mill refuse ("begass" *pata* or *khoi*), the use of firewood being almost entirely dispensed with. The fireman supplies only about a quarter of a pound of the dry refuse at a time, but he has no time to rest. His work must continue without any break, except perhaps when the clarifier is being supplied with a fresh supply of juice. The continuous feeding with small quantities of refuse is found by experience to give sufficient heat to deal with as much juice as the plant can hold.

The shape and dimensions of the various chambers and their different parts noted above have been carefully worked out, and in digging his furnace the manufacturer must see that the figures are closely adhered to, otherwise the distribution of heat in the furnace might be irregular and the boiling process unsuccessful.

VI.—BOILING THE JUICE.

The aim of every manufacturer should be to produce that quality of *rab* from which a high percentage of perfectly white sugar (*khând*) can be made with a centrifugal machine without decolorizing the crystals with *stivar*. This is a very difficult matter and the object cannot be achieved with the plant described above, unless the following instructions are literally carried out. The clarifier and the rest of the boiling plant, except the reserve tank (which may be made of iron), must be made of copper. Iron always imparts a greyish tinge to the crystals, which cannot be completely removed by washing or steaming the sugar while in the centrifugal. When the copper plant is new the *rab* boiled therein yields more or less pink sugar, but if the boiling vessels are rubbed regularly with stones and washed, and

the inner surface of the vessels is wiped with a piece of rag dipped in water slightly acidified with sulphuric acid, the *rab* made after the plant has been in use for three or four days ceases to yield pink sugar, the colour of the crystals then obtained being white.

The juice must be boiled as fresh as possible. As soon as the tin at each mill is full it should be brought to the factory and emptied into the clarifier, care being taken to strain the juice through the blanket strainer placed over the clarifier. As soon as the charge is complete, *i. e.*, when about 20 tinfuls of juice have gone into the clarifier, the fire underneath should be lit and the juice heated.

While the mills are starting work the defecants to be used should be prepared at the factory so that they may be ready as soon as the first charge of juice is received. About one pound of *pink saji* should be boiled in a tinful of water, and then cooled and strained. This solution should be kept on the right hand side of the sugar boiler; about one pound of *deula* stalks (wild hibiscus) should be washed, pounded, and immersed in a tinful of *clean* water. The stuff should next be well rubbed between the hands till the liquid inside the vessel acquires a thick mucilaginous consistency. This may be strained into another tin and a fresh supply of water poured into the first tin, in which the material should be rubbed again to yield more mucilage. This process should be continued till all the mucilage that the *deula* is capable of yielding has been squeezed out. *Deula* is the best defecant known in this country and answers particularly well in our process. If wild hibiscus be not available, cultivated hibiscus (*bhindi*, *hibiscus esculentus*) will do equally well.

Falsa, which is commonly used in Rohilkhand, *must not* be used. It imparts a peculiar colour to the crystals which cannot be got rid of.

When the clarifier is charged with juice for the first time the other vessels of the boiling plant should be filled partially with water, or else they will be damaged by the fire.

When the fire has been lit scum will soon begin to accumulate on the surface of the juice in the clarifier. The rising scum must *under no circumstances* be disturbed with the skimmer (a slightly hollow circular disc of copper sheet to which a handle is fixed) until the scum has begun to "crack." At this stage about half a tinful of the *deula* water should be introduced into the clarifier and the scum should then be removed as quickly as possible and thrown on the filter kept on the right hand side of the boiler.—A tinful or half a tinful (or less—just enough to stop the ebullition) of *clean* water should then be added to the liquor and a second dose of *deula* water should then be poured in and the scum taken off as it comes to the surface. The third dose of *deula* water (which is usually the last) should then be added to the liquor and skimming continued. About half a pint of *saji* water must be added with the third instalment of *deula*. This is usually the practice in Shahjahanpur, but Bareilly experts use *saji* water *without* the admixture of *deula*, and in our own experience it has been found to be preferable to avoid the addition of *deula* to *saji* water. If absolute transparency in the liquor is not obtained after adding *saji* water and skimming, an allowance of cold water must be added and the liquor boiled again with gradual additions of *saji*

water, (any scum rising to the surface being carefully taken off) till the liquor is quite bright.

There is no limit for the amount either of *deula* or *sajji* water. These agents must be used till the liquor is perfectly transparent and brilliant. If on examination it is found that the liquor is hazy, more *sajji* water should be added in conjunction with *deula*. Any foam that comes up at this stage on the surface of the juice should be perfectly white. If this is so, one may expect that if the boiling is properly carried out the resulting sugar will be of a superior white colour.

It will sometimes be found that in spite of the treatment of the juice above described the liquor is full of minute particles floating about in it. This is an indication of the fact that the juice has not been fully clarified, owing to careless manipulation. If the liquor be boiled down in this condition the floating particles will appear in the concentrator as they will pass out through the blanket filter provided over that pan. The precipitate if boiled down with the liquor will affect the quality of the resulting sugar, specially with regard to the colour. It is therefore important to avoid the formation of these particles, and, if they are found, to get rid of them. A simple way of securing this end is to add three or four tinfuls of fresh raw juice to the liquor and start clarification with *deula* and *sajji* water afresh, as if the whole contents of the clarifier were a new charge. If the instructions already given are then faithfully carried out, a brilliant liquor will soon be obtained.

If pink *sajji* be not available dark *sajji* may be used instead; it is cheaper and less active. Bicarbonate of soda may be substituted for *sajji* when the latter cannot be obtained; but great care is necessary in using bicarbonate as the scum rises with considerable violence as soon as a lump of soda is thrown into the boiling liquor, and if the skimming is not done quickly the liquor may overflow. About three to four drams (one tola to 16 mashes) of soda is enough to clarify about 10 to 12 maunds of juice: if more is used there is the risk of the colour of the sugar being affected. If the juice is poor in quality or has been obtained from stale cane it is desirable to use about three pints of lime water (*not milk or cream of lime*) along with *sajji* water after the liquor has been rendered transparent. The allowance of lime water should be added gradually and not all at once, continuing so long as the liquor does not show any haziness or floating particles, but as soon as such particles begin to appear liming should be stopped or else the colour of the sugar will be injured.

In clarifying by methods described above, the juice when it has been fully clarified is distinctly acid. No effort must be made to neutralize the acidity completely by any of the alkalies mentioned above, otherwise the resulting sugar will not be white.

It should be borne in mind that nothing pays so well as rapidity of boiling, and no time should therefore be lost at any stage in the process of clarification. As soon as the juice in the clarifier has acquired the desired degree of brilliancy the tap should be opened and the liquor allowed to flow into the concentrator. In doing so the juice runs through a double blanket filter placed over the concentra-

tor. Before running the juice into this pan the boiling water in the pan must, of course, be drained out and the clarifier should be promptly refilled with a fresh charge of juice drawn from the supply accumulated in the reserve tank. The liquor in the concentrator should be skimmed as long as skimming is found to be necessary. There is hardly any scum, but white foam appears on the surface of the liquor, and it is desirable to remove this on to the filter provided for elimination of liquor from the skimming. (The liquor so eliminated should be put back into the clarifier at intervals.) While the second charge is being dealt with in the clarifier the liquor in the concentrator is allowed to flow into the first or largest compartment of the evaporator. The sluice gate provided in this compartment should remain closed while the juice is coming in. The boiling water already in the various compartments of the evaporator should be expelled and then the juice should be run into the second compartment, and on to the third compartment, and so on till it reaches the last compartment. An even distribution of liquor among various compartments is essentially necessary, and it is also important always to keep a sufficient supply of liquor in each compartment and no more, or else it might overflow.

Care should be taken to prevent the liquor getting overheated in any of the compartments. This is sure to occur if there is a deficiency in the supply of the liquor to any compartment; and it is chiefly in order to regulate the supply of liquor in each compartment that shutters have been provided in each partition wall in the evaporator. When the liquor has been overheated, part of the sugar is converted into caramel, a substance which injures the colour of the *rab* so seriously that the *khand* obtained with it in the ordinary course is always of a poor quality. A little skimming will be found to be occasionally necessary when the liquor is travelling through the various compartments and it will pay the manufacturer to have it done in order to obtain the best quality of *rab*. The *pharui*, which consists of a semi-circular wooden disc to which a handle is attached, is a very useful implement for transferring the liquid from one compartment to the other, but it must be used with great caution in the last compartment, in which the liquid acquires the consistency of *rab*, and when the liquid has nearly acquired that consistency the *pharui* should not be used in the last compartment; if it is used for stirring or agitating the boiling mass the crystals will be injured.

The most critical stage of the boiling process occurs when the liquor is thickening into *rab* in the last compartment. If bubbles appear in large numbers and ebullition is violent, a few drops of castor oil mixed with *sajji* water or a little *ghi* may be thrown into the boiling mass, and the liquid will subside at once. The heat has to be regulated with much care to prevent conversion of part of the sugar into caramel, and the fireman must obey the orders of the boiler.

There is no rule of thumb for determining the point when the boiling may be regarded as complete and no satisfactory test can be used by ordinary boilers. If the *rab* has not been boiled enough the percentage of crystals in it will be low, while if it is overboiled the colour of the sugar will be defective. The boiler's art lies in

producing *rab* which is open to neither of these objections. Boiling must not therefore be entrusted to ignorant or careless men.

The outlet in the last compartment should be opened *as soon as* the boiling liquor has sufficiently thickened, and the *rab* allowed to drain into the earthen receiver (*nand*) placed underneath, the shutter of the next previous compartment being opened at the same time to let in a fresh supply of boiling liquor to take the place of the *rab* that has gone into the *nand*.

Rapidity of boiling is an important factor of success in the manufacture of *rab* and the heat should therefore be so regulated as to obtain the largest amount of *rab* in the shortest space of time without injuring the quality. If the liquor is boiled with undue slackness, the colour is affected injuriously, and it must not be allowed to stay in any compartment longer than is absolutely necessary.

As soon as about 20 or 30 sers of *rab* have accumulated in the earthen receiver it should be removed from its place, and another *nand* placed instead to receive the *rab* that will come in next. The *rab* in the first receiver should *immediately* be subjected to the process of *osana*, or airing.

This is done by holding a *karanga* (ladle) in the right hand dipping it into the hot *rab*, giving it a turn in the mass, lifting the *karanga* filled with *rab* up the brim and pouring the *rab* back into the *nand* from a height of about two feet so that the *rab* may be aired during its passage from the *karanga* back into the *nand*. This operation should be repeated over and over again with due rapidity till the *rab* has been aired to the desirable extent and can be touched with the figures without scalding them. The determination of the point at which airing may be regarded as complete is also a matter of experience.

If the *rab* has not been fully aired, the crystallization will be imperfect and slow. If the airing has been overdone, the crystals will be small in size. The airing having been finished, the *rab* should be *potted* as quickly as possible. The vessel commonly used in Rohilkhand for this purpose is the *kalsi*, which is similar to the common *ghara* but larger in size, capable of holding about 25 to 30 sers of *rab*. The use of *kalsis* is open to several objections but at present we assume that a better vessel is not available in the country at a reasonable cost and *kalsis* must therefore be employed for potting the *rab*.

The aired *rab* should be transferred from the *nand* by means of a *karanga* into a *well-baked kalsi* specially chosen for the purpose and from the latter it should be poured into *kalsis*. As soon as each *kalsi* is full, it should be covered over with an earthen cup and the *rab* left to cool and crystallise. *Kalsis* should never be filled quite up to the top or else the *rab* will overflow on cooling.

If the juice was of good quality and the boiling was performed properly, a thin crust of crystals will soon appear on the surface of the *rab* within the *kalsi*. If a bloom appears in place of crust on the surface of the *kalsi*, it is also a good sign, showing that the consistency is not too thick. If a sticky pale scumlike substance (techni-

cally known as *gabhoi*) makes its appearance on the upper surface it is an indication of the fact that the juice contained an unusually high percentage of uncrystallizable sugar, and in this case the *rab* obtained is as a rule poor in quality.

The *kalsi* should not be removed to any considerable distance while hot, otherwise the natural process of crystallization will be interfered with.

If during the process of airing it is found that the *rab* has been accidentally boiled too thick, the *nand* should be placed at once below the spout provided in the last compartment of the evaporator and some *rab* of thin consistency should be run into the *nand*. Similarly if the *rab* in the *nand* is found to be too thin, some extra-thick *rab* should be made and let into the *nand* to correct the consistency.

The *rab* when potted should be allowed to rest for at least ten days before it is used for making *khand*. During this period of rest the crystallization is completed, the grains become firm, and the molasses naturally separate from the crystal in the jars. If a jar is then broken, the greater part of the molasses will be found to have accumulated either at the top or in the middle of the jar.

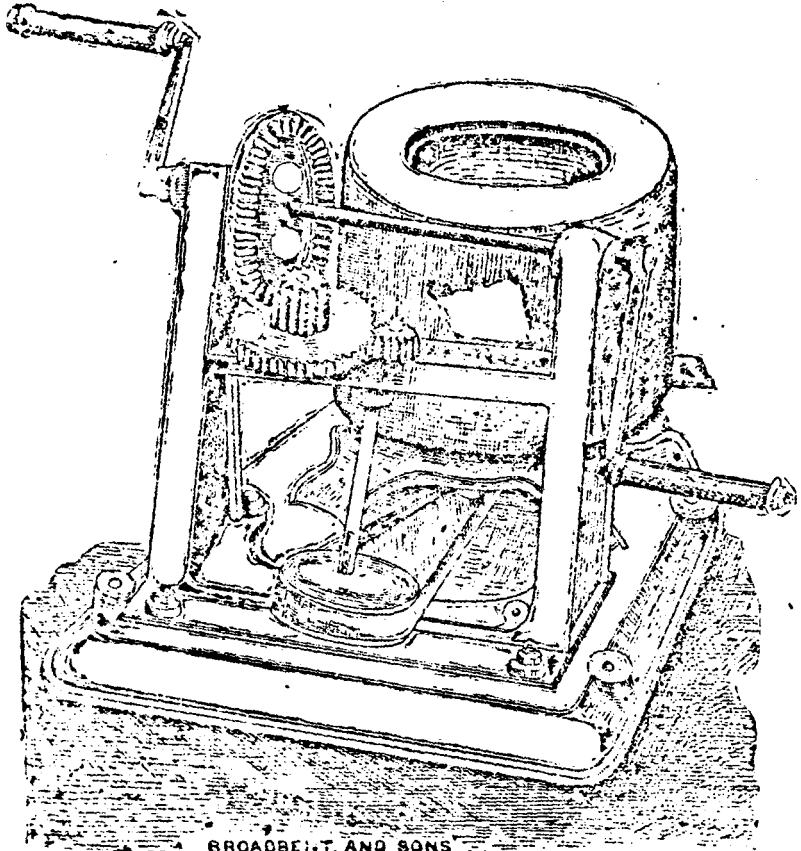
From the foregoing account it will be seen that the man in charge of the boiling plant must learn by experience—

- (a) how much of the clarifiers to use and when;
- (b) at what point to stop boiling;
- (c) how long to continue airing; and
- (d) how to regulate the firing.

VII.—SEPARATING THE SUGAR.

The separation of molasses from crystals can best be effected by means of a centrifugal hydro-extractor. Messrs. Thomas Broadbent and Sons of Huddersfield, England, have manufactured a hand-power machine to our order which serves this purpose remarkably well. The cost of Broadbent's machine in England is £25, or about Rs. 375. The freight from England and other charges of import amount to about Rs. 40. The machine consists of a cast-iron frame on the base of which is mounted a circular case made of mild steel. Inside the case there is a round cage of perforated copper, which is made to revolve at a very high speed by means of a leather belt and an arrangement of bevelled wheels attached to an axle which is turned by hand-power. The machine is said to run at a speed of about 2,700 revolutions per minute when the labourers turn the handles at 60 revolutions per minute; the high speed appears to be an important factor in dealing with *rab*. The machine should either be fixed firmly on a masonry platform, or wooden sleepers may first be sunk into the ground and the machine fixed to the sleepers by means of bolts and nuts. A hole should be dug under the spout of the machine to contain the molasses receiver, usually an ordinary kerosine tin. The various parts of the machine should be properly oiled (castor oil being best for this purpose). The keys which fasten the various cogwheels to their respective axles should be carefully tightened by a hammer.

DIAGRAM NO. IV.



BROADBENT AND SONS
HAND-POWER CENTRIFUGAL
HYDRO-EXTRACTOR 18 DIAMETER

The leather belt which runs the machine should be made perfectly tight; there is an arrangement in the machine whereby the position of the belt can be regulated. The cage of copper mesh should be thoroughly washed first with hot water, acidified if necessary with a little sulphuric acid; then with lime water applied with a rag and finally with clean hot water.

The pots containing the *rab* should be placed near the machine. One pot should be broken at a time and the contents taken out by means of a scraper (*khurpi*) into a clean brass or copper pan, any lumps which may be found in the *rab* being broken with the *khurpi* or crushed with the fingers. About 8 to 10 seers of the *rab* should then be transferred from the pan to the centrifugal. About half a seer of molasses should be taken into a *dori* (a round vessel to which a wooden handle is attached) and about one dram (four *masbas*) of bicarbonate of soda dissolved in an ounce of water should be thrown into the *dori* and mixed with the molasses by the hand till the liquid becomes frothy. This liquid should then be poured into the centrifugal over the *rab* and the latter well stirred. The machine should then be set in motion by four labourers (the latter being relieved at intervals), who should continue to revolve the handles until the molasses have been completely separated from the crystals. An indication of this point having been reached lies in the molasses coming out of the spout in drops instead of in a stream.

When the centrifugal is stopped, the sugar will be found adhering to the inner surface of the cage; it should be fairly white. This colour can be easily seen while the centrifugal is in motion. If, however, the colour be not entirely satisfactory, it should be washed with either a decoction of soap nut (*ritha*) or a distillate of the substance. *Ritha* is a well known fruit easily obtainable in all towns in Upper India. To make a decoction about half a seer of *ritha* should be boiled in about 20 seers of water and the liquid strained through a sieve. To prepare a distillate about one seer of *ritha* should be pounded and thrown into about 8 seers of water, which should be then distilled in an ordinary *qara-ambiq* (retort) such as is used by native druggists.

This distillate acts satisfactorily as a decolorizer and should be applied warm with a brush of *munj* grass, while the cage is revolving at full speed. If the washing is done properly the sugar in the cage should be perfectly white, identical with the best *khand* in respect of colour, but superior to it in the size of crystals and brilliancy, and in freedom from foreign substances. When the machine has stopped, the sugar should be scraped out with a wooden *khurpi* and dried in the sun. If the crystals are then found to be very much larger in size than those of ordinary *khand*, or if the colour is not perfectly white, the cured sugar should be very gently ground at once on a stone slab with a *belan* (wooden roller) before it is dried in the sun and should then be passed through a sieve, or it may be ground in a mill.* This process of gentle grinding is known in Rohilkhand as *kasna*.

* A grinding mill for this purpose has been devised and is under trial.

As soon as the sugar has been taken out, the machine should be charged again and the methods described above followed. After every two or three charges the wire mesh should be carefully wiped with a piece of rag dipped in *hot water* to prevent the perforations from being choked.

Broadbent's machine is sufficiently strong for hand-power. The only part which wears out quickly is the socket in which the spindle of the cage revolves. When this happens the movements of the cage become eccentric and the sugar is not cured properly. It has, however, been found that a new socket can be easily manufactured by a good native mechanic, and if this part wears out it should be at once replaced by a new one, and the machine will then run smoothly again.

VIII.—TREATMENT OF MOLASSES.

The best thing is to sell off the molasses if possible. In Oudh we have sold it at the high price of 15 to 16 seers per rupee, as it is readily purchased by confectioners, being quite fresh and fit for making sweetmeats. But when the factory is working on a large scale or in a small village it might be difficult to find a ready sale for the greater part of the molasses on the spot. In such a case it would be worth while to boil the molasses down to *gur*. The method of manufacturing *gur* from molasses is fully known to the manufacturers of Rohilkhand where professional boilers can be employed on payment of reasonable wages. The only improvement which I have made on their method, and one which has been much appreciated, is the addition of a little bicarbonate of soda or potash to the boiled mass when it is spread on the *chak* (earthen wheel) to be cooled before being made into balls. This treatment very considerably improves the colour of the *gur* which, consequently, commands a distinctly higher price than the *gur* made from molasses of the ordinary native factory.

IX.—THE SUGAR SEASON.

A few words may be said about the effect of weather on the quality of *rab* and the outturn of sugar. No doubt the best season for manufacture of *rab* both under the old and the new system is the dry cold weather when the *rab* sets quickly and the grains become quite firm within four or five days. Rainy or cloudy weather which generally comes on for a few days about the middle of the cold season, and is usually characterized by prevalence of easterly wind, is alleged to be unfavourable for operations generally, but whether it affects the quality of *rab* injuriously is doubtful. In such weather it is necessary to thatch the boiling plant over with a *chappar*, because if rain gets into the juice while it is boiling, the *rab* will be seriously damaged.

The higher outturns of sugar are obtained usually from *rab* manufactured in the latter part of the season, from the middle of February to the end of March, when the cane is fully mature. The *khandsari* usually closes his boiling operations soon after the Holi festival, i. e., when the warm weather has commenced. It is alleged that when the weather is warm the *rab* does not set properly and contains a very high proportion of molasses to crystals. Every care is therefore taken to finish off the boiling work within a few days

after the Holi, if not before that festival. To attribute the poor quality of *rab* made in the warm weather to the effects of season is decidedly a mistake. The reason really is that under the *bel* system, the juice, which is as a rule kept for several hours in the earthen receptacles sunk at the foot of the mills, gets so fermented in the warm weather, that it becomes practically unfit for boiling. I have continued boiling under my system quite successfully until the middle of May, but always taking care that as soon as about 20 seers of juice had been expressed by each mill it was heated to a high temperature in the clarifier to prevent inversion.

I have heard of standing crops of sugarcane which could not for some reasons be cut at the usual time, being burnt off in the hot weather, being then regarded as useless for the purpose of manufacture of sugar under the *bel* system. Such waste would be entirely avoided by the new method, in which the immediate heating of the juice cannot be helped.

The native method of manufacture of sugar from *rab* is obviously unsuitable for the hot weather and more so for the rainy season. Absolutely no sugar is consequently made by *khandsaris* during the rains. The *rab* has necessarily to be worked into *khand* before the rains. The *rab* made under our system does not deteriorate in that manner, at any rate not to the same extent, and I have quite successfully kept *rab* and made high class *khand* from it throughout the year; only the percentage of sugar obtained from *rab* in the latter part of the rainy season was slightly lower than usual, but the quality of sugar was very superior. These advantages of the new method must be regarded as most valuable, as the *khandsari* will be able, if he stores a sufficient supply of *rab*, to continue his work throughout the greater part of the year instead of only about six months.

X.—OUTTURN OF SUGAR.

The ordinary *bel* of Rohilkhand works up about 4,000 maunds of juice in a season: larger *bels* are said to work up to as much as 8,000 maunds, but in their case we have not entirely trustworthy figures of the yield of sugar. Taking as a standard a *bel* working up 4,000 maunds of juice, it is usually assumed that 800 maunds of *rab*, or 20 per cent., is a maximum yield. About 33 per cent. of this, or say 265 maunds of *khand* may be hoped for, together with about 430 maunds of molasses; thus about one-eighth of the *rab* is lost during the later stages of the process. These figures represent a thoroughly satisfactory outturn under the existing system of manufacture.

With the improved plant and methods described above about 8,000 maunds of juice can be conveniently dealt with. Of this about 1,480 maunds, or 18.5 per cent. is obtained as *rab* on the average of the various experiments. Thus the yield of *rab* is slightly below that of the old system, but the difference is in water and dirt not in sugar. From 1,480 maunds of *rab* the new system has given, on the average of different determinations, 680 maunds of *khand*, or about 46 per cent.: the actual percentage has varied from 40 to 52, and in one exceptional case 57. There will also be about 800 maunds of molasses, so that the loss of *rab* under the new system is nominal, being limited to the trifling amount that sticks to the different implements.

To compare the outturn obtained under the old and new system it is necessary to double the figures for the former given above: then from 8,000 maunds of juice in each case the outturn will be as follows:—

	Old system.	New system.
Ráb	1,600	1,480
{ Khand	530	680
{ Molasses	860	800
{ Loss	210	nominal.

This comparison is favourable to the old system in that a high outturn of *ráb* is assumed, probably from 60 to 80 maunds more than is obtained on the average.

As regards value, the *khand* made by the new system is distinctly superior to the old, but for comparative purposes the two may be valued at the same price, which may be put at Rs. 9 per maund. The molasses obtained by the new system are an altogether different article to what are now produced, and can be safely valued at Rs. 2 per maund against Rs. 1-8, the current price of the existing product.

At these rates the value of a season's produce under the old system is Rs. 6,060: under the new Rs. 7,720. After making every possible allowance, there can be no doubt therefore that the new process yields a much more valuable outturn than the old from a given weight of raw material. It remains to examine the cost of this increased yield.

XI.—COST OF PRODUCTION.

The cost of the juice is the same in both processes, and may be taken at Rs. 32 per *sakra*, a unit which is equivalent to $62\frac{1}{2}$ standard maunds, or Rs. 4,096 for the quantity dealt with in one season. The cost of making *ráb* by the old system is fairly well ascertained, and may safely be put at Rs. 8-6-0 per 100 maunds of juice, a rate which includes the annual erection of the *bel*. This gives Rs. 670 for the season. The cost of making *khand* may be put at Re. 0-8-0 per maund of *ráb* used, or Rs. 800: so that the total working expenses of the old system are Rs. 1,470. Under the new system, the cost of boiling is greatly reduced being only Rs. 235 exclusive of the cost of fuel, but the erection of the furnace costs more: the two items together come to Rs. 510 as against Rs. 670. The cost of making *khand* may be safely put at about $9\frac{1}{2}$ annas per maund of *ráb*, or Rs. 880 for the season: the total working expenses are therefore Rs. 1,390 or appreciably less than under the old system.

The accounts then stand as follows:—

	Old system.	New system
	Rs.	Rs.
Value of produce	6,060	7,720
Cost of juice	4,096	4,096
Working expenses	1,470	1,390
Profit (interest, depreciation, and earnings of management),	494	2,234

It is difficult to estimate the interest that should be allowed: but as most of the capital goes in the purchase of raw materials (which cost the same in both cases), and as the new process enables the sugar to be put on the market some months earlier than is possible under the old, the amount of interest is practically the same in both cases.

The boiling plant used in the new process as described above costs us Rs. 400. A set of pans for an ordinary *bel* costs Rs. 300 and the cost would be close on Rs. 400 for a *bel* of the large size assumed: the greater cost of copper is saved in the simpler process of construction of the new pans. Thus interest and depreciation of the pans will be about the same in both cases.

Three centrifugal machines will be needed with plant of the size described in order to work up the *rab* promptly.* Their cost will be Rs. 1,250. On these figures it will be seen that a manufacturer who works the new process as successfully as it has been worked in our experiments could pay for the three centrifugals out of his first year's profits, and yet have a materially larger balance of profit than one who worked the old system; after the first year his profits would be very much greater: or to put it in another way, if the centrifugals last only three seasons, (and they ought to last far longer), one-third of their cost can be charged against each year, and the balance of profit under the new system will still be more than three times the profit under the old.

Implicit reliance cannot of course be placed on the details of these calculations; but there is such an enormous margin in favour of the new system that it can be confidently recommended for trial, provided the man employed to manage the boiling has been trained practically in the details of the various operations.

The following details of the cost of operations will be of interest to practical men. The daily cost of working the boiling plant, exclusive of the cost of fuel, is approximately as follows:—

			Rs.	s.	p.
Pay of head boiler	...	...	0	6	0
„ second „	...	...	0	4	0
„ daroghá	...	...	0	3	6
„ clarifier	...	...	0	3	0
„ two firemen	...	...	0	4	0
„ two coolies	...	...	0	5	0
„ one <i>chaukidár</i>	...	...	0	2	0
Cost of earthen pots (including cartage)	..		1	0	0
Soda, <i>sajji</i> , <i>deula</i> , &c.	...	...	0	8	0
			<hr/>		
Total			3	3	6

* One centrifugal will deal with 130 to 150 maunds of *rab* in a month: with three machines, the quantity produced will be worked up in about 3½ months; if two machines are used about 5½ months will be necessary.

For working three centrifugals the daily cost will be :—

	Rs.	a.	p.
Pay of mistri	0	8	0
„ 24 labourers at 3 annas for working the machines	4	8	0
„ bhishti	0	3	0
„ 12 labourers (for handling the sugar and miscellaneous work)	1	14	0
Oil	0	4	0
Chemicals	0	6	0
Total	7	11	0

With eight labourers to each centrifugal, work can go on easily for eight hours a day, during which each machine will deal with about five maunds of *rab*. Thus the actual cost is practically eight annas a maund : but in the foregoing account it has been put at nine annas six pies to allow for occasional loss of time.

It should be added that the cost of working can be considerably reduced if power for driving the centrifugals is available, but we are not yet in a position to say whether the saving would be sufficient to pay for a steam or oil engine, and the use of centrifugals worked by hand is perfectly practicable. Of course if the sugar manufacturer has an engine standing idle, it will pay him exceedingly well to drive the centrifugals by its means, and the hand machines can be easily adapted to power working.

APPENDIX II.

[The papers printed in the text of the Report were contributed at the request of the organisers of the Conference. Those printed below were sent by the writers of their own accord.]

INDIAN AGRICULTURE.

BY KRISHNA RAO DESHMUKH, ESQ., *Pleader, Wardha.*

According to the eastern sages agriculture is the first and best occupation in life. It is the most healthful, useful and noble occupation of man, said Washington, whose name is immortal for his love of truth in his boyhood and love of liberty in his manhood. The ancient Romans had great enthusiasm for agriculture. Cicero and Cato were the great admirers of agriculture. Cato said, "I come now to the pleasures of husbandry in which I vastly delight. They are not interrupted by old age and they seem to me to be pursuits in which a wise man's life should be spent. The earth does not rebel against authority. It never gives back but with usury what it receives. The gains of husbandry are not what exclusively command it. I am charmed with nature and the productive virtues of the soil. The whole establishment of a good and assiduous husbandman is stored with wealth. It abounds in pigs, kids, lambs, poultry, in milk, in cheese and in honey."

SPECIAL IMPORTANCE OF AGRICULTURE IN INDIA.

If there is any country solely and wholly dependent on agriculture, it is India. The peasant is the backbone of the country and the land revenue derived from him is the backbone of the imperial finance. Native arts, indigenous industries and country-manufactures died out under foreign competition. Out of 100 of the Indian people, 85 depend on agriculture as the means of their livelihood. India, therefore, has become an agricultural country. Agricultural industry is the only industry from which all other industries draw their life-blood. In fact, agriculture constitutes the nucleus and foundation of all other enterprises. In the present crisis, agriculture is the hope and strength of India.

THE PRESENT STATE OF AGRICULTURE IN INDIA.

No doubt, the art of agriculture is known to the Indian peasant. But the art has come down to him, unimproved, from generation to generation. It is deteriorating every day. The science of agriculture is hardly known to him. Nature is bountiful to him but her bounties are hardly appreciated. He is still content with his old-fashioned plough.

In economy of means of production and in the practice of organized self-help, the Indian cultivator is generally ignorant and backward. Our agriculture is in a moribund condition. The reason of such a deplorable condition is not far to seek. It is this—that our agriculture is left in the hands of an ignorant and illiterate class of cultivators, to chance, and to *nasib* (caprices of fortune).

There are two classes of cultivators :—

The first class comprises persons owning land and cultivating the fields with the help of their own wives and children. They are illiterate, ignorant and deeply indebted. Ignorance and poverty have debased their mind and rendered them unfit for any scientific progress, in their present condition.

The second class of cultivators are persons who own lands and invest money in the agricultural enterprise. They may be called the landed gentry. They possess capital, intelligence and ability. But they do not take any personal interest in cultivation. They leave everything to their steward who is ignorant, illiterate and low paid. He leads and guides all the agricultural operations. He does not know that climate, location, varieties, culture, handling, packing, and marketing, each has a place in successful cultivation and stands vitally related to the rest. Indifference to any one of them may bring failure to the best directed efforts.

Ignorance, negligence and indifference are displayed at every stage of agricultural operations. No care is taken for the selection of suitable soil for suitable crops. No attention is paid to the selection of good seed. The land is not well manured. The waste of manure is something startling. The rules of weeding, thinning, pruning, are more honoured in their breach than in their observance. The principles of neatness and cleanliness in harvesting and marketing are hopelessly overlooked and the result is nothing but loss in the agricultural concern. The outturn is hardly sufficient to cover all expenditure incurred in cultivation.

Hence our cultivator is going from bad to worse. His annual income has been reduced from Rs. 28 to 20, since 1880. Half of the Indian population do not know from year's end to year's end what it is to have their hunger fully satisfied. Forty millions of the Indian population live on the verge of starvation. The Indian peasant has lost his staying power and a single failure of crops brings on famine in the country. He has lost all vitality. At the very first appearance of an epidemic he is liable to succumb.

THE PRESENT IDEAL OF CULTIVATION.

Our present ideal of cultivation is not high. The general belief is that no talents, no abilities, no originality and no learning are necessary for an agricultural pursuit. Any youth found unfit for any other profession is thought to be the best fitted for an agricultural career. The sooner we get rid of this notion the better.

SCIENTIFIC AGRICULTURE.

The necessary condition of success in agriculture is that, hand in hand with culture of land must go culture of the mind. The secret

of success lies in blending experience with theory, practice with science, progress with prudence and work with study. This can be best accomplished by uniting mental work with manual effort, combining science with art, and by transforming thought into action.

Scientific Agriculture means the utilization of scientific knowledge to secure the best possible results from the practical agricultural pursuits with the greatest possible economy. The study of science enables a man to understand, guide and control the natural forces that create all industrial progress. The sciences that play an important and prominent part in the field of agriculture are Chemistry, Botany, Geology and Veterinary Science.

GOVERNMENT AID IN THE CIVILIZED COUNTRIES.

In England, Denmark, Holland, France, Germany and the United States and Canada in America, great prominence is given to agriculture, even though the people do not entirely or even mainly depend on it. The urgent necessity of agricultural knowledge on a scientific basis is recognized. Large amounts are liberally spent on agricultural improvements. The scientific knowledge is systematically extended. Botanical gardens are fully equipped with laboratories and herbariums. Numerous experimental stations are established. The State organization consists of scientific and practical experts whose time is solely devoted to making improvements in every way possible. Steady and constant efforts are being made to improve the indigenous products. Exotic products likely to repay the cultivator are eagerly sought after. Those directly interested as cultivators or indirectly interested as manufacturers and exporters are encouraged to co-operate with the State, in the acquisition and dissemination of agricultural knowledge. Through the medium of the Central Intelligence Office, pamphlets, and journals agricultural knowledge is brought to the threshold of every cultivator. The gospel of agriculture reaches every poor cottage. The agriculturists freely and confidently turn to the State departments for help and advice.

SELF-HELP IN THE CIVILIZED COUNTRIES.

In the civilized countries mentioned above the people are not prone to succumb to difficulties and accept them as inevitable. They know that difficulty is the condition of success and it is a severe instructor. They do not say that "there is a lion in the path." They do not depend upon the Government for everything. They have great faith in themselves, in their own power and strength, in their own energy, industry and uprightness. The secret of their success lies in their power of self-help, organization and co-operation.

In England patriotic societies were the means of collecting a vast mass of statistics and general information connected with agriculture. They diffused agricultural knowledge amongst the cultivators. These national associations were soon aided in their important labours by numerous local societies which sprang up in all parts of the kingdom. So far back as in 1800, the original *Farmer's Magazine* entered upon its useful career. In 1842, an

Agricultural Chemistry Association was formed, funds were raised, and eminent chemists were engaged for the express purpose of conducting investigation.

At the annual shows a prominent place is assigned to implements and machines. The extent and the rapidity of the improvements in agricultural machinery which the society was mainly instrumental in effecting, are altogether extraordinary.

Market towns of importance have their organized clubs. There are Agricultural periodicals ably conducted and widely read.

The facilities afforded by railways for cheap and expeditious travelling induce most farmers to have an occasional peep at what is going on beyond their own neighbourhood. This, more than anything else, deals a deathblow to prejudices and extends good husbandry.

The literature on agriculture has been enriched by the contributions of many able writers.

In the United States of America in 1867, granges were started. Granges mean associations of farmers designed to further their interest and particularly to bring producers and consumers, farmers and manufacturers, into direct commercial relations without the intervention of middlemen or traders.

Now, in America, these granges wield an immense influence both on the people and the Government.

RESULTS OF SCIENTIFIC CULTIVATION.

The results of scientific cultivation are marvellous. By the help of scientific knowledge America produces 600 lbs. of cotton and 28 bushels of wheat per acre, whereas we in India produce 60 lbs. of cotton and 7 bushels of wheat per acre.

In Florida oranges used to be seriously damaged by frost but the scientific men found a remedy to overcome the difficulty. Cross fertilization of oranges of superior variety with inferior ones was found effective in resisting the attacks of frost and saving the crop from damage.

Inoculation of land in America is one of the wonders of science.

GOVERNMENT AID IN INDIA.

The Department of Agriculture has been in existence for a long time. The experimental farms have been doing their work for many years. But until recent years, what was going on within the four corners of the experimental farms was hardly known to the outsiders and much less to the real cultivator.

The Famine Commission of 1900 pointed out in unmistakable terms that the steady application to the agricultural problems of expert research was the crying need of the time. The Government changed their policy and began in right earnest the work of agricultural improvement. Now the agricultural staff is being strengthened. The experimental farms are being extended. The schools of agriculture are being increased in number. An agricultural institute has been

started at Pusa, and it was described by Sir D. Ibbetson as the first important outcome of the new departure in the development of agricultural enquiry and experiment, which is the crying need of the country.

The question that was very prominently brought before the Agricultural Conference held at Pusa, was how to teach the real cultivator, and several suggestions were made to solve that question. Agricultural journals are being issued and agricultural associations started. But all this is a mere beginning when compared with what is done by the Governments of other civilized countries. Anything, if well begun, is half done. Attempts are being made to enlist the sympathy of the cultivators and to popularize the Government institutions. It is with a sense of gratitude that we should acknowledge the good work that is being done by the Government to promote the cause of Agriculture.

THE SPIRIT OF SELF-HELP IN INDIA.

Now we come to a very unpleasant and unpalatable question. That question is one of self-examination. It is very easy to find fault with others and to load others with reproaches. It does not cost much to say what others should do for us. It is very difficult to determine what we should do for ourselves and do it with determination. The true ignorance of man lies in not knowing what he should do. Our educated Indians and our leaders have fully recognized the urgent necessity of scientific improvement of cultivation. They have completely appreciated the worth of the art and science of agriculture. They have thoroughly realized the value and importance of the improved methods of cultivation. That being so, what have they done to promote the cause of agriculture? The only answer that can be given is a negative one. They cannot claim anything to their credit except perhaps a few speeches and the Industrial and Agricultural Exhibition held along with the sessions of the Indian National Congress within the last few years.

DUTIES AND RESPONSIBILITIES OF EDUCATED INDIANS.

Ignorance is a great hindrance and education is a great power. Power means responsibility. To achieve success in agriculture, educated Indians have got a threefold duty to perform :—

1st :—To educate the masses, to enlighten them, to influence their destinies and guide their thoughts.

2ndly :—To kindle a genuine enthusiasm in the wealthy classes and big zamindars and middle classes. To inflame patriotic feelings and awaken the sense of duty in them. To induce them to employ their capital in the development of agriculture.

3rdly :—To advocate the cause of the poor cultivators. To help them and protect their interests in the matter of legislation. The heavy assessments, the short-term settlements and the restrictions on their power of alienation of land are their principal disabilities and grievances. Concentration of efforts in these times of strenuous competition is the most essential element of success. This

is the age of combination, and to hold our own in the mighty struggle for existence we must unite and benefit ourselves. The individual is but an insignificant factor compared with powerful organizations.

We must form companies, raise funds and start co-operative movements for promoting the art and science of agriculture. The European companies in every trade, commerce and industrial enterprise, furnish a most interesting and instructive instance of the wonderful and mighty results that can be obtained by uniting capital, labour, intelligence and industry and energy. By means of these companies they have conquered the trade of other countries, and have even conquered many territories. The companies of the mill-owners in Bombay and at other places have proved that the Western example can be successfully followed in the East. However, we have no companies for the development of cultivation and improvement of the agricultural processes. Messrs. Wallace & Co. have started a joint-stock company for the cultivation of long-stapled cotton in Behar and the concern has proved to be profitable.

We must have our agricultural granges, clubs, associations, libraries. We must have our chemical analyzers. We must send some students to America and Japan to learn the science of agriculture. Some practical experts in agriculture must be sent to these countries, to see what improvements can be successfully adopted in India.

India has a bright future before her. She can produce much cotton and much wheat and can meet the local wants and can export them to other countries and thus enrich herself to avert famine.

The future of India depends upon successful agriculture, and successful agriculture depends upon a thorough knowledge of business, and business on business principles.

The agricultural industry is the principal industry on the success of which all other industries of India must depend. Every right-thinking man interested in the salvation of India must do his duty to the motherland. Officials and non-officials, Indians and Anglo-Indians, Hindus, Muhammadans and Christians, one and all should make a common cause, remembering the noble words of Goldsmith :—

“But a bold peasantry their country's pride
When once destroyed, can never be supplied.”

“ COTTON : AND HOW TO BRING INDIAN COTTON TO INDIAN HOMES.”

BY BABU PRAPHULLA CHANDRA GHOSH, B. A.

The subject of my discourse is very homely. It is cotton. A very remote antiquity is assigned to its growth and manufacture. The word is derived from the Sanskrit *Karpas*.

The cotton plant belongs to the genus *Gossypium* and to the natural order *Malvaceæ*. The chief varieties are: *Gossypium herbaceum*, *Gossypium arboreum*, *Gossypium neglectum* and *Gossypium barbadense*.

India is the largest cotton-growing country in the world. The clothing of its people has from antiquity been chiefly made from cotton. Necessarily, India has matured a system of hand-spinning, weaving and dyeing unknown in any other country.

During the middle ages India manufactured and carried on an extensive trade in cotton goods. To such a degree did this branch of industry rise that some of the fabrics produced have attained a world-wide celebrity never before equalled. In the early years of the East India Company merchants and traders occasionally advanced remittances to India to keep the Indian weavers engaged in the production of those fabrics and gave them every encouragement and support. But since the establishment of the British Dominion the demand for such cotton fabrics has fallen off and their trade has totally languished.

The Indian cottons belong either to the species *Gossypium herbaceum* or to that of *Gossypium neglectum*. Sometimes cotton of other varieties is found which belong to a third species *Gossypium arboreum*.

Gossypium herbaceum is known by the fact that it puts fourth a number of side branches and has lateral development, and it therefore requires much room for each plant to develop properly. It has broad leaves with the cuts shallow. It bears light-coloured flowers. It has large, round, plump and smooth bolls with large seeds and long, soft, fine, silky wool. *Gossypium neglectum* has tall erect plants of few side branches, deeply cut leaves, yellow flowers with red spots at the base, elongated, shrunk and shrivelled bolls tapering in a sharp point and having small seed and coarse, harsh, short wool. Plants of the *Gossypium arboreum* species resemble those of the second with the exception only that they possess hairy, glandular, and dotted leaves. Their seeds are removed from each other, covered with white cotton overlying a dense green or blackish down and the cotton is not readily separable from the seed. To this species belongs the purple-blossomed plant that produces red silky cotton grown about the temples.

The parts of India which grow cotton are Bengal proper, Chota Nagpur, Behar, the Doab of the Ganges and the Jumna, the Central Provinces, the Berars, parts of the Panjab, the Northern districts of the Bombay Presidency and a few of the Southern districts of the Madras Presidency.

Bengal, Chota Nagpur, and Behar grow chiefly the species *Gossypium herbaceum*. The principal varieties of this species are : Gach Kapas, Bhoga, Athia or Desi Kapas, Barhiya and Bareya.

The varieties grown in the Bombay Presidency are the American species of the Sea Island, Mid-Uplands and New Orleans. The cultivation of these exotics in the soils of the Presidency has proved successful. The chief reason for this is that the climate of the cotton-growing States of America and that of the Presidency during the growing period are similar. The districts which grow most cotton are—Broach, Surat, Ahmednagar, Khandesh and Dharwar.

In the Central Provinces and Berars the yield of cotton is great owing to the black clay soil existing all over that part of the country. The principal varieties grown are : Bari and Jhai of the Central Provinces ; and Hingunghat and Amraoti of the Berars.

In the United Provinces longer stapled cottons of the United States varieties Watagodu, Allen and Cooke and several other exotic as well as indigenous varieties are grown. The climatic conditions of the districts lying on both sides of the Ganges and the Jumna in these provinces are favourable to the growth of foreign species and the same success as has been achieved in Bombay can also be attained here.

The production of cotton in the Panjab is variable. The ordinary climatic conditions are uncongenial to its growth. But the quantity which grows is due to the inundation of the Indus and its tributaries.

The produce which Madras yields is not superior nor is it heavy. But it is enough to supply the demands of the mills working in the Presidency. The varieties grown are the Salems and Tinnevelly.

There are two methods of cotton cultivation prevalent in India. They are (1) *Kachua* or *kachhauni* and (2) *Daha* or *dahil*. *Kachua* or *kachhauni* literally means 'uncooked' as distinguished from 'burnt,' which is the literal meaning of the *daha* or *dahil*. The *kachhauni* method is the ordinary one and in use everywhere except in hilly and jungly tracts. The *daha* process is adopted in the latter areas only. This system consists in burning a thick layer of wood over a cleared ground before sowing the seed. The object of the *daha* system is (1) to burn up the soil and thus to free its manurial ingredients ; (2) to destroy all grasses and weeds by thorough burning, and (3) to leave a layer of ashes over the ground. This system resembles the practice of burning clay soils which is followed to a certain extent in the clay districts of England and the advantage claimed for the English practice that it sets free a portion of the potashes and other alkalis in the soil is also secured by the *daha*. The land after the *daha* is performed is left without further treatment until the rains set in. In *Asar* (June-July) the seed is sown on the field. The land is then ploughed and again allowed to rest. No harrowing is done. As soon as seeds germinate and leaves burst forth, the field is fenced round. Once in *Sravan* (July-August) and again in *Bhadra* (August-September) weeding takes place. The flower appears at the end of *Bhadra*. The pods form in *Aswin* (October-November), and then the cotton is gathered. The yield of *daha* cotton is larger than that of *kachhauni*.

In the cultivation of *kachhauni* cotton land is ploughed in *Asar* (June-July) and seed sown without manuring. The crop is ready by *Aughryan* (December-January) and is then gathered. *Kachhauni* cotton may be reaped at any time as soon as ripe.

The few special requirements necessary for the cultivation of cotton are—(1) A sufficiently long growing-season for the plant to mature. This season must be very warm and hot, and if also humid and equable, so much the better. Provided the mean temperature is sufficiently high the plant grows and develops, but more quickly and luxuriantly in a humid atmosphere than in a dry one; (2) a clear weather of about two or three months for the picking season free from rain and clouds; (3) a loamy soil that will supply sufficiency of moisture throughout the life of the plant whether from rainfall or from irrigation, but at the same time open and high enough not to suffer from stagnant water. To overmuch moisture in the soil the cotton plant generally and the longer-stapled varieties particularly, are highly sensitive specially in the early stages of growth. The longer the staple, the more open and sandy must the soil be.

Besides the three chief requirements the other points to be observed in the cultivation of cotton are:—

1. *Tillage*.—It is enough to mention on this head that the deeper the first ploughing the better, and the deeper the ploughing the heavier the yield.

2. *Sowing*.—The seeds are to be sown as they are, but occasionally they are to be mixed up and rubbed with cow-dung to separate the seeds from one another.

3. *Manuring*.—Cotton fields require to be invariably manured. Ashes are considered the best for cotton, but *poudrette*, town-sweepings, hard mud, non-edible cakes, saltpetre are often used as well.

4. *Mixtures*.—The only mixture that will produce results commensurate with the value of land devoted to it is cotton and maize in alternate rows with a space of two feet intervening.

In course of time the British merchants learnt the mode of producing the Indian fabrics and utilized their knowledge by the help of improved machinery and science to produce similar stuffs in England. They had already realized the extreme profitableness of the industry by their experience. In the year 1787 a mill for manufacturing cotton-stuffs was established in England. The English manufactures soon supplanted the Indian in the European markets, and by reason of their being more neatly and evenly made and finer in texture delighted the Indians, who began to use country-made stuffs less and less. The weavers previously patronized by the East India Company were now thrown out of work. Some of them gave up their time-honoured craft and took to other callings. Those who still clung to their hereditary avocation lost all heart, and, finding no market for the fine stuffs which they produced, they restricted themselves to weaving coarse stuffs just sufficient to meet their own requirements and local needs.

At the present moment the question of supply of cotton goods has been exercising the minds of all true and patriotic Indians. The proper solution of the problem depends upon how they meet the cloth supply for which Manchester (veritably called Cottonopolis) has the sole monopoly. Organized and sustained efforts are needed in this direction. The first step needed in this way is the cultivation of superior quality of cotton on an extensive scale. At present the growing of cotton is on the wane in nearly all parts of the country except in the Bombay Presidency. The decline has been due partly to our total apathy and predilection for growing food staples, partly for want of improved methods of cultivation, and partly owing to the heavy import of foreign cotton goods. But now we have to take to the growing of cotton on a larger scale than at present with interest and zeal. We have also to adopt a mode of cultivation which is based on proper scientific knowledge. We have also to be supplied with seeds of improved varieties of cotton.

The second step is that strong inducements are to be held out to weavers to give up their adopted calling and resume their own. We have to form in different parts of the country committees whose duty should be to keep themselves in touch with local weavers and make them advances in money and yarn. Mr. Jamshedjee Ardasir Wadia, a well-known mill-owner of Bombay, writing in vindication of the *Swadeshi* movement, observes that India ought to be perfectly able in a short time to supply her own requirements; and as the result of the movement he anticipates a considerable increase in the quantity of cloth manufactured by hand-loom weaving which, he avers, has vast potentialities on account of the industry, thrift and good sense of the Indian weavers. The hand-loom industry still supports a vast majority of weavers. Hand-looms of the type used at Serampore and Kushtia, Bengal, or like that constructed by Mr. Churchill should be largely brought into use and be supplied to our weavers on the hire purchase system. Every Indian household also should resort to the old ways of ginning and spinning cotton with the time-honoured *Charakha*. Dr. Watt, speaking of the functions of the *Charakha*, says that 'on an average it can spin 6 to 8 lbs. of clear cotton per day.' Indian spinning, says Professor Royle, 'though rude in appearance is well-suited for the purpose for which it is used.' Attempts should, however, be made to improve the *Charakha*.

The writers of the book called 'Hand-loom Weaving for India' have proved from the evidence of facts that hand-looms can survive the competition of power-looms. Their most convincing argument is that the hand-loom fabric gives nearly twice as much wear as the average mill-cloth by reason of its possessing more strength and durability than the latter owing to the following causes:—

(a) The use of antiseptics and germicides necessary to protect a large stock of goods from vermin, damp, &c., impairs the tenacity and strength of the cloth. (b) 'Sectional' sizing as adopted in mills does not strengthen the warp so much as 'single' sizing as in vogue among hand-weavers. (c) In the power-loom the picking motion being very rapid, the web is not so firm as in the hand-loom where the weft thread and selvage are put in more carefully.

The Parsi merchants of Bombay have prepared the ground for the mill industry in India. Kabasjee Nanabhoy Dabar founded the first Indian cotton mill in 1855. The activity, spirit of enterprise and zeal which have always characterised our brethren of the Western Presidency have led them to add to the number of mills year after year. The impetus which they have thus given has encouraged people of other Presidencies to follow them. In the year 1896 there were 154 mills employing 37 thousand looms, 80 lakhs spindles and over a lakh of hands. In the year ending March 1905 there were 200 mills. Of these 9 were still under construction, the remaining 191 at work. Nearly 60 thousand looms, 70 lakhs spindles and over 2½ lakhs hands worked in those mills. A capital of 54 crores has been invested in them. The improvement of the cotton industry in India is wonderful inasmuch as 200 mills were set up between 1855-1905, a period of only half a century. But it is a noticeable fact that Bengal, which is considered the most advanced province, possesses only 12 mills out of this huge number, and a very few of them are owned by natives of the soil.

In the year 1904-1905 there were 2,750 cotton mills in England. They turned out 208 crores worth of cotton goods, out of which India consumed 40 crores worth goods. It is thus clear that India should possess at least 500 mills, i.e., 300 more than the number of mills working at present in order to meet the full requirements of her own.

How can this exigency be met? The question demands our most serious consideration. It is proposed that Bengal should erect a few mills and supply her own demands. The suggestion is encouraging and practicable no doubt. But if it be carried into execution, would such action be wise and expedient? For, the money which will be required for the erection of mills and purchase of the machinery such as will meet the full requirements of the province, would be enormous. At least, 1 crore and 60 lakhs is the estimated amount to set up 10 mills on a decent scale, and it will take no less than five years to construct and bring them into perfect working order. But the situation of the country is such that it cannot afford to spend so considerable an amount and wait for so lengthened a period to have its requirements supplied. Then there is the difficulty of getting trained Indians to manage our mills. The object of the *Swadeshi* movement will be frustrated if we are to look to England or America to give us mills and mill-managers. I therefore submit that it would be better if the fund which it is contemplated to invest in the erection of mills and the purchase of machinery from foreign lands be utilized in our own country by spending it on the cultivation of cotton on a larger scale throughout the province of Bengal and the revival of the hand-loom industry all over the province on an extensive scale. The matter may be taken in hand by organized companies and the cultivation begun at once with the help of our botanists and geologists. The reason for this humble suggestion is that though Bombay possesses nearly 200 mills, yet it has not been able to concentrate its entire energy on manufacturing cloth for want of raw material. The majority of them are engaged in manufacturing yarn, a few only produce cloth. Bengal may supply cotton and take cloth

from Bombay by way of barter. What is really needed is hearty co-operation with Bombay. Bengal will court failure and disappointment if it works independently of Bombay in the matter of mill industry. Bombay is 50 years ahead of Bengal in this direction. At this stage Bengal can hardly expect to acquire easily that experience in the management of mills which Bombay has taken two generations to gain.

The true solution of the problem of supplying cotton-goods lies primarily, therefore, on the part of Bengal, in its taking up the business of extensively growing a superior quality of cotton and secondarily in developing the hand-loom industry. There will be then no difficulty in achieving success. The people of Bengal have an aptitude for agriculture and domestic industry. The climate of the province is also favourable as it has been held that hand-weaving flourishes better in moist and damp climates.

INDUSTRIAL DEVELOPMENT OF INDIA.

BY MUNSHI PREM BEHARI, B.A., LL.B., *Munsif of Bisauli,*
Budaun District, U. P.

It is a hopeful sign of the times that a wave of reaction has set in, in the field of industry and commerce throughout the length and breadth of the country, and my countrymen are beginning to realise their true position in the scale of nations. They have been roused from their deep slumber, and as if under the influence of the magic wand of a mesmerist, have been perforce driven to "fresh fields and pastures new." Commercial enterprise now seems to be the burning question of the day, affecting millions. We should therefore take time by the forelock, and exert ourselves to the utmost in nourishing this young plant of spontaneous growth.

Let us all united stand to-day at the sacred seat of science and learning, and with one will and with one voice, pray to the Omnipotent power, that this unconstrained and free love for industrial development of India, may be based on the adamant rock of unity, organisation, and co-operation of our brethren. The angel of God has put the spark of enlightenment in us, it is now for us to see that "the holy flame may burn for ever."

Dear brethren, it is now an axiomatic truth that India has lost its unique position, which it once enjoyed, of being the leader of western nations in science, art, and philosophy.

The golden age, in which Ram Chandra and Krishna, the ideals of an adventurous and heroic life, flourished, exists only in our memories. In fact the degeneration of India commenced only with the establishment of Brahmanism, with the introduction of the sacred institution of the caste system, and with the prohibition against sea-voyages. These were the three chief factors, tending to check the

onward progress of the nation and to mould its future destiny. Excepting the Brahmans, the followers of the other three castes were not allowed even to touch the Vedas, the scriptures in which the secret treasure of science and learning was stored. Industrial pursuits were only followed by the Sudras or the menial class, and commerce was confined only to the Bania class. It is really a pity that the views of the upper classes were so narrow as to cause them to look on the commercial class with an eye of contempt, and I think the character which Burke gave to the Bania class at the impeachment of Warren Hastings was nothing more than the echo of the wrong notions entertained by the general public of India against the commercial and industrial class. It is, however, much to be regretted that an Indian of to-day, with an inclination for trade, is looked upon with contempt by the Indian aristocracy and high-born classes. We cannot hope to prosper unless we get rid of this wrong notion which we have got into our heads by tradition.

Lord Macaulay once taunted England with being a "nation of shopkeepers," but for the Englishmen of to-day the taunt has lost its point. History teaches us that the very position of England as a world-controlling Empire, has been attained by commercial enterprise. By resolute energy, by the untiring search for new markets and by the courage and honesty of their dealings, the nation of "shopkeepers" has become a "nation of world-governors." Commerce to-day is the key-stone of the policy of all countries and it is not chimerical to hope for the time when the races of our common humanity will have become so completely one another's creditors and debtors, that to wage war will be as reasonable as to destroy the bank in which one's wealth is deposited. Turning over the pages of the world's history, it can be learnt that commerce has been the chief factor in moulding the history of nations, and wonders have been achieved by resolute enterprise in the field of commerce. Even such a trifling article of merchandise as pepper has worked miracles. If the Dutch in the arrogance of their trade-monopoly had not, in the closing year of the 16th century, forced up the price of pepper to a point at which the British consumer could not buy, the famous East India Company, who became mistress of India and trustee of that priceless possession, would never have been founded. It is a great mistake on the part of the Indian aristocracy to treat questions of trade and industry with apathy, indifference and even with contempt. Unless the question receives serious consideration from every child of the soil, we cannot win the race of competition with foreign nations. It is, therefore, our first care and duty to do away with the old ideas of commerce, and to instil new life and vigour into the younger generation. But in our enthusiasm and zeal for the furtherance of the noble cause, we should not lose sight of the important fact that to wholly dispense with articles made in foreign countries is contrary to the principles of free trade, and that it will create a broad gulf between India and other civilized countries. High education in India is at a stand-still, technical education in its infancy, and general and free education at the lowest standard. We have to work in the face of these disadvantages, and so we must proceed cautiously.

My dear brethren, we have yet many things to learn from the west, but if you attempt to cut off all communication with foreign countries, and do not keep yourselves in touch with the significant developments of great human movements in various foreign countries, with the best minds of the time, and with great adventurers in the romantic realm of science, you make the young generation sink in the deep abyss of ignorance, and in fact, you place them a hundred years behind the times. Increased knowledge of nature, of the properties of matter, and of the phenomena which surround us may afford to our children advantages far greater even than those which we ourselves enjoy. The extension and improvement of technical and scientific education will, we may reasonably hope, raise them and make them more able to appreciate and enjoy the advantages resulting from western scientific education of a high order, and from realising the truth of the Italian proverb that wherever there is light there is joy. If we view the situation in the light of the remarks made by Herschell there is every reason to live in hope and aspire to rise in the scale of nations. "To what then may we not look forward when a spirit of scientific enquiry shall have spread through those vast regions in which the progress of civilization, its sure precursor, has actually commenced and is in active progress, and what may we not expect from the exertions of powerful minds called into action under circumstances totally different from any which have yet existed in the world, and over an extent of territory, far surpassing that which has, hitherto produced the whole harvest of intellect." According to this teaching of Herschell, a spirit of enquiry and research is all that is wanted in India at this juncture. Let our children foster this spirit of enquiry and make 'Why,' 'Wherefore,' and 'When' their firm allies, they will then learn to read even the book of nature in their eager desire for knowledge.

" And this our life exempt from public haunt
Finds tongues in trees, books in the running brooks
Sermons in stones and good in everything."—SHAKESPEARE.

There is no doubt that owing to want of proper and regular institutions for imparting a thorough and perfect education to boys, and a consequent lack of spontaneity and original thinking on their part, India has won the appellation of a backward country.

Give to our boys all those facilities for receiving high technical and specialised instruction which are enjoyed by European boys, and there can be no doubt that our boys will come off successful even in the field of scientific research. Owing to the sad want of regular scientific institutions and systematic training India could not produce a single man of genius, whose inventions might have been of considerable benefit to the human race, whereas western countries were flooded in the last century with men of genius who had achieved distinction in all the branches of learning, such as Science, Philosophy, Astronomy, and Political Economy, &c. It is still more remarkable that many of the greatest men rose from the lowest rank, and triumphed over insurmountable difficulties. The names of Lord Worcester, Stephenson, and Watt will be remembered for ever, as the invention and introduction of the steam engine was due to their genius and skill.

The names of such men of science and learning as Bacon, Hobbes, Locke, Berkeley, Hume, Hamilton, Newton, the discoverer of the law of gravitation, Adam Smith, the father of political economy, Young, the discoverer of the undulatory theory of light, and Wheatstone, the founder of the electric telegraph, are fresh in our memory. Let our children keep the ideal of the abovementioned men of genius before their mind's eye, and there will be still hope of progress in the future.

The various measures which may be adopted by the people for the regeneration of India may be summed up briefly as follows :--

(1) To educate the masses so as to raise the percentage of literate men in India.

(2) To found Industrial and Technical Institutes, on the model of European Institutes all over India.

(3) To send promising young men to foreign countries to receive technical education of a high order. To meet such expenses national or provincial funds may be created.

(4) To utilise the services of those Indian experts, who have already returned from foreign countries, and to engage them as teachers in central institutes to be started in each and every province.

(5) To invite the co-operation of large capitalists in starting new factories to be worked by machinery and other improved scientific methods.

Looking from the standpoint of commerce and industry, the first suggestion relating to the education of the masses is as important as the other suggestions, and it should on no account be undervalued. If you do not impart primary education to the masses you cannot expect any improvement to be made by the illiterate craftsmen in their respective crafts. Take the case of a village potter, a carpenter, a blacksmith or a weaver, and compare him with his brother in Europe. The artisan in India is the same as he was a thousand years ago, while his European brother is always progressive and keeps himself abreast of the times. Indian workers are averse to invention and reform, they will not move a step beyond the limits to which their grandfathers and great grandfathers advanced. The weaving class will not easily equip themselves with fly-shuttle or Japanese looms. Lately I met a friend of mine at Agra, and he narrated the story of a *julaha* who, when he was asked to work on the imported Serampore loom, replied that he could not work on the loom, and if he did, he would be excommunicated from the caste. Such are the traditional training and religious prejudices of the illiterate class. It is, therefore, extremely desirable that at least primary education should be given to the masses. As compared with foreign countries the percentage of illiterate men in India is very great. In the Argentine Republic education is free for children from 6 to 14 years of age, and 50 per cent. can read and write. In Ceylon nearly 90 per cent. of the children of school-going age are under instruction. In New South Wales instruction is compulsory between the ages of 6 and 14. In Western Australia education is compulsory. In Austria compulsory attendance begins with the completion of the 6th year. So is the case in Hungary. In Spain, the most backward country in

Europe, the percentage of illiterates is 68.1. In Japan elementary education is compulsory, but in India only 22.7 per cent. of the boys of school-going age attend school, while the percentage of girls is 2.5 per cent. The number of illiterates in India at a rough calculation is found to be 86 per cent. This is a sad commentary on the history of our people, and we should lose no time in removing this great blot on the national life.

As regards the second suggestion, I may add that with the recent industrial awakening people have already become alive to the necessity of starting regular industrial and technical schools all over India. We should, therefore, invite the co-operation of the people and also invoke the aid of the Government in founding regular technical schools in India after the model of European and American schools, where special studies might be so pursued as to yield the highest intellectual discipline and mental culture.

The art schools of Oxford and South Kensington and the technical universities of France and Germany are model institutions. In all schemes of special training much importance should be attached to general culture and mental discipline. In all these matters Germany leads the way, because the special studies are pursued more with an eye to their disciplinary than to their professional value. The success which Germany has achieved in the commercial world is due to her complete and up to date educational system. We should, therefore, take Germany as a model for founding technical institutions in India on the broad and solid basis of general education.

As regards the third scheme, I may only remark here, that the raising of a provincial or national fund, to meet the expenses of bright and intelligent boys who are inclined to receive technical education in foreign countries but unfortunately have not the means at their command, should be taken on hand at once.

There is no doubt that the Government of India has given encouragement to young Indian boys to prosecute their studies in foreign countries. The Education Commission recommended the establishment of courses of study intended to fit youths for commercial and other non-literary pursuits, and the Government of India in its Resolution of October 24, 1884, endorsed the recommendation, adding "that every-variety of study should be encouraged, which may serve to direct the attention of the native youth to industrial and commercial pursuits." The scheme cannot, however, satisfactorily be worked out, without the co-operation of the people. It is, therefore, extremely desirable that we should set to work in right earnest, in creating a national fund, and at the same time to guide a fair proportion of the educated classes in the path of industrial pursuits. Those who take an interest in learning applied chemistry, i. e., spinning, dyeing and tanning, may be sent to the Yorkshire College of Science, which is affiliated to the Leeds University, and is best suited for the study of applied chemistry. While those who have a taste for mechanical engineering and watch-making, may be sent to the Geneva Institute, which is open to all and where living is cheaper than in England. Students should, however, know French before starting for Geneva.

As regards the fourth suggestion, I may remark here that those Indians, who have already returned to India after completing their course of education in Japan, America or other countries, should be placed in charge of technical institutes and impart specialised instruction to the students. They would thus confer the benefits of their education on the general public.

As regards the fifth suggestion, I should say that unless we start large factories, and mills to be worked by steam-driven machinery, we cannot manufacture articles of every day use, in sufficient quantity to meet the daily demand. There is much waste of time, money, and energy where only hand-labour is employed, and there is very little margin for profit left for the capitalist in such concerns. If we do not employ up-to-date machinery, we cannot find a ready sale for our articles manufactured in India, nor can there be a market for them in foreign lands. The reason of this is not far to seek. The industrial competition, which is so keen even among civilized countries, runs no longer on the lines of excellence of material and solidity of workmanship, but greatly on the lines of artistic charm and beauty of design. This is the main principle which should guide our countrymen in the manufacture of articles of merchandise if they really want to seek foreign markets.

I now conclude these few remarks bearing on the general principles on which the industrial development of India should be based and hope that the general public will take them to heart. Their Highnesses the Maharaja Gaekwar of Baroda, the Maharaja of Kapurthala, and nine other princes who promised in England, to lend their support to the cause of technical training in India, may only be reminded of their patriotic undertaking.

THE EXPANSION OF COMMERCE IN INDIA.

BY BALAK RAM PANDYA, Esq., of Messrs. Basant Ram
and Sons, Lahore.

This paper is coming out at an anxious time in the history of the Indian nation. There has been great agitation in Bengal. We know that Eastern Bengal and Western Bengal are seething with discontent. Bengal is the scene of a furious struggle over its Partition. People are throwing away European goods in favour of Swadeshi articles. Monster meetings are being held in various parts of India, particularly in the Bengal Presidency. There is no lack of patriotic speeches and stirring appeals in the public press. But, gentlemen, I ask how many of us have given serious thought for devising practical ways and means for the establishment of commercial and industrial institutions throughout the length and breadth of the country so essentially needed for our economic regeneration? How to make this Swadeshi movement a living, lasting success? Not by lectures or big processions, not by monster meetings and sentimental appeals, but by calm business-like grasp of the situation and by setting ourselves earnestly and steadily to work the problem of the

development of our economic resources to supply our own needs of life. Europe and America have become wealthy and prosperous mainly on account of their industries and commerce. Japan is doing wonders, and there is no reason to doubt that we can similarly achieve success if we only avail ourselves of our opportunities. These are : (1) a wide-spread knowledge of the English language in the country, (2) the availability of literature of all kinds, grades and qualities in that language, (3) the facilities of trade and communication with the whole world, and (4) the examples of organisations furnished by the Post and Telegraph offices, the railways, the steam navigation companies and innumerable other institutions. Gentlemen, we do not take enough advantage of the English language. There is not a science or an art which we cannot learn and master if we care to study it in English books and in the Englishman's country. There is not a branch of human study which cannot be carried on to its ultimate end through the medium of this language. There is not a department of human activities which has not been organised and regulated by Englishmen beyond our dreams. The Englishmen possess the character of conquerors, organisers and rulers, and we should study them and imbibe their good qualities so far as we can. They have placed at our service the results of their high intellect and energy in facilitating intercommunication and acquiring a knowledge, both theoretical and practical, of things which the expenditure of crores of rupees would not have provided.

Gentlemen, the Roman empire fell because it was attacked by the Goths and the Huns. The Goths and Huns are pouring into India now in the shape of foreign goods. India must be up and doing, determined both to resist the invader and to establish her own dominion. It is a truly patriotic duty, therefore, for every Indian to help in the development of India's industry and India's trade. But there need be no superfluous patriotism in industrial schemes. Patriotism must be in the business-man's heart, not on his show cards. The industrial patriot must remember that the standard of his productions should be high, that Indian goods should not prove a disappointment to the buyer. If the Indian public should form a general impression, as the result of experience, that, for example, matches made in India fail to light, that sealing wax made in India fails to melt, that pen-knives made in India fail to cut and that lamp chimneys made in India are peculiarly brittle, it is not to be supposed that the public would be so patiently patriotic as to continue to use bad articles for the sake of the Indian manufacturer's benefits. There is evidence in abundance that goods of the very highest class can be made in India, and it is on goods such as these that India's hopes must rest. The manufacturer who turns out high class goods on an economic basis at prices that defy foreign competition and who waits patiently for the reward that sooner or later will assuredly be his is building up India's success and his own.

If Indian commerce is to increase on a substantial scale the Joint Stock system must be developed. Private firms in India are seldom rich enough to finance large enterprises; and therefore, if large enterprises are to be undertaken, the citizen of India must be taught to invest his money in Joint Stock concerns. The people

must learn to subscribe the necessary capital amongst themselves, then to elect an Executive Committee who will appoint a manager and finally to keep a watchful eye on the developments and look out for their profits. In other words, they must learn to form and nurse Joint Stock Companies for industrial development. But here in Indian towns there is great diffidence even on the part of educated men to invest their money in Joint Stock concerns, and except in and around Bombay, Ahmedabad and somewhat in the Punjab, commercial instincts have not made themselves felt. As long as this backwardness continues, Indian enterprise must remain largely in the hands of private individuals and private firms, and the development of larger schemes will be neglected and delayed. Gentlemen, it should be remembered that the moneylender's capital never increases in its own intrinsic value. A hundred rupees at the beginning of the year is worth a hundred rupees at the end. In the case of careful industrial investments on the other hand, the actual intrinsic value of the shares may increase and the investor profits not only by the interest but also by the increased value of his capital. Say, he invests a hundred rupees in a new industry. If it is successful and pays 8 per cent. at the end of the first year, it is not unlikely that his shares may then be worth, say Rs. 120, so that his actual interest is not 8 per cent. but 28. The profit that is sometimes made in this way by industrial enterprise is enormous. Consider, for instance, the coal mines in Bengal. We will consider one mine in particular, the Katras Jherriah Mine. Some years ago the shares in the Katras Jherriah Company could be bought at par value of 10 rupees. Indian coal then came into demand, and the shares in the Katras Jherriah Company ran rapidly up till they were bought and sold at rupees 42, a dividend having meanwhile been paid at the rate of 40 per cent. per annum. This, however, was not all. The coal fields owned by the Company were larger than the Company could conveniently work and a part of their land was accordingly sold to a new Company, the Sibpur Coal Mining Company, which, in payment for its purchase assigned to each shareholder in the Katras Jherriah Company, free of all cost, four shares in the Sibpur Company, valued at Rs. 5 each, for every four shares that he held in the original concern. The public demand for these shares was such that in a very short time the five-rupee shares were bought and sold at 14 rupees.

Consider the profits of a man who had bought shares in this Company. The Indian capitalist, although he may hope for good profits, must not expect to find this sort of investment open to him every day. I may add that the success of these Indian Coal Companies must be regarded as of an extraordinary kind. The sudden demand for Indian coal was mainly due to the exigencies of the South African war and the extra demand might have dropped off altogether as soon as the war was over, and many a speculator might have been ruined. As a matter of fact, however, this was not the case, for the South African purchases were splendid advertisement for Indian coal, which till that time had been somewhat neglected by consumers.

Gentlemen, people say that some Joint Stock Companies have failed in India. The answer is that no doubt small glass factories,

match factories, and a few others had been started and have failed, but that their failure was due to the fact that they had, as a rule, been started without a sufficient knowledge of the conditions of the industry concerned, without proper technical knowledge on the part of the craftsmen, and without the amount of Capital necessary to equip the work aright, and to keep it going till the industry had turned the corner and profits had begun to come in. A "factory" where the office is a dingy hovel in which a half-naked clerk seated in a broken chair before a rickety table represents the staff and where three or four coolies pottering about on the floor represent the factory hands is not the sort of factory that will succeed in this age of machinery, steam and electricity. Grand offices and steam machinery may not be the requirements for success of all concerns, but things should be sufficiently respectable to beget confidence, and the failure of crude mushroom companies must not be set to the discredit of industrial enterprise.

Gentlemen, it is a regrettable state of affairs when every man mistrusts everybody else. It goes without saying that there are in India crowds of honourable men of unimpeachable integrity, but this general sense of mistrust between man and man must necessarily be a most serious obstacle to Joint Stock development. The best thing for the Capitalist in this matter is that he should be wide-awake, that he should learn to put reasonable trust in his fellowmen, and that he should remember that in a well-organised Company it is not easy for anybody to cheat. The administration of a Joint Stock Company's Capital is very different from the administration of temple funds. With an organised staff under a Manager of experience and of good repute, with a fairly large body of influential directors, and with a responsible Auditor of Accounts, it would be well nigh impossible, if everybody did his duty, for fraud to go undetected. The shareholder, moreover, receives his balance sheet; and at the yearly or half-yearly meetings he may heckle the Directors to his heart's content over and above the advisory visits with which, in his character of a proprietor, he may worry the Manager in the interim.

Gentlemen, why should we not float Joint Stock Companies in India in large numbers and of various kinds? Organisations for banking, insurance, transportation, trading, mining and manufacturing should be called into existence. Both the theory and the practice of such questions should engage our attention. For instance, Banking is a business of general interest to the community. The number of those interested in it is very large. The holders of shares in Banks are counted by thousands, and hundreds of thousands more are interested as customers; to all of whom the subject is a matter of personal concern. The utility of banking comes home to different classes of the community in very different ways. To those engaged in business, whether that business may take the wider forms of commerce and the larger branches of industry or the narrower limits of retail trade, whether it may be a great railway or a small shop in a back street, a Bank provides a convenient depository at which the trader may leave what spare cash he has till the moment he requires it; and more, a depository whence, if circumstances render it advisable, he may obtain on suitable security an advance which will enable him

to increase his profits and permit him to carry out plans for development which without such assistance, could never have been accomplished. There are Sahukars who deal with money, but these firms carry on small business and command small capital, and their business, as a rule, is confined to a narrow area.

Gentlemen, let me say a few words about insurance. The essential feature of all insurance is that it enables the insured to escape from a position of financial uncertainty into a position of financial certainty. The loss of a vessel, the outbreak of fire, the occurrence of an accident, and premature death are risks which at least in their financial consequences may be guarded against by means of insurance. While individuals may thus be freed from uncertainty, insurance companies, by taking the risk do not place themselves in a risky or uncertain position. The man who buys one ticket in a lottery obtains one chance of winning in return for a certain payment; but the man who buys all the tickets in a lottery eliminates chance, and is sure of winning the prize. This is what is done by insurance companies. By taking a large number of risks they can be certain of experiencing average results and in practically all matters the accumulated experience of the past is a reliable guide to the average experience of the future. Why should we not have our own insurance companies? Why should not every life in the country be insured against risks of sickness, old age and other incapacities common to human and more particular to Indian life? Why should not every family be insured against the risks of death of the bread-winner? Why not every house that human effort brings into existence be assured a permanency by being insured against risks of fire, storms, earthquakes and other accidents? Why not the crop that is reared by the husbandmen be insured against droughts, insects, and other calamities? and so on and so forth. If in England, as we are told, window glasses are insured against breakage, what a nice thing it would be if milk could be insured here against inroads of cats that deprive ourselves and our children from drinking sweet milk on many an occasion! We should solve these problems of various technical subjects.

I pass on to another subject, that is, transportation of goods, which is another question which requires our serious attention. It may concern a ricketty bullock cart, or a system of Railway like the B. B. and C. I. Railway, or a system of navigation like the P. and O. Steam Navigation Company. I am not mentioning these institutions as practical probabilities of the near future, but if we study the matter closely, and from the point of view of creating such companies, we shall find that our efforts must be directed on the path of enquiry into the factors that combine to assure success: training ourselves and our co-workers in the art of doing the things properly and so systematising the whole thing that every piece of work that requires to be done is attended to, that everybody who is employed finds sufficient work to do and is put on work that he can do best, and that the work is done punctually and carefully so as the whole field of operations is made best conducive to the attainment of the objects in view with a minimum expenditure of labour.

The export and import trade of India totals up very nearly 250 crores of rupees every year. What amount of employment can be found in the higher branches of this trade in and out of the country, can be properly gauged only by those who are actually engaged in it. I would say it would afford employment to thousands and yield profits of crores. There is ample scope for any number of industries and branches of commerce in India.

THE PRECIOUS STONES OF INDIA.

By BABU AMBICA CHAKRAN, B. A., *Department of Mining and Metallurgy, Imperial University, Kyoto, Japan.*

I.—DIAMOND.

The first place will be given to diamond not only because it is the most precious of stones, but because it has been known longer in India than in any other country and the most beautiful, famous and many of the largest stones were found here. The rich adornment with this and other precious stones of the oldest temples goes to show that the art of diamond cutting has long been understood. Until the discovery of the Brazilian deposits in 1729, the supply of the whole was derived almost entirely from India.

The diamondiferous sandstone of India is of very wide distribution, all of which belongs to the Vindhyan formation; the southern diamond districts belong to the lower division, namely, the Karnul series, while the northern districts, *e. g.*, those in Bundelkhand, belong to the upper division of the above-mentioned formation.

The mining of diamonds is still almost entirely in the hands of Indians, and attempts on the part of Europeans to take it away from them, have, fortunately, seldom been attended with success.

The diamond mines of India have been arranged in the following five (5) groups by C. Ritter, a German mineralogist, in his *Erdkunde von Asien* :—

(1) THE CUDAPAR GROUP.

At the present time the majority of the mines in this group are abandoned, but it does not follow that the supply of diamonds has been completely exhausted. At Chennur, the principal mine in this group, many stones, some of very fine quality, have been found. In two particular cases Rs. 75,000 and Rs. 45,000 were obtained for single specimens. At Wajra Karur was found in 1881 a diamond valued at Rs. 1,80,000. Some of the largest and most famous of Indian diamonds are said to have been found here. Diamonds occur in a very peculiar way at this place: they lie loosely scattered about on the surface of the ground, and there is no definite diamond-bearing bed. This peculiar mode of occurrence has not as yet been satisfactorily explained.

(2) THE NANDIAL GROUP.

This group includes some of the most famous mines ever worked in India, most of which, however, are now abandoned. The most remarkable of these are the Ramulkota mines which are probably identical with the Raolconda mines mentioned by Tayernier, a French traveller and dealer in precious stones. At the time of his visit in 1665, these mines had been worked for 200 years, and were a source of much wealth. Further details are not just now available.

(3) THE GOLCONDA (OR ELLORE) GROUP.

The largest and most beautiful of Indian diamonds were derived from these so-called Golconda mines. They derive their name, not from their situation, but from the fact that the diamonds from these mines were sent to the market held near the old fortress of Golconda.

The richest of the mines to the east of Golconda were those of Kolher discovered about 1560. A 25-carat stone was first accidentally found, and numerous others soon followed, many weighing more than 40. Such famous diamonds as the "Kohinoor," the "Great Moghal," and the "Hope Blue" were probably found here.

From the Partial* mines on the Krishna river is supposed to be derived the "Pitt" or "Regent" Diamond, now in the French Crown jewels.

In the district in which this group is situated, which lies partly in Hyderabad, the "Hyderabad Company"—of course an English company—has acquired working rights and is making immense profit, while we, dormant as we are, are sleeping, or, even if awake, are only fighting for petty clerkships.

(4) THE SAMBALPORE GROUP, ON THE MAHANADI.

The whole diamond-bearing stretch of the Mahanadi is about 28 miles long. The most important place is the "Hira Kund," an island 4 miles long, where was found in 1809 a diamond weighing 211 carats. Its subsequent history, however, is unknown. In the Mahanadi, diamonds are associated with pebbles of heryl, topar, garnet, carnelian, amethyst, and rock-crystal.

The mines of Wairagarh, in the Chanda district of the Central Provinces, though abandoned at present, are likely to become of importance at no distant date, for, though Indians are sitting with their eyes closed, the world at large has them wide open.

(5.) THE PANNA GROUP IN BUNDELKHAND.

Large stones have seldom been found in this district, but the number of smaller diamonds of good quality found now as well as formerly, is considerable.

The mine at Majgoha (Maigama), south-west of Panna, though apparently abandoned at present, is not considered to be exhausted, but is reserved for future working.

With respect to the quality of Indian diamonds, detailed accounts are not available. But, as a general rule, Indian stones rank high in the possession of the most desirable qualities. An Indian stone shows a combination of lustre, purity of water, strength of fire, and perfect "blue-whiteness" of colors, such as is absent from Brazilian and South African stones. Moreover, India can claim for her own all the finely colored stones of blue, green, and red.

I shall now proceed to give a brief history of some of the more famous Indian diamonds. Probably the largest of them is the Great Moghul, the history of which is very obscure. It was seen in the Treasury of Aurangzeb in 1665 by Tavernier. It had the form of a very high and round rosette, and was of good water. It weighed 319½ ratis, or 188 carats. The rough stone is supposed to have been found about 1630 in the mines at Kolher, and to have originally weighed 787½ carats. The considerable disparity between the weight of the rough stone and its weight when cut, has been attributed to the unskilful manner in which it was cut by Hortensio Borgis, the Venetian diamond cutter, who at that time was domiciled in India. The subsequent history of the Great Moghal is a complete blank; it has been variously supposed to have been lost or destroyed, to be in existence under another name, such as the "Orloff" diamond, or the Kohinoor, to be in the possession of the Shah of Persia, or to be lying forgotten among the jewels of some Indian prince.

Another large diamond of the same weight, namely 320 ratis, is described in the memoirs of Babar. This stone is regarded as being identical with the diamond seen at Delhi by Tavernier, and identical with the stone at present known as the Kohinoor.

In 1813 the Kohinoor was the property of our Ranjit Singh, the Lion of the Panjab, who when asked its price replied, "panch jootian" (पाँच जूतीयां). In 1850 it was taken to England where it still remains. It has been recut and is now a stone of considerable beauty, weighing $106\frac{1}{16}$ carats. It is valued at 15 lakhs of rupees, but, in fact, it is invaluable. It cannot be bought by money and can only be taken by force. The question as to the identity of the Great Moghal with Kohinoor can scarcely be now decided. Tennant regarded them as identical, and suggested that the Kohinoor and the Orloff are both parts of the rough stone of 787½ carats, mentioned by Tavernier, and that the third and remaining portion of it is the plate of diamond weighing 132 carats, often mentioned as having been taken by Abbas Mirza with other jewels from Rera Kuli Khan at the capture of Cocha, in Khorassan. Tennant constructed models of these separate portions in fluor-spar, a mineral which has the same octahedral cleavage as diamond, and by piecing the portions together arrived at the conclusion that the rough stone had the size of a hen's egg, the form of a rhombic dedecahedron, and a weight of about 793½ carats, which agrees closely with Tavernier's account.

Opinions differ as to the origin of the name Kohinoor which, signifying Mountain of Light is supposed to have been the name given to it by Nadir Shah. It has also been supposed to be a corruption of Kollur, the locality at which it was found, and the name by which it is said to have been formerly known in India.

The "Orloff" is the largest of the diamonds comprised in the Russian Crown Jewels, and usually forms the termination of the imperial sceptre; it is a stone of the finest water, perfectly pure and with a brilliant lustre. In form it is very similar to that of Tavernier's drawing of the "Great Moghul." This stone has had a chequered career; it is said to have once formed an eye of an image in a temple on the island of Srirangam, in the Cauvery river near Trichinopoly. It was stolen from there by a French soldier, passed into the hands of an Englishship's captain, and having found its way into Europe was bought in 1791 at Amsterdam by Prince Orloff for the Empress Catharine II of Russia.

The "Moon of the Mountains." This diamond, which weighs 120 carats, became the booty of Nadir Shah, who used it for the adornment of his throne. At his assassination it was stolen by an Afghan soldier, from whom it passed into the hands of an Armenian, named Schafras, who sold it to Catherine II for 450,000 roubles, an annuity of 4,000 roubles and letters of nobility.

"Akbar Shah," so called from its first possessor, when in the possession of Jehangir, had Arabic inscriptions engraved on two of its faces. It subsequently disappeared for a long period, reappearing in Turkey, comparatively recently, and still recognisable as "Akbar Shah" by its Arabic inscriptions. It at first weighed 116 carats, but after recutting in 1866 its weight was reduced to 72 carats and the inscriptions were lost in the process. In 1867 the stone is said to have been sold to the Gaekwar of Baroda for Rs. 5,25,000.

One of the largest of Indian diamonds is the "Nizam," a stone of 277 carats, which is supposed to have been picked up by a child on the ground in the neighbourhood of Golconda. It was originally in the possession of our Nizam, who, it is said, was in a way obliged to send it to England.

A large diamond of singular beauty, perhaps the most perfect of all, is the "Regent" or "Pitt," at present preserved among the French Crown jewels. In its rough condition it was the largest of all Indian diamonds. It was found in 1701 in the Partial (परतिपाल) Mines on the river Krishna, and was bought for Rs. 3,06,000 by Governor Pitt of Fort St. George. In 1717 it was acquired in its rough state by the Duke of Orleans, then Regent of France, for 12 lakhs of rupees. The stone when cut was a brilliant of the most perfect form. In the valuation of the French Crown Jewels, made in 1791, this diamond was valued at (seventy-two) 72 lakhs of rupees. In 1792 it was stolen along with many other crown jewels, but was subsequently recovered, and after being pledged at the time of the Revolution was redeemed by Napoleon. Being an object of general interest, it was not disposed of with the other crown jewels, but has remained up to the present time one of the most beautiful and valuable of the jewels belonging to the French nation.

The "Nassak" diamond so called from its originally being in the temple of Siva at Nassak on the Godaveri, was till 1818 in the possession of Ranjit Singh's descendants. Its fate, however, has been the same as those of many others, and it is now lying in England in the treasure of the Duke of Westminster.

Thus ends the history of the Indian diamonds, all or almost all of which have left India and carried away with their own brightness, the grandeur of their land. The ancient land of diamonds and of their worthy wearers, Babar, Akbar, Sivaji, and Ranjit Singh, is now a land of darkness and starvation, crumbling to pieces at every moment and sinking down and down, Goodness only knows when to rise again. But if the blood of the departed heroes of Hind still runs in our vein, the day is not far off when the sons of India working with one united effort will accomplish the salvation of their once glorious land.

II.—SAPPHIRE.

One of the important localities is the Sanskar Range in Kashmir. The exact locality was for a long time kept secret from Europeans, but in 1881 it became known and passed into English hands. The valley in which the sapphires are found is 1000 yards long and 400 yards wide, and is about 13 days' journey from Srinagar. From the deposit the gems can be picked out by hand "like potatoes," though they are, of course, also won by washing.

The fine blue colour of the sapphires of this locality first attracted the attention of the inhabitants, who, not knowing their value often used them for striking fire. They were so abundant at first that large numbers were collected by the people and sold to the gem merchants of Simla and Delhi, who, supposing them to be blue quartz or amethyst, purchased them very cheaply.

Numerous dark-brown or green tourmalines are often observed enclosed in, or growing on the surface of, the crystals of sapphire. The crystals are frequently very large, specimens suitable for cutting having been found measuring 5 inches in length and 3 inches in thickness, while some are so much as a foot long.

Sapphires are found in the Hamta Pass in Kulu in the Panjab, as well as at other places.

III.—AQUAMARINE.

Various objects worked in the aquamarine have been found in ancient tombs, temples, &c. Most of them appear to have been obtained in the Coimbatore district, as at Paddur or Patiale. At Kangayam in the same district was found a stone of the most perfect transparency, which weighed 900 carats and sold for Rs. 7,500.

Pale blue crystals of fair size, sometimes measuring as much as 3½ inches in length, are found at many places in the Punjab in granite veins penetrating gneiss. In the Jaipur State aquamarine is mined in the neighbourhood of Toda Rai Singh in the Ajmere district, in the Tonk Hills, and at various other places.

Small crystals of yellow heryl occur imbedded in a thick vein in the Hazaribagh district.

Detailed information regarding other reputed localities is not just now available.

IV.—GARNET.

Garnet is of wide distribution in India. The precious alwandine occurs in such large quantities that it forms an important factor in the

industry of our country. It is collected and cut at many places, especially at Delhi and Jaipur. The stones suitable for cutting as gems are all obtained by excavating and washing the weathered products of gneiss and similar rocks. There are workings of this kind at Kondapalli in the Godavari district. The garnets found here have been derived from a horablendegneiss, and have been long famous. At Bhadrachalam, on the Godavari river in the Central Provinces, as well as at Mahanadibett, in Orissa, garnets of the same kind are obtained. Stones of better quality come from Gharibpett, eight miles south of Paloncha in Haidarabad.

The garnet mines in Rajputana are a more important source of supply. The mines of Sarwar in the Kishengarh State yield a good supply. Stones from Sarwar are smaller than those from the garnet quarries of Kakoria in the Jaipur State. The quarries of Rajmahal also situated in this State yield garnet, in a less abundant degree though. Garnets are found at Meja in Udaipore, and also at several places in Mewar. Garnet of gem quality is found at many other localities.

V.—TOURMALINE.

The name originated in Ceylon, where *turamali* is the name used by Cinghalese jewellers for hyacinth.

Five specimens of blue tourmaline or indicolite (indigolite) are very rare in other parts of the world, but they occur with green tourmaline, lepidolite, and quartz in the granite south of Pahira, near Hazaribagh. The largest crystals found here measure an inch in length; the central portion of the crystals is sometimes indigo-blue and the outer layers green. Blue tourmaline associated with the yellow and brown varieties occurs also with the sapphire of the Sanskar range in Kashmir.

VI.—ROCK-CRYSTAL.

It was, and is still, worked in India in various ways, but the objects now carved and worked in this material do not bear comparison with those of bygone times. The industry is still said to be in operation at Vellum, in the Tanjore district, where brilliants, rosettes, spectacles, lenses, &c., are produced. A once famous centre of this industry is Delhi, the bowls, vases, drinking-cups, and other objects carved there being renowned for beauty of design and skill in workmanship. The art is now forgotten, but the old mines at Aurangpore, fifteen miles south of Delhi, are still to be seen. There are, besides, many other localities in India for rock-crystal.

VII.—QUARTZ-CAT'S-EYE.

The finest quartz-cat's-eye is found in India where it occurs mainly on the Malabar coast. But details are not known. At Ratanpur, in the district of Rajpalia (Bombay), the stone occurs, together with agate, in the form of pebbles, which are undoubtedly derived from the basaltic rocks—the Deccan traps—of the region. Other localities are in the vicinity of Madras, and in the valley of the Lower Krishna in the neighbourhood of the Palanath mountains.

In Ceylon the stone occurs abundantly.

VIII.—CARNELIAN.

In India blocks of Carnelian, weighing as much as 3 lbs., are found in the Rajppla hills, at Ratanpur, on the lower Narbada river. The material as it is found in the mines is blackish, olive-green, milk white, or, in fact, almost any colour except red. This tint is acquired after the stone has been heated, the heating being effected partly by a long exposure to the sun's rays and partly by fire. Stones, of which the original color was olive-green, assume an especially fine tint on heating, they are very valuable, and are largely cut in the neighbourhood of Cambay.

Deposits of Carnelian are worked also on the Mahi river, north of Baroda, and the mineral is found at many other places in the volcanic district of Western India, but is not everywhere collected and worked. Moreover, pebbles of Carnelian are found together with jasper and other varieties of chalcedony in almost all the rings. Carnelian, likewise, occurs in the volcanic rocks of the Rajmahal Hills.

IX.—PLASWA AND HELIOTROPE.

A considerable amount of Plaswa is obtained from India. It is especially fine in quality here, and occurs like Carnelian in the volcanic rocks of the Deccan, especially in the district south of the Bhima river in Haidarabad, and as pebbles in the rivers Krishna and Godavari among others.

Heliotrope is also called 'blood stone' from its green colour being spotted, patched, or streaked with a fine, blood-red. It is obtained almost exclusively in India, where it occurs with Agate, Carnelian, Plaswa, &c. A famous locality is the district north of Rajkot, where masses weighing as much as 40 lbs. are found. It is also found at Poona. It is also supposed to occur in the Rajmahal Hills, but nothing definite is known. Compared with the Indian occurrence of heliotrope that of Europe is quite insignificant.

X.—AGATE.

The mother-rocks of agate and other varieties of chalcedony are the amygdaloidal rocks or so-called traps of the Deccan Plateau. The crevices and amygdaloidal cavities in these rocks are everywhere filled with agate, carnelian, etc., which are set free by the weathering of the mother-rock and are found loose in the ground or as pebbles in the Godavari, Wardha, Krishna, Bhima, and several other rivers rising in or flowing through the Deccan. In some places the angular or rounded blocks of chalcedony are more or less firmly bound together by a ferruginous cementing material, thus forming extensive and sometimes thick beds of conglomerate, which constitute the main source of the material used for cutting.

The best known deposits are at Ratanpur, from where for more than 2000 years the lapidaries at Broach have obtained their supplies of rough carnelian, agate, &c.

The lapidaries of Banda on the Khan, a tributary of the Jumna, in which a large number of pebbles of chalcedony are found, deserve mention as being once very famous.

The lapidary works which are of the greatest importance at the present day are those at Cambay, from where articles worked with exquisite finish are exported to Europe.

The murrhine vases, famous in ancient times, are said to have come from Ujjain.

Fine dendritic agates are met with as pebbles in Jamuna, and the mineral also occurs in large quantity north of Rajkot and the Kathiawar peninsula, and in the bed of the Majam river. Here are found blocks of spherical, botryoidal, or amygdaloidal form, weighing as much as 40 lbs., as well as rounded pebbles.

XI.—MISCELLANEOUS.

Olivine of gem quality occurs in India, but the locality is not definitely known.

The best crystals of kayainte go to Europe from some unknown localities in India.

Nephrite occurs in the southern part of the Mirzapore district.

Amethyst occurs in India though not in considerable quantities.

Very fine crystals of chrysoprase are exported to Europe, but exactly where they are found does not seem to be known.

Good specimens of Riband-jasper are found in Chutia Nagpore.

Fine specimens of Avanturine are met with in India, but nothing definite is known as to their mode of occurrence or the exact locality. A very pretty green glistening variety from the Bellary district, deserves mention, the scales of mice enclosed in it are of green chromiferous variety known as fuchrite, and the mineral itself occurs in blocks from which slabs of considerable size can be cut.

With a word to our rich and patriotic men I shall conclude. The mining industry is one in which we cannot afford to wait. Once a foreigner gets hold of a mine, all the wealth therein goes away from our country never, never to come again. If we have a bad harvest one year we might have a better one in the next, but the mineral wealth once removed from India can never be recovered. It takes thousands of years before a mineral deposit is formed, and there is nothing like sowing and reaping in the mining industry. Feeling on the point more keenly than I can express, I make an earnest appeal to our monied men to spend even a part of their money in sending Indian youths, to learn mining, to America and Germany. The Japanese Universities are overcrowded, and in England the education imparted is not of a very high order. I sincerely hope that my words will not fall on unwilling ears.

“Not in vain the distance beckons
Forward, forward let us range.”

APPENDIX III.

Before resolving to hold the First Indian Industrial Conference at Benares, the Executive Committee of the Fifth Indian Industrial and Agricultural Exhibition of the Indian National Congress, under whose auspices it was held, addressed the following circular to about a hundred prominent Indians in the several provinces, with a view to ascertain their views on the matter :—

SIR,—I take the liberty of addressing you in pursuance of the following resolution passed by the Exhibition Committee at a meeting held on the 6th May :—

“That the opinions of the persons named below be invited on the desirability of holding an Industrial Conference in connection with the Exhibition and as to the lines on which it should be organized if held.”

You are one of those whose opinion is solicited by the Committee on this important matter. It will perhaps make matters clear if I give you a general idea of the scope and purpose of the Industrial Conference which the Committee have in mind.

2. The deplorable poverty of the bulk of our countrymen, aggravated by recent famines and the ravages of the plague, have placed the economic question in the forefront of national problems demanding early solution. The Indian National Congress has from the very beginning recognized its paramount importance, and has held discussions and passed resolutions on this question at every one of its annual sessions. During recent years it has given the subject even greater attention, and placed it in the very front rank of the questions to be considered.

3. The awakening of the nation to the need for industrial activity has manifested itself in the shape of the Industrial Exhibition held in connection with the Congress since 1901. A special feature of the Exhibition held at Bombay last year was the addition of an agricultural side to it. The Congress Reception Committee of Benares have decided to hold the Fifth Exhibition this year, and this Committee are entrusted with the task of organising the same.

4. The Committee recognize that these Exhibitions are excellent, calculated as they are to open the eyes of the people to the present condition of Indian industries and the possibilities of their future development; but while a knowledge of these is a condition precedent to the beginning of practical effort, the knowledge must be followed by well-considered and well-directed action before it can be turned to advantage. Clear and accurate knowledge as to the directions in which effort should be made for industrial development and the best means of achieving success in those directions should be made available to the people through those who have made a special study

of such subjects. It seems to us that to secure this end, it will be useful to organize an Industrial Conference in connection with this year's Exhibition, at which papers should be read on a few selected subjects, discussions held on the views enunciated therein, and resolutions may be passed embodying the conclusions arrived at by the Conference. With a view to secure the aid and co-operation of all competent men—Anglo-Indian and Indian, official and non-official—without reference to their political opinions, the Committee desire to make the Conference non-political in its character.

5. The selection of subjects and of writers of papers, as well as of persons to be invited to take part in the discussions thereon, the election of a President, the drafting of resolutions to be placed before the Conference, and other matters of procedure and detail, will have to be decided later if the general opinion be in favour of holding such a Conference. The present idea is to definitely settle the subjects and the writers of papers by the end of July.

6. I have the honor now to solicit your opinion on the points brought out in this letter, which are summarised below, and I shall esteem it a favour if you will send in your reply not later than the 20th of June :—

(1) Should an Industrial Conference be held in connection with the Congress Exhibition?

(2) What subjects should be taken up for consideration thereat?

(3) Who are the gentlemen—European and Indian, official and non-official—who should be invited to prepare the papers on the subjects that are suggested by you?

(4) Should the reading of papers be followed by discussions?

(5) If so, would you suggest the names of those who might be invited to take part in them? and

(6) Should resolutions be submitted to the Conference on the subjects brought forward?

Any other suggestions that you may be kind enough to offer will, I need hardly say, be gratefully received and considered by the Committee.

I have, &c.,
(Sd.) MADHO LAL,

Chairman of the Exhibition Committee.

The following extracts are taken from some of the replies to the above circular :—

DEWAN BAHADUR K. KRISHNASWAMI RAO, C.I.E.,
Madras.

The exhibitions that have been held since 1901, have, no doubt, done good service in showing us what our industrial and agricultural condition and capabilities are. I fully concur with your committee that these exhibitions should be followed up by "well-considered

and well directed action" for our industrial and agricultural improvement. I offer my most hearty congratulations to you and your committee on the conception of this idea which, if carried into effect, will make the exhibitions more business-like.

The Government of India have been recently paying attention to the agricultural improvement of India. The opening of the Pusa Institute and the establishment of demonstration farms in several places, may be taken as an earnest of their benevolent attitude towards agriculture. But in the matter of industrial development, I fear that we should rely more upon ourselves than on Government. What is most necessary is that a number of competent and experienced native gentlemen should form themselves into a standing committee to make a comparative study of various industries with special reference to their financial success and select the most promising of them, to begin with. "One thing at a time" should be their motto. I will have on the committee, intelligent and successful merchants, traders, and artisans, although they may be ignorant of English. They are almost intuitively able to discern what will pay and what will not. It is only those who make a careful observation and study, from day to day, of the manifold aspects and workings of any industry, that would be competent to give practical and sound advice.

There must be a standing committee in every important industrial or commercial centre in India. The Industrial Conference should mainly consist of the members of such committees and of gentlemen who have taken special interest in industrial subjects or who are pioneers of industries or who are carrying on industrial operations. A conference thus constituted will be able to command the respect of the public and secure the attention of Government. I expect no substantial good from an annual gathering, unless it is backed up and supported by standing committees. I know that it is impossible to constitute the *first* Industrial Conference on the lines above sketched. I only wish to emphasise that one of the chief objects of the proposed Conference should be the creation of standing committees who should work *throughout the year* and seek the aid and advice of the Conference on points of difficulty and delicacy, during its annual meeting.

I next proceed to give my opinion on the points mentioned in your letter in their order :—

(1) I think that an Industrial Conference is a desideratum and should be held in connection with the exhibition or even independently of it.

(2) The Conference should consider the following subjects :—(a) Establishment of standing committees in important centres of industrial or commercial activity; (b) the creation of funds for granting scholarships to selected Indian students for prosecuting technical and scientific studies in Europe, America or Japan; (c) the selection of the technical and scientific subjects to be studied, with special reference to Indian needs and requirements and *their financial success*; (d) the best means of utilizing the knowledge and the services of the successful students after their return to India; (e) the nature and extent of the help which the Government should be asked to give

to Indian industries with a view to their protection against foreign competition, and (f) the selection of industries which may be taken up at once and worked.

BABU BOIKUNTHA NATH SEN, *Berhampore.*

1. (a) The poverty of the bulk of our countrymen is no longer a matter of controversy, but is an admitted fact and the development of indigenous works of art and industry has drawn the attention of all who have the good of their country at heart.

(b) The Indian National Congress is avowedly a Political institution. The Social Conferences are held by people whose opinions vary in different matters connected with Social problems. But with regard to the Industrial development no apprehension can be entertained regarding differences of opinion. Official, non-official, Hindu, Mahomedan, Christian, or any one of any other religious persuasion, all must agree as to the necessity for improvement. There may arise differences of opinion regarding the ways and means for achieving success. Industrial Conferences may fairly be expected to be of great use in the adoption of measures and in imparting knowledge which would go to develop our industries. I am, therefore, distinctly in favour of holding an Industrial Conference in connection with the Congress Exhibition.

2. With regard to the selection of subjects our aspirations should for the present be not of a very high character. Capital proportionate to the magnitude of the work would be required for the initial start and for maintenance: but unused to the formation of Joint Stock Companies our countrymen find the greatest difficulty in raising funds and in succeeding in developing the natural resources of our Motherland. Individual efforts, I know by personal experience, are not very encouraging and seldom meet with the desired success. Theoretically speaking, our attention should be devoted to the improvement of those articles which are exported in raw condition and which come back to us as imports after being converted into manufactured goods. Jute, cotton, oilseeds, wool, hide, shellac, quartz sand, kaoline ought to attract the attention of my countrymen for the manufacturing of articles which are imported by crores and crores of rupees. Pottery works may be carried on and glass may be successfully manufactured if indigenous quartz sand and kaoline receive a fair share of treatment.

3. European gentlemen connected with European firms, and having liberal views, and European officials in the Financial department should be sought for for advice, and Indian merchants carrying on business respectably, and who have got special knowledge of particular subjects should also be resorted to, and they might be requested to prepare papers on different subjects. In this connection I would also take the liberty to suggest that some Baroda officials connected with the Financial department might very profitably be consulted. I may mention here that while at Bombay during the last Exhibition under the auspices of the I. N. Congress, I met with some Baroda officials and found after some hours' acquaintance and mutual exchange of thoughts that they have collected much information, and they can undoubtedly help by writing out essays on some important subjects.

RAJAH PEARY MOHAN MUKERJI, C. S. I., *Uttarparah.*

Only a few subjects should be taken up for consideration at the Conference; 1st, the appointment of a permanent Committee to make an Industrial survey of the country; 2nd, a provision for the submission of a detailed annual report by such Committee dwelling on the condition and prospects of Indian industries; 3rd, the creation of a fund for the support of decaying industries and the encouragement of new industries.

DEWAN BAHADUR P. RAJARATNAM MUDALIAR, C. I. E.,
Madras.

The question of the economic condition of the people has been discussed by the Congress year after year, and I venture to think that the time has arrived when we ought to be up and doing—doing something practical, something definite, towards the solution of this difficult problem. A few weeks ago I happened to be reading Mr. Edwin A. Pratt's book on "The Organization of Agriculture" in view to prepare a note for the information of the Central Agricultural Committee, which has recently been formed in connection with the Victoria Technical Institute in this Presidency. That excellent book seems to me to give us the key to the solution of the problem.

In the early eighties, most of the countries of Europe suffered from severe agricultural depression which threatened to involve the agricultural population in utter ruin, but they were fortunately saved by the establishment of co-operative agricultural societies. A perusal of Mr. Pratt's book will show how this has been effected. I enclose for the information of those who have not the time to read that excellent work, a copy of extracts that I had made, giving a brief account of the operations carried on by those societies in France, Germany, and Denmark.* It is simply astonishing that a small kingdom like Denmark, a country no bigger in size than the Central Provinces, should, by a system of co-operative societies, have achieved successes which have made her "a power in the commercial world with which other nations have had seriously to reckon."

Let each delegate start a similar co-operative association in his own sphere of influence, and I am sure that our salvation will be ensured. True, there are difficulties in the way. Denmark was a united nation. We are not. But we need not despair. Let the Maharaja of Benares and the Maharajah of Durbhanga come forward and set the example in their own estates, and see how soon it spreads.

DEWAN BAHADUR AMBALAL S. DESAI, *Ahmedabad.*

The principal subjects for consideration may be as follows:—

- i. The indication of the general lines along which industrial activity ought to proceed.
- ii. The selection of industries which ought to be introduced, and can be introduced at once.

* *Vide Appendix IV.*

- iii. The provision of technical education.
- iv. The specification of subjects which Indian students may, under the present system, study with advantage in foreign countries.
- v. The co-ordination of the efforts of various provinces for the introduction of new industries.
- vi. The promotion of agriculture in all its departments.

It has often struck me that owing to a want of clear perception of the immediate wants of the country, much of our time and resources are wasted as things are managed at present. I think that a conference, such as is proposed, is calculated to do much good in this direction, though it may not have to be held every year.

THE HON. SIR V. C. DESIKACHARI, *Kt., Madras.*

i. Encouragement to be offered for the revival of the already dying Industries—

- (a) By opening Emporiums in different parts as a medium to collect and register orders.
- (b) By making advances to artisans upon orders given.
- (c) By purchase of such articles in lax seasons, and exposing them for sale on a small profit.
- (d) By training young men of the artisan classes in improved methods of manufacture.
- (e) By opening small unpretentious—yet useful—Industrial Schools for training and giving Instruction free.
- (f) By starting Co-operative Societies for the supply of Indigenous articles and gradually creating a demand for them.

ii. Starting of new Industries on the same lines on which they are carried on in Europe and America—

- (a) By establishing in different centres manufacturing factories on moderate scales managed by two or three persons without having recourse to the unsuitable Companies Act.
- (b) Starting societies—say one for each Province—to collect Funds for maintaining students who go to foreign countries like Japan and America for receiving some kind of technical Education.
- (a) Starting model factories, not so much to make profit but simply to serve as models or training ground.
- (d) Establishing Societies purely with the object of collecting information as to—

1st. What raw materials are exported from different countries.

2nd. What use is made of such materials and how are they converted.

3rd. What kinds of finished articles are mostly in demand in our country ;

and issuing pamphlets and leaflets containing such information.

(e) Establishing free Libraries.

DEWAN BAHADUR R. RAGOONATH ROW, *Kumbakonam*.

Our industries have been considerably injured by our contact with the people of the West and this circumstance has impoverished our people and multiplied the number of famines in India. Any attempt to compete with the West without the use of machines the Europeans have invented and have been constantly improving is worse than useless. They take a good deal of raw materials from India, and manufacture their goods and sell them cheap in India. If we can retain these raw materials, use them for the production of goods by using machinery, we can beat the Western trade and procure livelihood for our people. To do this we want money and skilled labour. These we have not. We should get our people to learn the use and construction of machinery, not in our colleges here but in manufactories, &c., in Europe. This, again, requires money and enterprise. We are sadly in want of them. So long as the present bureaucratic Government continues, there will be no accumulation of capital in India. In these circumstances what we ought to do, I think, is first to secure capital by co-operative society or societies. To form these successfully we want rich men and patriotic gentlemen. These should work incessantly, intelligently, and economically, to get our men educated in Europe under a covenant, purchase machinery and employ European superintendents to work them till we can get our own people to supply their place. This should be the main object to be secured by the resolutions and actions of the Conference.

Our native mill owners have already effected something, but the owners appear to be actuated merely by the desire to gain good interest on the capital invested ; but this is not sufficient. To this should be added a strong desire to develop our industries in all possible directions for the good of the people in general. I would, therefore, answer the second question thus :—The subjects which should be taken up for consideration should relate to the increase of our industries, to improve what we have, and to utilize cotton, oilseeds, hides, &c., for manufacture in India. One annual three-day Conference will be of no use. There should be a general Conference for the whole of India, having branches all over the country, all working incessantly under the direction of the Head Conference.

K. NATARAJAN, Esq., *Bombay*.

The Conference, in relation to Government, must concern itself chiefly with questions of economic policy. And I, for one, think that the time is come when we ought to demand protection to industries till they are in a position to shift for themselves. I do not believe that the talk of industrial development can lead to much sustained action till protection, in some form, is assured to industries at starting.

As regards the public, the Conference can best serve its object by undertaking the provision, on a small or large scale, of facilities

for the aggregation of capital. The formation of a Bank or Banks, is an object worthy of its aspiration. The small savings of our population are frittered away, owing to ignorance of the value of co-operation. How to prevent this, and how to attract them to the Banks, are subjects which give the widest scope for our energy and ingenuity, informed, as it will be, with a close knowledge of the ways and tendencies of the people.

RAO BAHADUR M. ADINARAYANA IYAH, *Madras.*

An Industrial Conference is very desirable. The characteristic of most of our indigenous industries is that they are for the most part mere handicrafts, carried on according to rule of thumb, with little exercise of intelligent ingenuity, and with little resort to labour-saving mechanical contrivances. In these remarks I do not refer to the spinning and weaving cotton-mills which we have copied from European models. That such handicrafts as still remain to the country can be very much improved, and that industries for the supply and manufacture locally of many of the articles now imported from foreign countries can be created, admits of little doubt if proper steps are taken for the purpose. But for any discussion of the steps to be taken to be a profitable one, I would suggest that the Conference should be one mainly of persons who are directly interested in or connected with the general trading or industrial operations of the country and who from their education and intelligence are capable of taking a sound view of the position of affairs. Merely theoretical and academical discussions will be of little use.

P. L. NAGPURKAR, Esq., *Sholapur.*

The idea of holding an Industrial Conference, *on non-political lines*, so as to allow officials and non-officials to participate in its deliberations, is one which meets with our entire approval. Indeed, we need a common platform where the aristocracy of the land can freely mix with the commercial leaders from different parts and work, shoulder to shoulder, in solving the great Industrial problem that faces us all. Experts, in Government service, should be requested to attend the Conference with the local Government's sanction. In fact, co-operation of officials and non-officials, of artisans and other industrialists and of manufacturers and capitalists, is essentially necessary, because, nothing practical can be attempted in the direction of India's Industrial regeneration without the combination of all these.

2. But great influence and tact are required to bring about such a gathering and we have no doubt that, with men of your stamp and ability at the forefront, your efforts would be completely crowned with success, as were those of the Hon'ble Sir P. M. Mehta, the Hon'ble M. Vithaldas and others, last year, in the matter of the Industrial and Agricultural Exhibition, although its path was at first beset with difficulties.

3. Such Conferences were previously held in Poona for a few years, through the inspiration, and under the guidance of the late Mr. Ranade. Delegates from several parts of the Bombay Presidency, including a few Native States, attended. Papers on industrial questions were read and discussed and the Resolutions which were arrived

at, during the course of the two or three days' sessions, were printed and published for the information of the general public and also of Government. But all this came to a standstill, owing to several causes, the chief of which was, the non-participation therein of the Industrial and Commercial Leaders. Most of those who took the lead in political agitation, had also a considerable share in the organization and up-keep of the Industrial Conference; but the energies of these gentlemen were spent up and a complete collapse was the sad result. No one thinks of reviving that Institution, though more than ten years have elapsed since its cessation. Should your Committee succeed in organizing an Indian Industrial Conference this year, we believe that your example would be usefully copied in the different Provinces of India.

RAO BAHADUR G. V. JOSHI, *Satara*.

The idea of holding an Industrial Conference simultaneously with an industrial exhibition is most happily conceived, and I am sure, will meet with the support and sympathy it deserves. The economic question in India is one of vital moment, and the proposed Conference is not called a moment too soon.

Our difficulties in the British Provinces are well known. In the Native States, however, the way is clearer and much can be attempted in the field which seems simply impossible in British territory. So I would suggest that, among others, representatives may be invited from these States—including Dewans and ex-Dewans and administrators. It is here that our hope seems to lie.

Among the subjects for discussion I would give prominence to questions relating to *mining industries*. As you are aware, there has been during the past 25 years an alarming progress in foreign exploitation in the line under special encouragement from the State. We Indians have almost no foot-hold here. We have no mining school in India, and our old mining craft is almost gone. Concessions to foreign exploiters—and their successful operations—represent so much adverse possession of a field which of right is ours. The recent renewal of the gold-mining concessions to a foreign Company in Mysore—the prohibition by executive order of gold washing in Assam—entailing much injustice and hardship on a considerable native population—in favour of English exploiters, etc.,—these would appear to be simply without justification—and I am one of those who think that we ought not to lose time in asserting our claims in respect of this important branch of our national industries.

G. SUBARMANIAN IYER, Esq., *Madras*.

TWO DIRECTIONS IN WHICH OUR ENDEAVOURS SHOULD BE MADE.

There are two directions in which we should pursue our endeavours. How to foster and improve existing industries which for want of sufficient encouragement from the public and from want of knowledge and enterprise on the part of our industrial classes, are in a languishing and moribund condition, should be the first care of the Conference. The second should be, how to organise our capital, train our labour and improve our skill; and by co-operative and patriotic efforts,

undertake new manufacturing industries for which raw materials exist in the country in abundance. As regards the existing industries, I may quote the opinion of Mr. Tozer, of the India Office, who recommended that by means of a special industrial census it should be ascertained how many persons are wholly or partially engaged in the various handicrafts, how far such industries were suffering from goods made by modern processes in India or abroad, what measures could be taken to revive them by special instruction or by the introduction of improved appliances; and what are the earnings and general condition of the artisans. With regard to the weaving classes who number five millions and who constitute full one-third of the whole industrial population, Mr. Tozer thinks "there is need to ascertain what is the best kind of loom for ease and effectiveness of working and what facilities, if any, could be afforded for the purchase of improved appliances by a system of advances." It might be also worth while, he added, to inquire how far electricity could be applied to handlooms in the manner adopted in some industrial centres in Europe. Such an enquiry can only be undertaken by the Government, although with the help of the knowledge obtained by that means, people interested in our industrial well-being might take steps calculated to infuse fresh life into such industries as can be made secure against the effects of foreign competition.

INDUSTRIAL MUSEUMS.

It would be a part of the Swadeshi movement to establish Industrial Museums, where the products of every art and industry in the country might be stored and exposed for public view. Such museums would be connecting links between the producer and the buyer who have now no touch with each other. The producer would know what articles command ready sales, and the buyer would know where and at what prices he could get the articles he wants. Such museums are common institutions in Europe and America. By way of illustrating the nature and objects of these museums I may here quote a detailed description of an "Industrial Technological Museum" which the Federal Government of Mexico recently proposed to establish in the city of Mexico. Its purposes and duties are thus outlined:—

(1) To collect samples of the minerals, vegetable and animal raw materials which are found in the country to be supplied by their producers or exploiters, together with all the data possible concerning their use, regardless of whether the materials can be employed in domestic or in foreign industries. These samples will be kept on exhibition permanently.

(2) To place beside each special series of raw materials pictures showing the manufactures to be made therefrom, both in the domestic and foreign markets where they are consumed, and lists of the commission merchants and commercial houses which handle these manufactured products.

(3) To make geographic charts of the Republic, showing by means of conventional colours, the section of the country, where the various groups of raw materials are cultivated or produced.

(4) To have on exhibition a map of the Republic which shall always be kept up to date, and on which shall be indicated with exactitude the various transportation routes—maritime, river, etc.

(5) To collect data, for the information of the public, relative to the rates of freight from the place of production to any point in the country or abroad, and also the customs duties which the raw materials pay upon importation into any country which consumes them.

(6) To establish in the same quarters a "technological library," containing the most minutely specialized catalogues, with their prices, of the principal factories of all nations and especially of the manufactures of the machinery employed in converting the raw materials produced by this country into the best furnished products. This library is to be kept up to date—that is to say, pains will be taken to secure continuously the last editions of every catalogue. The classification to be adopted shall be practical and one admitting of easy consultation.

The museum, says the United States Consul in Mexico, is to furnish applicants, free of charge, with all the data it possesses about prices, places of production, producers, and freight on raw materials and with the data about manufacturers of machinery. Producers or manufacturers can, under certain regulations, place therein samples of catalogues for distribution. The library and services of translation of its catalogues will be free. The museum is to publish and distribute free its own catalogue of the raw materials on exhibition, giving the name of the material, name and address of the producer, place of production, quantity that can be produced, price at the place of production, cost of transportation to the nearest railway station, and the principal uses of the raw material. The co-operation of scientific societies is invited as is that of persons willing to contribute technical studies for publication as special bulletins. The museum will undertake the analysis or technical examination of raw materials, according to agreements made with those desiring this service. It will not, however, undertake commissions between producer and purchasers, only putting them in touch with each other. The plan of putting on exhibition, in connexion with foreign consulates, collections of raw materials, etc., from Mexico, which has recently been inaugurated, will be continued under the direction of this museum, which will also have charge of Mexican exhibits in foreign exhibitions.

It is not suggested that museums entirely or mostly on the above lines can be established in this country. But they illustrate the type of institutions which can be established here with adaptations and changes suitable to our conditions. Indian industrial museums such as suggested above, will have to be much simpler institutions and to be tried as experiments.

INDUSTRIAL SYNDICATES.

In his recommendation of an inquiry into the present condition and prospects of industries, Mr. Tozer suggested the advisability of making advances to the producer to enable him to meet the output necessary in the making of his articles. So far as his resources go, the Indian artizan is in the same predicament as the cultivator. His poverty often drives him into the hands of the money-lender from

whose clutches he finds it impossible to redeem himself. The profits he is able to make from his work often go towards meeting the demands of his creditor, and little remains to help him in hard times. Besides, on account of his poverty, he is unable to keep the articles he makes for any length of time in his hands, waiting for a favourable time to dispose of them. His need makes it necessary to dispose of them at once; but costly articles of more than ordinary merit or of special workmanship cannot be sold off at once. He is therefore obliged to make cheap articles which will command prompt sale, or such articles as will satisfy the fancy of foreign tourists and collectors of curiosities who do not care for articles of genuine artistic merit, but only those that will satisfy uninstructed or vulgar curiosity. It is therefore extremely desirable that there should be means at the disposal of the workman to enable him to obtain loans at moderate rates of interest and repayable by easy instalments, and also to dispose of the articles he makes promptly, though for moderate profits. It seems to me that syndicates of capitalists and merchants should be established in different centres, and they should advance small sums to the workmen on the security of the articles to be made, and purchase these articles at prices which will give the producer some reasonable profit. The articles might be stored by the syndicates with a view to sell them when good prices are obtainable. In this manner, the Indian craftsman will be able to ply his occupation without stop or hindrance, and while protecting himself from insolvency, he will command a steady income which will keep him above want and from the grip of the usurer. He will not feel the necessity to pander to the vulgar taste of the foreign tourist and will preserve the excellence of his professional traditions and his own art from deteriorating.

EXHIBITIONS ARE ONLY ADVERTISEMENTS.

The successive Industrial Exhibitions that have been held in different capitals of India have only served as effective advertisements of Indian products, and beyond that they have had no effect. Unless the person that wants or wishes to possess a particular article exhibited, purchases it on the spot or makes a note of where and at what price it can be purchased, there is no chance of the exhibit being remembered and bought. Few are prepared to undergo the inconvenience caused by inquiries, correspondence and so forth. Articles for sale must be under the very nose of the purchaser. It is a great secret of modern trade, that the commodity is exhibited to the public in the most attractive manner possible, and facilities and temptations are provided to catch the purchaser. European importers and their trading agents do exactly the same thing in India, and it is said that British merchants often get driven out of the markets of the world by the superior skill shown by Germans and Americans in duping the purchasers. But in regard to our own indigenous products, the case is entirely different. They are made in remote, obscure villages, and absolutely no means exists by which the general public may know about them and take any interest in them. There is no touch whatever between the producers and the purchasers. No wonder that they languish and die for want of support. There should be some means by which

this want of an intermediary can be supplied—an intermediary which will be in constant contact with the producers as well as with the consumers.

THE INDIAN STORES LIMITED—ITS AIMS AND OBJECTS.

The Company recently established in Calcutta, by name, "The Indian Stores, Limited," will satisfy this important want. The objects at which it aims are :—(a) To collect chiefly articles of Indian arts, manufacture, and produce and to open show-rooms or shops for the sale of such articles. (b) To establish agencies in any part of India for the sale and purchase of such articles and to do the business of agents generally. (c) To export such articles and to import others and for such purposes to establish, if necessary, agencies outside India. (d) To aid and assist in all possible manner Indian workmen, artisans, manufacturers and craftsmen, with a view to procure articles of Indian art, manufacture and produce suited to the requirements of the country. (e) To establish factories and workshops in connection with the business of the Company. (f) To promote the formation of companies, trusts and combinations and such other public bodies, societies and institutions as may be necessary or expedient for stimulating or regulating the production and increasing the consumption of articles of Indian art, manufacture and produce, in the interest of the Company and that of Indian trade and commerce. (g) And otherwise to encourage, preserve, revive and develop Indian industries, arts and manufactures, with a view to expand the business of the Company and the scope of Indian trade and commerce. It will be seen from the above that though the Company was primarily dominated by patriotic considerations, still it was not proposed to work it on that basis. It is worked on commercial lines, being gradually made not only self-supporting but paying also. The advantage of making a movement of this kind paying is obvious, because, as in other matters, in the matter of disinterested patriotism, of self-sacrifice for the public cause, economy is desirable; and where a movement can be placed on a satisfactory pecuniary basis, it is unwise to guide it on purely philanthropic lines.

APPENDIX IV.

CO-OPERATIVE AGRICULTURAL SOCIETIES.

[The following are the extracts from Mr. Edwin Pratt's "*Organization of Agriculture*," referred to in Dewan Bahadur P. Rajaratnam Mudaliar's letter printed in Appendix III above.]

During the latter part of the past century, most of the countries of Europe suffered from severe agricultural depression which threatened to involve the agricultural classes in complete ruin. Various economic causes brought about this crisis, but it is sufficient for our purpose to consider only the means adopted to overcome it. Mr. Edwin A. Pratt furnishes us with some interesting information on the point in his excellent work on "*The Organisation of Agriculture*."

Various schemes were tried by different countries, but the remedy that was finally adopted as the most effective was the formation of agricultural co-operative societies by which the agricultural classes were gradually freed from the clutches of the money-lenders, and were enabled to reduce the cost of production and sell their produce to advantage. The following extracts from Mr. Pratt's book will show how these societies have been organised in some of the countries of Europe and what benefits have been derived from them:—

FRANCE.

In France, the movement began some time in the early eighties. The historian of the movement writes:—"The French market, which, by reason of the development of the means of transport, was no longer protected by the natural barrier of distance, began to be flooded with foreign commodities produced at a cost that defied all competition. Our lands exhausted by centuries of cultivation, had no chance against the productions of virgin soils, or of countries more favourably situated in regard to taxation, cost of labour, &c. The wheat of North America, India and Russia, the wool of Australia and LaPlata, the wines of Spain and Italy, and even the cattle of Italy, Germany and the Argentine Republic, &c., took, little by little, on our markets the place of our home supplies, and the simple threat of their being imported was sufficient to effect a lowering of prices. The national market existed no longer, and on a market which had become universal, and was affected by the slightest fluctuations that reverberated among the great centres of the world, the French cultivator offered an easy prey to the speculations of international commerce."

"These new economic conditions, which there was every reason to regard as permanent, imposed on the agricultural industry a profound evolution."

“It was necessary to organise for the struggle, to realise promptly all the possible opportunities for progress, to decrease the cost of production, and to improve the methods alike of production and of sale. For the attainment of these ends the old agricultural associations were but ill-prepared. It no longer sufficed merely to spread technical knowledge and to give prizes and awards to agriculturists at periodical exhibitions.”

This was the critical position in the period referred to above and it was met in an eminently practical way by “a certain M. Tanviray, departmental Professor of Agriculture at Blois.” This gentleman found that there was great difficulty in getting the agriculturists to use for their impoverished lands the fertilizers which agricultural chemistry was offering to them; but he saw also that their reluctance was not unnatural. Apart from the ignorance and the prejudices of the farmers in respect to the use of artificial manures, the producers thereof, having to send out travellers and push a business then far from active, charged high prices, and, what was still worse, sent out adulterated or inferior qualities. M. Tanviray’s happy inspiration was to get all the farmers in a certain District to join together in sending in one big order, by means of which they would be able to purchase the fertilisers, at a less price, get lower Railway rates, and also, be in a better position to secure a guarantee of quality. A combination with these objects in view was brought about in 1883, and when in March, 1884, organisations of this type acquired a legal status in France many more of such purchase associations followed. The use of the fertilisers was found to yield increased crops at a reduced cost, and the operation of the new Syndicates obviated all the difficulties previously experienced. So the movement for the establishment of agricultural Syndicates spread, in course of time, throughout the whole of France, while in proportion as their utility was more and more recognised, the scope of their activity widened. Seeds and feeding stuffs were purchased in wholesale lots, the same as fertilisers. So were tools and agricultural appliances of various kinds, while special Syndicates either procured agricultural machinery too costly for individual farmers to get for themselves and let it out on hire, or enabled farmers to purchase on special terms.

In these and other ways there was, in the first instance, a direct appeal to the material interests of the agriculturists; and leaders of the new movement had the good fortune to win the early sympathy of the farming community by the offer of practical advantages which prepared for further considerable developments of the combination principle a class of men who, in France, as in England, might well be regarded as the least likely to co-operate for the achievement of a common purpose.

Thus the movement spread rapidly, and in less than twenty years, the number of these Agricultural Associations whose formation had been officially notified up to 1st January, 1903, amounted to 2,433 and the total membership was 599,000. There were also Provincial and Central Syndicates formed for the purpose of influencing public opinion on agricultural questions by means of publications, conferences, &c., and to conduct in general, campaigns by which the views

expressed at the representative gatherings of agriculturists might be carried to a successful issue. From the magnitude of the orders given under this system of combination, the Agricultural Associations secure a three-fold advantage: (1) They get wholesale prices from the manufacturers instead of retail, these prices being made still lower by the fact that the manufacturer, dealing direct with an association or union, incurs less expense for travellers, &c. (2) The quality has to stand the tests of the association's experts, and (3) lower railway rates are obtained because the consignments are sent to Central depôts in waggon-load lots instead of small quantities. So the small cultivator who buys a couple of sacks of fertilisers or seeding stuffs, through his association, gets just the same advantages in price and railway rates as a large farmer who orders his five or ten tons. These facilities, combined with the skilled advice given free by the associations, have led to a very great increase in the use of fertilisers in France, and many factories have been set up in that country for their production, while a decrease of from 40 to 50 per cent. has been effected in the prices as compared with what they were before the advent of the agricultural associations.

Besides the associations formed to promote the interests of agriculturists in general, there are many which apply to special industries such as the Syndicate formed at Rennes by a group of cider-makers, with others organised by market gardeners, nurserymen, the growers of vines, beet-root, tobacco and medical plants, bee-keepers, &c. Such organizations seek to promote the general interests of the industries concerned by means alike of spreading technical information, grouping purchase of necessaries, facilitating the sale of products, or making joint representation, in case of need, on the subject of market tolls, railway rates, &c.

GERMANY.

Turning to Germany, it is observed that at the time of general depression, the agriculturists there had the advantage of a system of protective tariffs which gave them a greater chance of preserving their own considerable home markets for themselves, than was the case with agriculturists in free-trade England. The German agriculturists also enjoyed exceptional advantages under the thorough-going system of agricultural instruction which had been established in the country for several years past, and from the discoveries of agricultural chemistry in regard not only to the application of artificial manures, but to the use of agricultural products in various industries, such as the use of beet-root for the manufacture of sugar, of potatoes for the production of a spirit used for driving motors and engines, for lighting, heating, cooking, &c. No fewer than 14,000,000 tons of beet-root, representing a value of £12,000,000 are used in Germany in the course of a year in the manufacture of sugar, and the production of these supplies for an industry that is the direct outcome of scientific research is a valuable set-off against possible depression in other branches of agriculture. Still more remarkable is the production of potatoes which amounted to a total of 48,500,000 tons in 1901, of which about one-half is used for other purposes than human consumption, *viz.*, for distillation purposes, manufacture of starch syrup, starch sugar, feeding of cattle, &c. Notwithstanding these advantages,

however, the agriculturists found themselves placed in a difficult position in the time of their depression. Science could tell the farmer what it would pay him best to produce and how to secure big crops ; but it left him to his own resources in the way of raising money and of selling his crops to the best advantage. Falling prices and other adverse circumstances had so far decreased the available funds of the farmer that it was difficult enough for many of them to carry on their ordinary operations in their ordinary way, year by year, without embarking on those wider undertakings or those more costly methods which agricultural science was opening out to them. In these conditions, it often enough became a matter of urgent importance to the farmer that he should raise a loan which would enable him to carry on until he obtained a return from his crops. Such a loan might make all the difference between comparative success and absolute failure. But while the ordinary banks were ready enough to advance money to a landowner who could give them a mortgage on his estates, they were reluctant to make advances to individual farmers on nothing but their personal security, and their reluctance increased in exact proportion to the growing needs of those who wished to borrow. The way out of the difficulty was found by a resort to the co-operative credit Bank system under which the joint credit of the whole of the members of an association is used for the purpose of borrowing money. Once the possibilities of co-operation were fully recognized, these credit Banks spread rapidly and they were soon followed by special agricultural societies for the purchase of artificial manures, feeding stuffs, machinery, tools, coals, &c., which aggregated over 1,000. Of production and selling societies (representing among other branches, societies for the sale of seed, fruit, vegetables, and produce of all kinds ; selling societies, the German spirit syndicate and societies for the sale of cattle), there are 669. Of dairy produce societies, there are 1,682. There are also co-operative societies for drainage and irrigation and especially for the purpose of reclaiming bogs and moorlands. The extent of land so reclaimed between 1878 and 1890 is estimated at over 700,000 acres and much of this land on which nothing but heath had grown before now ranks as among the most productive soil in the Empire. In regard to the use of machinery, it is stated that steam threshing machines are used on no fewer than 35,000 farms of less than five acres each. Without co-operation, such a thing would be altogether impossible. In some instances the farmers of a particular district will organise a society for the purchase of a steam-plough, letting it out on hire to their neighbours when they are not using it themselves. It is stated that the number of registered agricultural co-operative societies on 1st July, 1903, was no less than 17,162, and some idea of the enormous benefit conferred upon the people by these societies will be formed when it is realised that in 1902, the total amount of the purchases of agricultural necessaries effected by the German credit banks or by the special associations for the purpose was alone valued at 3½ million pounds.

What, therefore, with her very practical and comprehensive system of agricultural education, her elaborate development of an easy and most effective agricultural credit, and finally, her great variety of agricultural co-operative associations, Germany may well

claim to have reorganised the position of the cultivators of her soil in a way that has brought to them a measure of success, and to herself a degree of economic advantage, that would have been impossible, if, when they were threatened with agricultural depression, they had clung tenaciously to old ideas and antiquated methods.

DENMARK.

But it is in the little Kingdom of Denmark, that the farmer will find the most impressive object lessons as to the benefits to be derived from agricultural co-operation. After the Napoleonic Wars, and later on, the disastrous wars with Prussia and Austria, when Denmark lost two of the fairest and most fertile of her provinces, she was reduced to the narrow limits of the islands, and Jutland, and even of this area, a considerable portion consisted of moor, marsh, and dune land, practically unfit for cultivation. On the top of all this came the fall in the price of corn which led to a severe agricultural depression which left the people in a most deplorable condition. But the country fought against adversity with the courage of a giant, and crippled though she was, she not only regained her strength but became a power in the commercial world with which other nations have had seriously to reckon. It was in the development of the dairy industry that the Danes mainly found the means of recovering from the crisis which had overtaken them. Originally the butter exported from Denmark came from what were little more than blending mills, the supplies produced by the individual farmers and representing a variety of qualities and different degrees of freshness, being bought up and mixed together with results that were not always satisfactory to the purchaser, while the expense to which each farmer was put in producing his own particular lot of butter left, as a rule, a very small margin for profit. Then there was adopted the system of creameries to which the farmers would take their cream only. This represented a distinct advance as it effected a saving alike of time and of cost to the farmer; but the greatest degree of progress began with the perfection of the centrifugal cream separator which left the farmer to do no more than send his milk to the butter factory, where the cream was taken from it by the separator, and the skim milk given back to him for the feeding of his pigs.

In other ways, the researches of the learned professors had placed the working of the industry, on a more scientific basis, thus facilitating operation, reducing expenses, and allowing of far better and much more profitable results being obtained than had been the case before. Then also, the spread of an extremely practical scheme of national education and especially agricultural education, had prepared the people to take advantage of the coming transformation, while the system of land tenure in Denmark which had done so much to encourage both the creation of agricultural free-holders and the increase of small holdings, and further strengthened the power of the agricultural community to benefit from the opportunities opening out to them.

The immediate and striking outcome of these various conditions was a resort to co-operative dairies, so that the agricultural classes could get a maximum of possible benefit for themselves. The first

co-operative dairy in Denmark was opened in West Jutland in 1882. Others followed, and to such an extent has the movement spread that at the present time, a co-operative dairy is to be found in almost every parish, and there are now no fewer than 1,050 of such dairies in Denmark, with 148,000 members, owning 750,000 cows out of a total 1,067,000 milch cows in the country. In 1902, this little state exported, mainly to Great Britain, 168,000,000 lbs. of butter, 135,000,000 lbs. of this total representing home produce and the remaining 33,000,000 lbs. butter received from Sweden and Russia. The total value of the imports of butter from Denmark into Great Britain in 1902 was £9,302,000. The practice usually adopted is for about 150 farmers in a particular district to raise, say, £1,200 by subscribing £8 each, this sum being sufficient to provide a dairy which will deal with the milk of 850 cows.

The establishment of the co-operative dairies has been followed by the founding of societies for the sale of butter together with some 200 central unions which employ capable men—to take periodical tests on the milk on the farms of the members, and see which particular cows gave the best results according to the quantity and cost of food consumed.

[*Note.*—The Indian farmer, even if he does not go in at once for co-operative dairy society, might at least take some useful lessons from his Danish brethren in sending pure milk and pure butter to the market, by which he is certain to earn a larger profit than he can by adulterating his articles.]

Next to the co-operative creameries, and now, indeed, rivalling them in importance, come the Danish co-operative bacon-curing factories, the success of which has been, if possible, even more rapid. It is stated that these factories were the outcome of political prejudices, but whatever the cause, the success of the movement was almost phenomenal. The first co-operative factory was started in 1888, when the number of pigs killed for curing was 23,407, valued at £57,000. By 1902, the number of these factories had risen to 27 with a total membership of 65,800, while the number of pigs killed for curing amounted to 777,232 and their value to £2,500,000. In the organisation of these co-operative factories, no capital is subscribed by the farmers whose joint guarantees are sufficient to enable them to secure from the banking institutions of the country the loan they may require to defray the cost of construction and to provide the working capital as well, the loan being repaid out of the profits of the business. The members also guarantee to supply to the factories all the pigs they raise on their farms, a fine of 10s. 3d. per pig being imposed in case of non-compliance. On sending his pigs, the farmer is paid a certain sum, representing less than the value, but subsequently he receives a share of the profits according to the number of animals he has supplied.

Another highly successful branch of co-operative agriculture in Denmark is represented by the Egg industry. Here the chief organisation is that of the Dansk Andels Aeg-export which was founded in 1895, and now constitutes the central body of a large number of local societies in all parts of Denmark. The members of these societies pledge themselves to deliver none but freshly-laid

eggs, all that are sent in being so marked that the farmer supplying any single one of them can be readily traced, while a penalty of 5s. 6d. is imposed for every bad egg received after a warning has been given. The local societies remit the eggs to the central organisation which arranges for grading, packing and sale and fixes the price per lb. to be given to the farmer less the cost of collection and other expenses.

Membership of the local societies is generally obtained in return for an entrance fee of six-pence. So profitable has the business become that the Danes send their own eggs to Great Britain and import eggs from Russia for home consumption, the difference between the price they get for the former and the amount they pay for the latter representing by the end of the year a fairly substantial sum.

Among the many other forms of co-operative organisation in Denmark an important rôle is filled by the association formed for the supply of agricultural necessaries, seeds, feeding-stuffs, manures, machinery, &c.,—at the lowest price and in the best condition. Here again the local societies are formed in turn into large federations. The ramifications of this co-operative purchase system extend to practically every parish in Denmark.

Again, the growth of the Egg industry has given rise to numerous poultry societies for the improvement of fowls. Some of these societies have a membership of from 2,000 to 3,000 persons. They receive grants from the Government, and their operations are greatly facilitated by experts who devote their time to delivering lectures or giving personal advice to the farmers.

There are also local Bee-keepers' Associations, for making honey. They number about sixty with a membership of 5,000.

Thus there is hardly any branch of agricultural industry in Denmark which is not represented by its separate co-operative organisation. As a rule, each particular co-operative society works on independent lines, for its own special object, so that one farmer may be a member of many different organisations, according to the particular branches of agriculture in which he is interested. The system has been so successfully established in the country that a few years ago, the Department of Agriculture and Technical Instruction in Ireland thought it necessary to send a deputation of members to enquire and report on co-operative agriculture and rural conditions in Denmark, and the results of the enquiry are published in a report which was issued in the autumn of 1903.

The rapid development of this co-operative effort in Denmark has brought about changes in the economic conditions of the country that have been almost revolutionary in their character. Not only has it effectually checked the serious consequences that seemed to be impending as the combined result of agricultural depression and national disaster, but the general position of Denmark to-day is one of greater prosperity than ever, for the Danes are deriving more advantage from the extremely limited amount of soil they now possess than they got from the land before the dimensions of their country were so seriously curtailed.

APPENDIX V.

SOME SUGGESTIONS.

TO—THE PRESIDENT, INDIAN INDUSTRIAL CONFERENCE.

Benares City, 26th December, 1905.

SIR,—I regret I shall be unavoidably absent from the sittings of the Conference, and I beg to place my suggestions in your hand.

The Congress Exhibition must be a necessary adjunct of the Industrial Conference and should be worked on well-organised principles. The Exhibition should not only advertise itself and leave the rest to be done by the industrial public, but I believe the Exhibition Committee should have a complete organisation with a small working sub-committee in every district of India, and regular and sustained efforts should be made to represent all the industries of India at the Exhibition. The lessons of each Exhibition should be taken up by the Central Committee and inculcated throughout through the sub-committees.

The object of the Conference should be first of all an industrial survey of India and the forming of a detailed programme of industrial activities. For this purpose, the whole country should be divided into centres. Each centre should be in charge of a committee, which should report itself to the Conference every year. So far as Bihar is concerned, it should form a centre by itself, and I am prepared to serve as a member of the Bihar sub-committee. As for the industries that may be undertaken in Bihar, I suggest the following:—

(1) *Weaving industry—both power-loom and hand-loom.*—The hand-loom industry has been already undertaken in right earnest. But there is room for power-loom industry, with special advantages. Chittagong Hill Tracts and Saran (including Champaran) are the greatest cotton growing districts in the whole of Bengal. The ordinary Garo Hill variety of cotton, indigenous in Chittagong, is not suitable for weaving. Chapra cotton is much better and is long stapled. Labour is abundant in Saran and is exported to the tea districts. I consider Saran is one of the best places for enterprise in power-loom weaving industry.

(2) *Aloe fibre.*—The aloe or agave plants are abundant in Bihar. The Raikon aloe fibre is exhibited at the Congress Exhibition. The fibre exhibited at Sonepur by the Darbhanga jail was not inferior to what I found at the Benares Exhibition.

(3) *Glass-making.*—Professor Ramsay examined the specimens of sand sent to him from Patna and he considered them to be well suited for glass-making.

(4) *Paper Mill.*—Babu Gurmukh Rai, an enterprising Marwari of Patna city, collected statistics for starting a paper mill industry in Patna, about which he was very hopeful, but for lack of capital, he could not undertake it.

In conclusion, I have to suggest that the Conference should do all it can to raise capital for the weaving industry or some other industry wherever it meets. It would be setting a good example if a large capital be raised at Benares in the first year of its existence. I am told that Messrs. Baghmal Badridas of this city are willing to pay 2 lakhs towards weaving mill industry. This may be made the nucleus for raising a capital of ten lakhs from Benares city. Benares has the largest weaving population, and weaving industries may be at once organised here.

I have, &c.,

PURNENDU NARAYAN SINHA.

TO—THE PRESIDENT AND DELEGATES,

INDUSTRIAL CONFERENCE, BENARES.

DEAR SIRS,—Will you kindly bring the following suggestions prominently to the notice of the Industrial Exhibition Committee :—

(1). It is a very happy sign of the times that the educated classes of India have begun to realize the necessity of reviving old industries and starting new ones. But apart from capital and skilled labour, the principal difficulty that threatens any new enterprise is the want of a guaranteed market or permanent custom on which to rely for the sale of articles produced. This difficulty can only be removed, by securing the sympathy and co-operation of wholesale merchants. The bulk of the import trade of foreign articles, is to-day in the hands of a few Bora or Mahomedan merchants at the principal ports like Bombay, Madras, Karachi and Calcutta. These merchants are not at all in touch either with the Congress or the Industrial Exhibition, and the consequence is that, though a native factory may offer them country-made articles equal in quality and cheaper in rates as compared with foreign goods, still they are not inclined to encourage their sale. It is, therefore, suggested that as soon as the sessions of the Congress are over, the Managing Committee of the Industrial Exhibition should select, out of the numerous exhibits, such articles of daily requirements as can compete in quality and prices with foreign products, and approach the wholesale merchants of the place through some of their educated leaders, with definite proposals and prevail upon them to enter into an agreement to purchase those articles up to a certain limit every year. This would in my opinion be a very practical step, without which no amount of lecturing on industrial questions or awarding prizes for good exhibits will have any permanent effect. As retail sale cannot be depended upon, it is always necessary to secure the co-operation of wholesale dealers before starting a new industry.

(2.) In several towns in India, Depots have been opened for the collection and sale of Indian stores. To render these Depots as complete as possible, it is necessary to compile something like a directory of Indian arts and industries containing the names and full addresses of the mills and factories and of the manufacturers or supplying agents of various articles. This directory should be a complete guide to the manufactures and natural products (vegetable and mineral) of India, and should contain also statistical information on important arts and industries. In America, they have got the Peck's Buyers' Index to the manufactures and products of the U. S. A. I have been for sometime thinking of compiling such a directory and have already collected 1,500 names, but I find, from practical experience, that it is very hard to approach the individual manufacturers who never advertise their wares, nor care to read newspapers, in case appeals are made to them through the Press to communicate their own names as well as the names of the articles produced. To meet this inconvenience, I would suggest that the proceedings of each year's Industrial Exhibition be published together with a complete list of the exhibits, as well as the addresses and names of the manufacturers or senders of those articles. If this suggestion be accepted, there will be within four or five years, a reliable record of the raw materials as well as manufactures of the various provinces in India.

(3). At every session of the Congress, appeals should be made for funds for the purpose of sending out promising students to foreign countries to learn a particular art or industry which may be fixed upon by the Industrial Committee. The surpluses that may remain after defraying the expenses of the Exhibitions should be utilized for this or similar other purpose. It is reported that the Ahmedabad Industrial Committee has got a balance of about Rs. 12,000 and much controversy is going on regarding the way of its disposal. I would take this opportunity of suggesting that the money may be used in sending a few deserving students to Japan or any other foreign country.

(4). There has arisen a desire amongst the educated classes to purchase cloth of Indian manufacture, and it is high time that the leaders of the Congress movement should themselves set an example in this matter, which will surely have a far-reaching consequence in further advancing the mill industry of India. Why should not our leaders forget the behests of fashion and false taste and set an example by appearing in this national assembly in dresses of country-made cloth?

(5). Secondly, it is also necessary to collect the trade-marks and names of all weaving mills in India. If the facsimiles of these trade-marks be printed in pamphlet form, these pamphlets will be a very reliable guide to distinguish foreign from country-made cloth because trade-marks in themselves are very misleading. The names of Indian importers are sometimes stamped on foreign cloth, to give them the appearance of Indian-made, while Indian manufacturers wish that their cloth should pass off as foreign-made. This difficulty can also be solved easily if all the manufacturers make it a point to stamp their goods with the words "Indian-made."

(6). In the principal cities of India, societies should be started pledging themselves to patronise Indian-made cloth and other articles.

(7). There is also the necessity of opening Depots all over India for the collection and sale of country-made articles. This will be a very useful opening to enterprising educated men.

I have made the above suggestions to my countrymen in the hope that they will prove acceptable.

SANGAMNER, DISTRICT AHMEDNAGAR, }
BOMBAY PRESIDENCY. }
11th November, 1905. }

Yours faithfully,

M. B. SANT.

I.—A committee to be formed to collect information on the following points:—

- (a) (1) The articles manufactured in different parts of India.
(2) The speciality of these articles, their prices and other details.
(3) Any deficiencies and how to remove them, i. e., how the articles can be improved.
(4) Whether there is a Railway station where these articles are manufactured, if not, the name of the nearest Railway station.
(5) The names and addresses of reliable dealers who deal in those articles.
(6) If possible, the names and addresses of the manufacturers and makers themselves and their specialities.
(Collect a few specimens of all articles.)
- (b) (1) The places where machines are at work, their names and addresses.
(2) How these machines are worked, whether there is any deficiency or shortcoming and how to remove it.
(3) Whether the articles produced by them are sufficient for the requirements of the country or it is necessary to have new machines to fulfil the requirements.
(Collect a few specimens of these machine-made articles.)
- (c) (1) What sort of factories, mills, &c., can be started in India.
(2) What places are suitable for their establishment.
(3) Full estimates of cost of working and starting such factories or mills, and the amount of capital required.
(4) Estimate of income or profit on them.
(5) From where such machines can be purchased, with full names and addresses of their makers or manufacturers.

II.—An office or show room to be established in Calcutta, Bombay or elsewhere where all specimens or models could be had and where full information could be gathered and all enquiries could be attended to fully.

III.—A detailed and full report of the above to be published. If the work cannot be finished within one year, it may be continued regularly. A report of the work accomplished in the year to be published by the end of the year so as to give an idea of the work done.

III.—For this work good able persons may be appointed on suitable salaries, and given travelling allowance as well. They should see everything with their own eyes to make their report.

IV.—All savings of the Congress and Industrial Exhibition to be devoted for the accomplishment of the above proposal and also special subscriptions to be raised.

WARPING.

By CHOTALAL RAM SINGH.

Here is a piece of news of some interest to our people at this time.

In May last, one Mr. Gharpure, a graduate of the University of Bombay and an assistant master in the Sholapur High School, started as an amateur a small weaving establishment. Shortly afterwards he was joined by his son-in-law. At first they used the common country hand-loom. In June, however, some Parsi gentleman suggested that they might try some such machine as the American fly-shuttle loom, lately exhibited by the American Mission at Bombay. The idea was taken up; and in their efforts to construct some machine according to the description given the gentlemen have fortunately lighted upon what may be called a genuine indigenous invention. The "भरारी" as they have named their new machine is a fly-shuttle hand-loom in which the shuttle is worked by the reed itself as in the case of the American loom but on quite a different mechanical principle. The भरारी is very simple in construction and free from all complications. It consists only of straight bars of wood, put together by simple joints and fixed by screws or nails; and is little likely to get out of order; and if it ever does so, it can be repaired by any ordinary country carpenter. It accomplishes about 120 strokes of the shuttle in one minute through 52" warp—that is only about 20 strokes less than the looms in the Mills. The भरारी has already been put to work and the gentlemen have for some days past been weaving with it. The cost of the भरारी with teak wood frame comes to about Rs. 35.

APPENDIX VI

LETTERS OF SYMPATHY.

C. E.

No. 6863

GOVERNMENT OF INDIA.

DEPARTMENT OF COMMERCE AND INDUSTRY.

Calcutta, the 24th November, 1905.

FROM—W. L. HARVEY, Esq., C. I. E., I. C. S.,

SECRETARY TO THE GOVERNMENT OF INDIA,

TO—THE SECRETARY, INDIAN INDUSTRIAL CONFERENCE, BENARES.

SIR,—I have the honour to acknowledge the receipt of your letter of the 13th instant, in which you ask me to forward a note on the work of the Commerce and Industry Department to be read at your meeting in December next. The Conference will, I trust, be a successful one and may do much useful work if any practical suggestion for the encouragement of indigenous industries be put forward. While I regret that I am unable to comply with your kind invitation to send a paper, I shall watch the proceedings of the Conference with interest and shall be glad to put before Government any information they may wish to give on the subject of industrial improvement or any measures they may indicate as likely to have a practical result in this direction.

I have, &c,

W. L. HARVEY,

Secretary to the Government of India.

LAIDLAWSTIEL, GALASHIELS, N. B.

14th November, 1905.

DEAR SIR,—I am very glad to hear that an Industrial Conference is to be held in Benares in December. I hope it may lead to an Industrial Survey of India and to the further promotion of technical instruction. For the proper development of the vast resources of India and the prosperity of those engaged in industrial and commercial pursuits as well as in agriculture systematic training is an imperative necessity, and I am sure that the Central and Local Governments are fully alive to the need of organisation.

Your faithfully,

(Lord) REAY.

DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION, DUBLIN.

30th November, 1905.

DEAR SIR,—I am desired by Sir Horace Plunkett to say that he has received your letter of the 30th ultimo, in which he was much interested.

He regrets that owing to his being run down in health through over-work, and under medical treatment, it is impossible for him to reply personally to your communication. He asks me, however, to express his sincere thanks for the kind wishes which you have been good enough to convey to him, and for your too generous appreciation of his work in Ireland.

He wishes every success to the proceedings of the First Indian Industrial Conference, and hopes that it will be the means of giving a valuable stimulus to the important industrial and social movements in India, which in many respects are closely analogous to the similar movements in this country.

As he has not yet had the privilege of visiting India, he fears he could hardly give any hints which would be of use to those who, like yourself, are on the spot, and intimately acquainted with the local conditions. He will always be interested in hearing how those who are working for the improvement of social and economic conditions in India are solving the difficult problem of administering State Aid without weakening the action of the principle of self-help. If the proceedings of the coming Industrial Conference are to be published, he would be much obliged by your kindly having a copy forwarded to him.

He is having sent to you by this mail a copy of some publications of this Department and of the Irish Agricultural Organisation Society (this latter body representing the self-help side of the Irish movement) which he thinks may be of interest to you and your co-workers. Should you wish for any further information, he will gladly have you supplied.

I am,

Yours faithfully,

HERBERT S. SMITH,

Private Secretary.

4, KING'S WOOD ROAD,
UPPER NORWOOD, LONDON, S. E.

19th November, 1905.

DEAR FRIEND,—Your note of 29th ultimo this moment to hand. I am sure I wish you and your committee all success in the praiseworthy work you have in hand, and I hope and pray that it will, if persevered in for some years, bear fruit that will bring about some amelioration in the condition of the masses in India. One must not expect miracles, but I really believe that in this undertaking there is a distinct promise of good for India in the not distant future. . . .

You and *all* who are working in *this* and *every* line for India's good, have my entire sympathy. Little may seem to come of all these efforts at the outset; but good, honest, *unselfish* work for the good of others is never thrown away, but even as time sweeps along (often long after the doers have been forgotten) sooner or later brings forth new alleviations of suffering or new blessings for mankind.

I remain,

Yours ever very sincerely,

A. O. HUME.

22, KENNINGTON ROAD,

LONDON, S. E.

1st December, 1905.

DEAR CHINTAMANI,—I have received your kind letter of 15th October last.

I am very glad indeed that a separate Industrial Congress is now to be commenced and under such good auspices that our friend, Mr. R. C. Dutt, is to be the President, and such competent gentlemen, as our friends, Mr. G. V. Joshi, Mr. R. N. Mudholkar and Mr. G. Subramania Iyer, are to take part in it. Now three distinct Congresses—Political, Social, and Industrial—being formed, each will do its own work well, and the joint result will be most beneficial to India.

The Industrial Congress composed of practical business men, with efficient Central organisation, and Branch organisations all over India will be of incalculable value.

Giving all the three Congresses my best hopes and wishes—and with kind regards to all friends.

Yours sincerely,

DADABHAI NAOROJI.

CARLETON, PRINCES PARK, LIVERPOOL.

28th November, 1905.

DEAR SIR,—In reply to your letter I wish God-speed to your Industrial Conference. India will never be prosperous till it gets industrial development and it must not object to foreign capital and skill coming on to aid this movement. Agriculture also is very backward and much more must be done in the way of irrigation and improved methods of husbandry. I understand the Government is starting model farms in the various districts. This is important. I have propounded a plan to clear the ryots of debt—their condition in many provinces is almost hopeless. I enclose you some copies of my last speech in the House of Commons dealing with this subject; also some copies of a pamphlet I published this year, containing some letters bearing on industrial questions. I have discussed those

questions with Mr. Gokhale who has been well received by our leading statesmen.

You have my hearty good wishes for the prosperity of India and for the success of your Congress.

Believe me,

Yours truly,

SAMUEL SMITH.

48, SACKVILLE STREET, MANCHESTER

7th December, 1905.

DEAR SIR,—On my return from London to-day I received your letter of 13th November, inviting me to send you an article dealing with the industrial situation in India to be read before the coming Industrial Conference at Benares on the 27th of this month.

I thank you, and through you the Committee, for your kind expressions of confidence in my ability to furnish you with an useful and instructive memorandum. But I find that unless I post it by mail leaving to-night, it will not reach Benares in time for the meeting. Without time and thought I could not prepare a paper worthy of so great and important an occasion, and I must therefore regretfully abandon the opportunity.

Wishing the Conference every success, and with kind regards to all members of your Committee,

I am,

Yours very truly,

F. FORBES ADAM.

LEEK,

23rd November, 1905.

DEAR SIR,—I duly received your letter of the 31st October, and I think the best way of complying with your request is to send you a copy of my book on Kashmir Sericulture, from which you will be able to obtain all the information you require.

I am very glad to say that the Weaving Branch which I have introduced there, and which is now at work with 200 looms, promises to be a very great success. The silk cloths which are being woven there are quite equal, if not superior, to the same class woven in China and Japan and also compete favourably in price. There is every prospect of its being a very large and important industry and has the obvious advantage of the production of textile work from silk actually produced on the spot.

Believe me,

Yours very truly,

THOMAS WARDLE.

(CAMP) TELlichERRY,
30th October, 1905.

MY DEAR SIR,—I feel honoured by the invitation from your committee to contribute to the Industrial Conference, a brief paper on some subject bearing on the Indian Industrial problem.

I shall have much pleasure in endeavouring to comply with the invitation, but I cannot promise because I am not sure whether I shall succeed in writing anything that may be worthy of the occasion or useful to the public. For one thing I am engaged, by desire of the Madras Government, in an enquiry into the great fishing industry of the presidency, in view to attempting its improvement and development so as to provide more food, work, and manure for the country: this absorbs all my time and energy and involves incessant travelling in out of the way places. Hence an initial difficulty in preparing a paper for the Conference.

Kindly let me know approximately the desired length of the paper, and the latest date on which it should reach you.

I look forward with much interest to the approaching Conference and the action which will arise out of it, having paid much attention to the industrial problem and having spent good deal of money in practical attempts in certain directions.

Believe me,
Yours sincerely,
F. A. NICHOLSON.

COCHIN,
10th December, 1905.

DEAR SIR,—I regret that I have been unable to put together anything worth sending to the Conference on the subjects mentioned in your letter. You will, however, have abundance of material for discussion without my adding my own mite. I shall look forward to reading the full proceedings which will, I presume, be published at an early date.

Yours sincerely,
F. A. NICHOLSON.

November 15th, 1905.

DEAR SIR,—I am in receipt of your letter of the 25th October and deeply sympathize with your efforts to produce industrial life in India. At present I am travelling from place to place and shall not get access to my papers before the first week in December. There will still be time then I hope for me to write a short note on co-operative credit as you desire, and if there is, I will certainly do so. In any case I thank you for asking me and trust that you will have a successful meeting leading to practical issues.

Yours faithfully,
F. S. P. LELY.

December 5, 1905.

DEAR SIR,—In continuation of my last letter to you I have the pleasure to send you a brief note on the Agricultural Co-operation question. It is, of course, a mere bird's eye view, but it may at any rate serve as an expression of my interest in your aims and hope that you will have a successful and profitable conference.

Yours faithfully,

F. S. P. LELY.

SERLE'S GARDENS, ADYAR, MADRAS.

25th December, 1905.

DEAR SIR,—Your kind invitation of the 16th instant has only just reached me. I much regret that official duties prevent my being able to accept it, as I should have been delighted to attend the sittings of the Conference, which I trust will tend to stimulate the economic development of the country.

Believe me,

Yours faithfully,

A. E. CASTLESTUART STUART.

(Member, Board of Revenue.)

6, PIAZZA SAVONAROLA, FIRENZE.

November 19th, 1905.

DEAR SIR,—I have just received your letter of October 19th regarding the proposed Indian Industrial Conference, and regret that, owing to my absence in Europe on furlough, I am not in a position to assist you in any way. I should be glad to receive later a copy of your Report on the proceedings of the Conference.

Yours faithfully,

R. E. ENTHOVEN, I.C.S.

GEOLOGICAL SURVEY OFFICE,

Calcutta, November 27th, 1905.

DEAR SIR,—I shall be very glad to assist the object of your Industrial Conference as far as my limited spare time will permit, and I consequently accept with much pleasure your invitation to contribute a note on the mineral resources and industries of India. If possible, I will attend the Conference myself in order to assist in answering any questions, or in giving information, which may be of practical value to the members. You will understand, I hope, that if I find it in the end impossible to visit Benares whilst the Conference is on, it will be merely because my work is more than I can get through, and that I shall certainly endeavour to attend.

Yours sincerely,

T. H. HOLLAND.

7th November, 1905.

The objects of the Conference have had my greatest sympathy for years, and I hope that the meetings will be successful, and that lasting effects will ensue.

Yours faithfully,

R. BURN. (I.C.S.)

(*Editor, Imperial Gazetteer of India.*)

20th December, 1905.

MY DEAR SIR,—I am sorry that I am prevented from visiting what seems likely to prove the best Exhibition that has been held in India. I was particularly anxious to study the collection of improved agricultural implements and hand-looms, and metal works in view to see what improved appliances might be introduced with advantage into this Province. As I have already informed you, we have started a Central Agricultural Committee, in connection with the Victoria Technical Institute, and the Trustees of Pachaiyappas Mudaliar and Chengalvaraya Naicker's charities (of whom I happen to be one) have recently established a Technical and Industrial Institute. In connection with both these Institutions, I was desirous of obtaining as much useful information as I could by spending some days in your Exhibition.

I trust that the organizers of this grand Exhibition will establish a museum for preserving the best exhibits and products of our indigenous manufactures and industries, to serve as models for introducing into other parts of the Empire.

Your truly,

P. RAJARATNAM MUDALIAR.

(*Late Inspector-General of Registration, Madras.*)

BANK OF CALCUTTA, LIMITED.

Calcutta, 3rd November, 1905.

DEAR SIR,—I am in receipt of your letter of the 30th ultimo, addressed to Mr. David Yule, and as that gentleman is at present in England, it is doubtful whether he will return in time for the meeting of your Conference. I very much regret he will be unable to send you the note on the industrial development of India to be read at your approaching meeting. However, speaking for Mr. Yule I can say that having regard to the unceasing interest he takes and has taken in the development of Indian industries, and particularly those which would help to the advancement of Indians, it will be a source of disappointment to him not to have had the opportunity of giving your Conference the benefit of his wide experience. I am sending your letter to Mr. Yule by the out-going Mail. In conclusion both on behalf of Mr. Yule and myself I wish your Conference every possible success.

Yours faithfully,

D. KING,

Managing Director.

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[Besides the above, letters expressing sympathy with the objects of the Conference and wishing it success were received from Mr. S. H. Butler, C. I. E., I. C. S., Secretary to Government, United Provinces ; Mr. Edgar Thurston, Superintendent, Government Museum, Madras ; Mr. John Adam, Barrister-at-Law, Crown Prosecutor, Madras ; the Honourable Mr. S. M. Moses, Bombay ; the Rev. Foss Westcott, Cawnpore ; Mr. C. A. Radice, I. C. S., Commissioner of Hazaribagh ; Mr. W. R. Gourlay, I. C. S., Registrar of Co-operative Credit Societies, Bengal ; Mr. John E. Mackenzie, Principal, Victoria Jubilee Technical Institute, Bombay ; Sir George Arbuthnot, *Kt.*, Madras ; Mr. P. H. Swinchatt, Head-Master, Government Industrial School, Lucknow ; Mr. C. Benson, Deputy Director of Agriculture, Madras ; Mr. John S. Dawson, Acting Principal, Victoria Jubilee Technical Institute, Bombay ; and several other eminent men.]

APPENDIX VII.

LIST OF DELEGATES TO THE INDUSTRIAL CONFERENCE.

The gentlemen, named below, were elected as delegates to the First Indian Industrial Conference:—

1. *By the Committee of the National Fund, Calcutta*:—Rai Parvati Shankar Chaudhuri, the Hon'ble Babu Nolin Behari Sircar, C. I. E., the Hon'ble Mr. J. Chaudhuri, M. A., Bar-at-Law, Kaviraj Upendra Nath Sen, Kumar Rajendra Nath Mukerji, Mr. A. H. Ghaznavi, Bar-at-Law, Babu Provas Chandra Mitter, M. A., B. L., Babu Silendra Nath Datta.
2. *By the Mahajana Sabha, Madras*:—Messrs. G. Subramania Iyer, B. A.; V. Krishnaswami Iyer, B. A., B. L., T. Rangachariar, B. A., B. L., G. Venkataranga Row, M. A., N. C. Rajagopalachari, G. A. Natesan, B. A., C. Sankaran Nair, B. A., B. L., C. I. E., V. S. Srinivasar Sastri, B. A., L. T., K. B. Ramanadha Iyer, M. A., B. L.; L. T., P. Lakshmi Narasu Naidu, B. A., S. Venkatachariar, B. A., B. L., C. Vijayaraghavachariar, B. A., the Hon'ble Mr. L. A. Govindaraghava Iyer, B. A., B. L., the Hon'ble Mr. M. Krishnan Nair, B. A., B. L., Mr. M. Govindan Nair, B. A., B. L., Mr. A. C. Parthasaradhi Naidu, Mr. V. Rru Nambiar, B. A., B. L., Mr. C. R. Tiruvenkatachariar, B. A., B. L., Mr. C. V. Krishnaswami Iyer, B. A., B. L., Mr. T. V. Gopaldaswami Mudaliar, B. A., B. L., Mr. K. Narayana Row, B. A., B. L., Mr. G. Subbarao.
3. *By a Public Meeting held at Cawnpore*:—Babu B. N. Sen, Babu R. C. Chatterji, Babu Gopal Chandra Banerji, Sayyid Muhammad Hashim.
4. *By a Public Meeting held at Bellary*:—The Hon'ble Mr. K. Venkata Row, Messrs. H. Lakshmana Row, P. Siva Rao, T. Somasundara Rao, A. A. Sahbapati Mudaliar, J. Pilla Reddi.
5. *By the Kayastha Sadar Sabha Hind, Lucknow*:—Babu Fateh Bahadur Nigam, Vakil, High Court, Lucknow, M. Radhey Behari Lall Nigam, Vakil, Rae Bareilly, M. Munnu Lall, Rais, Cawnpore, Babu Debi Prasada, Vakil, Cawnpore.
6. *By the Landholders' Association, Madras*:—Mr. G. Venkatarangarow, M. A.
7. *By the Saraswat Samiti, Mysnasingh*:—Babus Akshaya Kumar Mazumdar, M. A., B. L., Puresh Chandra Lahiri, Pleader, Judge's Court, Kulada Charan Munshi, M. A., B. L.

8. *By the Sujan Samaj, Benares* :—The Hon'ble Munshi Madho Lal, Dr. Sri Krishna Barman, Babu Abhaya Charan Sanyal, M. A., Mahamahopadhyaya Pandit Adityaram Bhattacharya, M. A., Babu Indra Narayan Singh, M. A., the Rev. E. Greaves, Mr. A. C. Mukerji, B.A., Babu Kali Das Mitra, Pandit Chhannulal Joshi, Lala Jagdeo Prasad Gour, Rai Siva Prasad, Babu Joogal Kishore, Babu Durga Prasad, B. A., Pandit Baij Nath Misra, B. A., Babu Bhagawati Prasad, B. A., Babu Madho Prasad, Rai Bahadur Munshi Raghunandan Prasad, Babu Ram Krishna Varma, Pandit Ram Narayan Misra, B. A., Babu Ram Prasad Chowdhri, Pandit Ramawatar Pande, M. A.; Babu Sita Ram, B. A., Babu Hari Prasad Palodhi, B. A., Babu Hari Kesav Sanyal, B. A., Babu Sarada Charan Chakravarti, B. A., Babu Syam Sundar Das, B. A., Babu Lakshmi Das, B. A., Pandit Ramchandra Rao Naik Kalia, Dr. Ganesh Prasad, M. A., Dr. D. D. Pandya, D. P. H., Babu Kalka Prasad, Babu Badri Prasad Khatri, Mr. C. Y. Chintamani, Rai Bahadur Dr. Sripat Sahai, Dr. Ishan Chandra Roy Chowdhry, Dr. Jogendra Prasad Sanyal, Babu Ananda Kumar Chowdhry, Babu Kedar Nath Ghose.
9. *By the District People's Association, Madura* :—Mr. G. Srinivasa Rao, B.A., Mr. L. K. Tulsiram, B. A., B. L., Mr. D. Lakshman Bhagavathar.
10. *By the Indian Art School, Calcutta* :—Pandit C. L. Sharma, Babu Jnanendra Nath Das, M. A., B. L., Editor, *Samaya*, Kaviraj A. C. Bisharad, Babu Behari Lal Chakravarti, Editor, *Pradip*, Babu Manmatha Nath Chakravarti, Principal, Indian Art School, Babu Gopi Kanta Sen, Manager, Indian Art School, Babu B. N. Dutta.
11. *By a Public Meeting held at Baranagore* :—Rai Yatindra Nath Chowdhury, M. A., B. L., Zemindar, Babu Kedar Nath Mukerji, Babu Fani Bhusan Deb, the Hon'ble Babu Jogendra Nath Mukerji, M. A., B. L., Babu Lalit Mohan Ghosal.
12. *By the Swadesi Hitaisini Sabha and the artisans of Bishunpur* :—Babu Haridas Bhattacharya, Head Master, Bishunpur High English School.
13. *By the Bengal National Chamber of Commerce, Calcutta* :—The Hon'ble Babu Nolin Behari Sircar, C. I. E., Babu Radha Raman Kar, Babu Nibaran Chandra Dutta, Babu Muralidhar Ray.
14. *By a Public Meeting held at Bankipore* :—Babu Purnendu Narayan Sinha, M. A., B. L., Government Pleader and Zemindar; Babu Gajadhar Prasad, Pleader and Zemindar, Municipal Commissioner and Member, District Board; Babu Ram Gopal Singh Chowdhry, B. L., Pleader and Zemindar; Babu Kali Kumar Sinha, B. L., Pleader and Zemindar; Babu Krishna Sahay, B. L., Pleader and Zemindar; Babu Manmatha Nath Dey, B. L.; Babu Gopalji Sahay, Banker; Babu Alakh Kumar Sinha, B. A.; Babu Brij Nandan Singh, B. L.; Babu Nilambar Prasad, Pleader.

15. *By the Dawn Society, Calcutta*:—Babu Kishory Mohan Das Gupta, M. A.
16. *By the Rifah-i-Am Association, Lucknow*:—Babu Ram Chandra, M. A., Vakil; Mirza Samiulla Beg, B. A., LL.B., Vakil; Syed Wazir Hasan, B. A., LL.B., Vakil; Pandit Gokaran Nath Misra, M. A. LL. B., Vakil; Babu Bisheshwar Nath B. A., LL.B., Pandit Sukhdina Bihari Lall, B. A., LL.B., Vakil; Babu Ganga Prasad Varma; A. P. Sen, Esq., Bar at-Law.
17. *By the Council of the Dev Samaj, Lahore*:—Shriman Mohan Dev, Editor, *Sindh Upkarak*, Dr. Parashram, Medical Practitioner.
18. *By the Central Agricultural Committee, Madras*:—The Hon'ble Mr. L. A. Govindaraghava Iyer, P. A., B. L.
20. *By the Landholders' Association, Bhagalpur*:—Babus Uma Gouri Bose, Gouri Prasad Misser, Shital Prasad Misser, Sante Lal Misser, Chandra Kishore Chowdhuri, Surendra Nath Bose, Charu Chandra Bose, Surendra Nath Mukerji, Akshaya Kumar Chatterji, Sharada Prasad Mukerji, Ksbetra Nath Ghosal, Harendra Nath Bagchi, Manmatha Nath Banerji, Satish Chandra Singha, Shastri Bhushan Singha.
21. *By the Swadesi Vastu Paracharini Sabha, Bombay*:—Professor Nilkanth Babaji Ranade, B. A., Mr. Prabhakar Govind Vaidya, Banker, Mr. Ganesh Laxman Page, Mr. Mahadeo Gopal Vaze.
22. *By the Industrial Club, Ahmedabad*:—Mr. L. Nagardas, Mr. Chunilal N. Bhat, Mr. Keshavlal Manasukhram, Mr. I. C. Kanishver, Mr. S. M. Maharaja.
23. *By the United Provinces Graduates' Association, Allahabad*:—Babu Ramananda Chatterji, M.A., Dr. Tej Bahadur Sapru, M. A., LL.D., Babu Devendra Nath Ohdedar, B. A., LL.B.
24. *By the North Arcot District Association, Chittoor*:—The Hon'ble Mr. L. A. Govindaraghava Iyer, B. A., B. L., Mr. N. Krishnamachariar, B. A., Mr. V. C. Seshachariar, Mr. T. K. Narasimbachariar, B. A., B. L.
25. *By a Public Meeting held at Cocanada*:—Messrs. Pydah Venkatachalapathi, P. Ramarazu, G. Subbarayudu, B. A., D. L. Devalrazu.
26. *By the District Association, Vizagapatam*:—The Hon'ble Mr. B. N. Sarma, B. A., B. L. Mr. D. V. Narasinga Row, B. A., B. L., Mr. V. Jagannadham, B. A., B. L., Mr. V. Purnaiya, B. A., B. L., Mr. O. V. Jagannadha Sastri.
27. *By a Public Meeting held at Barakur*:—Babu Satish Chandra Dutta.
28. *By the Bengal Landholders' Association, Calcutta*:—S. R. Das, Esq., Bar-at-Law.

[The President of the Madras Chamber of Commerce, the Secretary of the Karachi Chamber of Commerce, and the Secretary of the Behar Landholders' Association wrote letters expressing sympathy with the objects of the Conference, and regretting their inability to send delegates to it.]

APPENDIX VIII.

SPEECHES AT THE OPENING CEREMONY OF THE INDUSTRIAL AND AGRICULTURAL EXHIBITION AT BENARES.

THE HON'BLE MUNSHI MADHO LAL'S SPEECH.

Your Highness and Gentlemen,—As Chairman of the Exhibition Committee, it is my privilege to open the proceedings of this meeting and my duty to give you a brief account of our work during the year. I tender to you all a hearty welcome to this interesting function, which has been made possible only by the generous support of the public. It is in my opinion a sign of the times that even a backward city like Benares has been able to organize an Exhibition on the scale of the present one. This is the first instance of such an Exhibition being held here so far as my recollection carries me. In saying this I do not forget, ladies and gentlemen, an Exhibition held here many years ago which I myself witnessed; but that was a purely local affair and a comparatively easy one to finance and to manage, whereas our present Exhibition is what its name implies—an Indian Exhibition; Indian not only in that it has been organised entirely by our countrymen, but Indian in the representative character of the exhibitors and the exhibits. As you are aware, ladies and gentlemen, the Indian National Congress has, during the last four years, associated with itself an Exhibition of the products, arts and industries of this country, and this Exhibition is the fifth of its kind. The excellent movement was inaugurated by our Bengali brethren, who have of late added to their public achievements a zealous effort to foster indigenous industries, and it has been taken up with avidity by enterprising Ahmedabad, practical Madras, and always progressive Bombay. That backward Benares should also have caught the contagion is to my mind full of significance. That, not resting content with following in the wake of the other cities named above, Benares should inaugurate an Industrial Conference is further eloquent proof, if one were needed, that the educated Indian is determined to do what in him may lie, to bring about the development of Indian industries. I will not, however, anticipate the function of Saturday week by any lengthy reference to this latest child of the Indian National Congress.

Your Highness, the essential point to be borne in mind in respect of the Exhibition which will presently have the honour of being opened under your august auspices, is in my opinion that it is a middle-class movement. Herein lies its principal significance. That the educated classes, who are obliged to give their first attention to their own bread-winning occupations and who are not as a rule very rich in the possessions of this world, should be able to do so much, is a practical demonstration that they are thoroughly alive to the need of what our present Lieutenant-Governor, whose absence to-day I am sure we all regret, has called industrial self-help. It proves that when they

appeal for State aid in any matter of national importance, they do so, less because of their unwillingness to work out their own salvation than on account of the impossibility of achieving great results without the active support of the State. I venture to invite the attention of high State dignitaries to this view of the matter, and hazard the prediction that no broad-minded official of the Government who studies our Exhibition with sympathy and insight will care to deny the truth of my statement. Gentlemen, I have said that this is essentially a middle-class movement. On that very account it must appeal to your indulgence. In this country it is the sad fact that organisations which are not started under the auspices or with the active countenance of Government and which have to depend on the uncertain support of public subscriptions, can at best be imperfect successes. Your Highness can with difficulty form an adequate conception of the innumerable difficulties which a middle-class movement like our Exhibition has to contend against. When His Excellency the late Viceroy, a generous admirer of Indian art, conceived the idea which bore such rich fruit in the delightful Exhibition which it was the good fortune of some of us to witness at Delhi two years ago, he had only to allot a few lakhs out of State revenues and to depute experts like Sir George Watt to carry his project to a successful completion. Again, when their Highnesses the Nizam of Hyderabad and the Maharajah of Mysore decided that the Royal visit to their capitals would best be celebrated by the holding of exhibitions of the products, arts and industries of their States, nothing more troublesome was necessary than the deputation of a few of their high-placed officers to carry out the task with the aid of munificent sums placed at their disposal. We, your Highness, are less fortunately circumstanced. While we are nothing but sincerely grateful to those Maharajahs and Rajahs who have helped us with munificent donations, it is the humble mite of the poorer middle class which has been our chief support. And if the best effort of which we have shown ourselves capable has been less than the minimum necessary to lead us to success, I may still venture to hope that a visit to our Exhibition will not be altogether useless and that those who do us that honour will not feel that we have laboured in vain.

Gentlemen, enthusiastic as our countrymen are in the efforts to develop manufacturing industries, we have all to recognise the hard realities of the situation and must admit that for long years to come, if not for ever, agriculture is bound to remain the principal occupation of the bulk of our countrymen. And he is the truest saviour of the famishing millions of this impoverished land whose efforts will make two blades of grass grow where only one grows now. Wrote Sir James Caird many years ago:—'I believe it possible to obtain such a gradual increase of production in India as would meet the present rate of increase of population for a considerable time. One bushel of increase gained gradually in a period of ten years, in addition to a moderate reclamation of cultivable land, would meet the demand of the present growth of population.' This statement is as true to-day as when it was made; and the aim of the re-organised and improved Agricultural Departments of the Supreme and Provincial Governments, of the Provincial and District Agricultural Associations which are being formed in several provinces, as well as of the Agricultural Exhibitions

and Cattle Shows which have become a regular feature of the day, is to bring about the result insisted on by Sir James Caird and other eminent experts. Bearing this well in mind, and convinced as we are that the future of Indian industries is safe only if the means of our agricultural population will be so increased as to enable them to make even moderate purchases of articles of utility as well as luxury, we of the Benares Committee have from the outset attached great importance to the Agricultural Section which was added to the Congress Exhibition last year at Bombay. True it is that the actual achievement bears no proportion to the wished for result, and that even what has been done was only possible because of the assistance rendered to the Committee by Mr. S. M. Hadi, the capable Assistant Director of Agriculture who has been deputed by the Provincial Government to show off the exhibits of his own department. There is, however, one special feature of the Agricultural Section which deserves to be brought prominently to the public notice. I refer to the demonstration of the improved processes of Sugar refining which is in charge of Mr. Hadi. It is generally known that while the Sugar industry first took root in this ancient country and that even so late as three quarters of a century ago, India was exporting large quantities of Sugar to foreign lands after meeting the full demands of its own population, our countrymen are at present obliged to consume nearly six crores of rupees worth of foreign Sugar. Nothing can be more lamentable, and any effort made in the direction of rehabilitating this considerable industry demands complete public support. Besides, as is generally known, these Provinces are the centre of the Sugar refining industry, and consequently a special responsibility rests on us to do whatever is possible to restore the old conditions. Mr. Hadi has devised improved processes of Sugar refining, and it may be assumed that their general adoption will go a long way towards making Sugar refining an important industry once again. Of course this will be the case only if our capitalists invest in the industry. I venture to appeal to them not to hesitate to do so as they will in all probability get a good return on their outlay, besides generally closing the Indian market to the foreign sugar producer. Before concluding my remarks on this, I will with your permission tender my thanks to Sir William Wedderburn, that never tiring friend of India, for sending for exhibition here samples of some foreign agricultural products.

Your Highness, I will now address myself generally to the Industrial section of the Exhibition. I have said that agriculture is and must remain the principal industry of India unto the distant future. It is hardly less true that its material prosperity does largely depend on the development of manufacturing industries. It is as much the case to-day as when it was written by the Famine Commissioners nearly thirty years ago, that "at the root of much of the poverty of the people of India and the risks to which they are exposed in seasons of scarcity lies the unfortunate circumstance that agriculture forms almost the sole occupation of the mass of the people, and that no remedy for present evils can be complete which does not include introduction of a diversity of occupation through which the surplus population may be drawn from agricultural pursuits and led to earn the means of subsistence in manufactures and some such employment. A main cause of the disastrous consequences of Indian famines and one of the greatest difficulties in the way of promoting relief in an

effectual shape, is to be found in the fact that the great mass of the people directly depend upon agriculture, and that there is no other industry from which any considerable part of the population derives its support." Between agriculture and urban manufacturing industries are the old village industries which furnish occupation to many a poor soul and whose gradual destruction is one of the most tragic of Indian economic phenomena. Cultivation and labour, and after these Sugar making and weaving, these are the chief occupations of the mass of our population. I have already emphasised the paramount importance of paying increased attention to the Sugar refining industry. In so far as the working of large factories by the use of power goes, it is for the capitalist class to do the needful. But there is improved refining process by hand mechanism as well, and it will be very beneficial if this could be popularised and brought within the reach of our village folk. Then we have the weaving industry, which is not only a secondary occupation for the agricultural classes but is the primary means of livelihood of several million people. These men are unfortunately not in the best of circumstances, and it is notorious that they cannot stand the first touch of scarcity. After the agricultural labourers they stand most in need of relief wherever the seasonal rains fail. Any steps taken to set them on their legs again, would not only solve the problem of their poverty but will be the means of producing enough cloth for all the people of the country. This can best be done by devising improved handlooms which will produce more cloth in less time than is the case at present. It may be quite true that powerloom mills will have to be established in larger numbers if we are destined eventually to do without foreign cloth, but opinion is by no means unanimous that that way lies our salvation. Indeed, I am not sure that experts have not made up their minds in favour of the hand mechanism as best suited to the conditions of this country. Let this be as it may, there is an urgent reason for doing all that is possible to develop the village weaving industry. It is my experience as a landlord that it is best suited to the conditions of Indian life to make every village, in which lives the nation, as self-contained as possible. Apart from the social perils incidental to factory labour, it is imperative for more reasons than one that our old village industries should be revived wherever possible and not allowed to die a painless death, and these remarks hold equally true of other industries such as pottery, vessel making, cane work and so on. For these reasons the Exhibition Committee has deemed it its duty to bestow prominent attention on the handloom business, the more so because of recent events which have given so encouraging a stimulus to the demand for country-made goods. Early in our work we put ourselves in communication with such men as Mr. E. B. Havell, Mr. S. P. Kelkar, and Mr. Alfred Chatterton, while we have received particularly useful assistance from Rao Bahadur Raoji Bhai Patel, Director of Industries and Agriculture in Baroda, whom I am glad to see here to-day. A Handloom Court has been organized and the weavers deputed from the Technical School of Baroda are there to demonstrate the working of nearly every improved loom now before the public. I am confident that no one who visits this court will go away without being amply rewarded. Another special feature of the Industrial section, to which I may usefully invite your attention, is the

demonstration in lace-making that will be given by girls from the same enlightened state, who have been specially called here at the instance of our eminent countryman, Mr. R. C. Dutt. Our ladies, who are so fond of wearing lace and who find some little difficulty in satisfying their wish as they have an increasing desire to wear only articles made in this country, will, I dare say, be delighted to know that Baroda will come to their aid. To the gentlemen named here, and the Hon'ble Mr. Vithaldas Damodher Thackersey, whose genius for organisation found such splendid scope in the wholly successful Exhibition held last year at Bombay, and to Mr. D. V. Hanumantha Row, Secretary of the last Madras Congress Exhibition, I gladly tender my grateful thanks for the help they have rendered us.

I do not propose to take up your time, ladies and gentlemen, by lengthy references to the other sections of our Exhibition. There is the Arts Section, there is the Health Section and there is the new Educational Section, to all which I invite a visit from you. True it is, none is more conscious of it than I am, that there is a good deal left to be desired in our organization. But I feel that the Committee has not totally failed in its work when I contemplate the practical good that is likely to result from the demonstration of the Sugar refining processes and of the working of the improved handlooms. I cannot bring these remarks to a close without tendering the grateful thanks of the Committee and myself to all who have assisted us with their helpful counsel or rendered us material support. Few can know how much we are indebted to our sympathetic Commissioner, Mr. D. C. Baillie, our amiable Collector, Mr. E. H. Radice, to Mr. Bramley, the Superintendent of Police, and to the Military authorities of Benares, of whom gratitude compels me to make special mention of Colonel Bowring. It is the literal truth that it would have been impossible to organize this Exhibition or the other grand function which will be held in the next few days, without their sympathy and assistance. It is not possible to make a personal reference to every one who has been of help to the Committee, as there are so many of them, but I would ask all these volunteer workers to believe that we are sincerely thankful to them.

I now request Your Highness, to whom we are all so grateful for becoming the patron of this Exhibition and for presiding at this opening ceremony, to declare the Exhibition open.

H. H. THE MAHARAJAH OF BENARES' SPEECH.

It is a great pleasure to me to come to open this Exhibition, and I must thank the members of the Executive Committee for having invited me to do so. It affords me an opportunity of meeting such a large gathering of my distinguished countrymen who have taken all the trouble to come to our holy city from different and distant parts of the country, among other things, to appreciate and encourage local industry and manufacture.

I will not traverse the ground covered by my Hon'ble friend, the Chairman of the Exhibition Committee in the interesting speech to which, I am sure, we have listened with close attention in attempting

to give you an idea of the aim and the scope of the exhibition. I would rather content myself with a few general remarks pertinent to the occasion. The organisation of these annual Exhibitions by successive Reception Committees of the Indian National Congress is proof of the determination of the educated middle class of India to wipe away the somewhat just reproach that they pay excessive attention to political agitation and have no adequate conception of industrial development as a factor in national regeneration. If I am right in thinking so, I take leave to congratulate them on this recent development of their programme. Believing as I do that the first need of my native land is the working up of its rich natural resources, I am naturally pleased at the earnest effort that the intellectual aristocracy of the country have begun to put forth to compass this end.

I do not propose to dwell at any length on the splendid past or the brilliant possibilities of Indian industry. It is enough for us to know that it is the considered opinion of so-high an authority as Sir Guilford L. Molesworth—

“That India possesses enormous natural wealth and resources, Agricultural, Mineral, or Industrial, but they are to a great extent undeveloped. Her coal-fields so far as they have been explored cover an area of 35,000 square miles and are estimated to contain 200,000,000,000 tons of coal! Some of the seams are 70 to 100 feet thick. 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 extraordinary and unparalleled magnitude, whole hills and ranges of it being of the purest variety. There is chrome-iron capable of making the finest Damascus blades, manganiferous ore, magnesite, splendid Hematites in profusion, Peat, Petroleum, Gold, Silver, Aluminium, Lead, Tin, Copper, Plumbago, Lime, Magnesia, Mica, Gypsum, Salt, Soda, and Asbestos. There are immense forests of valuable timber. There are food grains of every description, soft wheat equal to the finest Australian, hard wheat rivalling the best Kabauka, Oilseeds, Rubber, Tobacco, Tea, Coffee, Cocoa, Sugar, Spices, Dyes, Cotton, Jute, Hemp, Flax, Coir and fibre of every description—in fact, products too numerous to mention.”

The development of this potential wealth can only be the result of a combination of capital, skill and labour, of the joint effort of the State and the people. I have no doubt that the Government have done much and will do all that lies in their power to further this end, provided we approach them in a practical way showing them what we have done and what we want them to do for us. By the way, I might suggest that we ask them to render support to Indian captains of industry, to help in the establishment of co-operative industrial banks in our towns with a view to the better organisation of indigenous capital, to establish a Polytechnic Institute at some suitable centre in the country, and above all to institute an industrial survey of India which these competent to pronounce an opinion have declared to be a condition precedent to the introduction of an organised system of technical education in the several provinces. At the same time I would urge my own countrymen to sedulously cultivate a living interest in industrial problems, to employ their capital and talent in wealth-production instead of wealth-consumption, to learn the

essential virtues of self-help, self-respect, mutual confidence and co-operation, to exhibit less of anti-foreign bias and more of a real desire to profit by the lessons which the industrial West has to teach us. In this connection it is perhaps permissible for me to express my sense of cordial approval of the action of the Benares Exhibition Committee in inaugurating the Industrial Conference movement from which I expect great things if persistently worked by capable men.

Turning now to the Agricultural problem, I would take leave to remark that the Government in the last few years have done so much towards the improvement of the agriculture of this country that with a little co-operation from the people themselves the prosperity of the agricultural class ought to be practically assured. The gigantic irrigation programme which the Government has taken in hand at the recommendation of the Irrigation Commission will, when completed, serve to mitigate the evils of the scanty rainfall so far as lies in the power of any human agency to fight against fate. The improvements effected in the veterinary department, the easy rules framed for the grant of loans for agricultural purposes, the elastic elements introduced into the system of the land revenue, the liberal remissions and suspensions sanctioned in times of scarcity, the valuable concessions made to the Credit Societies, and above all the establishment of an institution for agricultural research with an Agricultural College in prospect, ought to make the lot of any agricultural community as happy, and its future as bright as possible.

If our peasantry determine to curtail their marriage and funeral expenses, which is at the root of their chronic indebtedness, give their children some elementary education at the village schools, which a kind Government has placed at their doors, and thus save them from the clutches of the village Patwari; cultivate the habit of saving, and instead of burying it deep in the ground, invest it in safe undertakings; give up the notions of fatalism and be active and doing; while attached to their ancestral home cultivate the habit of migrating to "pastures new," which the facilities of the Railway journey have made possible; and in short, instead of living an isolated life mix with the world at large with courage and determination; I have no doubt that they will become as flourishing as any peasantry on the face of the earth.

It behoves those amongst us who are landholders to try to improve the condition of their tenantry by encouraging them in every way and by showing them by their own example that the people are never slow to follow and adapt, and thus pave the way for their prosperity.

Gentlemen, I will not take up any more of your time but would conclude with wishing every success to this Exhibition, which no doubt, will convey many useful lessons to the lovers of Indian art and agriculture and appreciably advance the cause of our national progress.

APPENDIX IX.

NOTES ON THE INDUSTRIAL AND AGRICULTURAL EXHIBITION AT BENARES.

EXTRACTS FROM AN ARTICLE BY MR. PURAN,

*Analytical Chemist (Tokio), Member of the Chemical and the
Pharmaceutical Societies of Japan, in the "Indian Review"
for January, 1906.*

On the whole, the Benares Exhibition gave a bird's-eye-view of the Industrial India and the following industries, some of them pretty well represented, struck me. After counting them one by one, as I have on my note book, I will offer a few remarks on some of them.

The candles from Gujarat; the soaps of Bengal, Bombay and Cawnpore; the perfumes from Cawnpore and Kanouj; horn, ivory and silver work of Cuttack; cutlery of Dhulia, Khandesh; drills, twill, piece-goods, reeled thread from Bombay; glass manufactures of Rajpur and Umballa; pottery and fancy tiles from Jeypore; the brushes of various sorts of the Empire Brush Factory; the stone-ware of Gaya and Agra; ivory work of Vizagapatam; science apparatus from Umballa; pen-holders and nibs from Calcutta; umbrellas and buttons from Bombay; the sports materials from Sialkote; paints, colours and varnishes from Calcutta; silk weaving on the Chinese and Japanese lines of the Aligarh Weaving Mills; gold tapestry of Benares; enamel of Multan; the agate work of the Madras School of Arts; steel trunks from Sialkote and other places; locks, hinges and bolts, iron safes from Calcutta and other places; chromé-tanned leather goods from the Madras School of Arts and bark-tanned leather goods from Cawnpore; straw work and fine mats; cigarettes; hand-looms from Lahore, Calcutta and Baroda; sugar from Agra; plantain fibre and cloth from the Moola Rama Varma Technical Institute; woollen stuffs from Cawnpore; carpets, ribbon work on silk and velvet cushions by Miss Avabai Gudiali, Bombay; needle work and embroidery; engraving, photography and drawing; prison industry as well as the plantain preparations from Madras, all struck me as growing industries and with very green prospects for their future development in India.

GLASS INDUSTRY.

Considering the vast market of India and the enormous demand for glass articles, I have to confess that the Umballa and the Rajpur factories have only made a beginning and a very crude beginning, too. No doubt, the glass industry has many impediments in its way, but no organised effort has been made, as yet, to surmount them. I had a long interview with the manager of the Himalaya

Glass Works, Rajpura, who explained to me how they had, after a loss of Rs. 4,000, come to a stage from where they expected good profits henceforward. He pointed out the chief difficulty they encountered in training the blowers and that the Indian proprietors very soon lose their patience under such circumstances, not realising that this initial loss is to be reckoned as investment in such prominent and clearly profitable industries.

By this time the first difficulty of finding good materials for glass is overcome. The Himalayan glass works quarry it from a mountain near Rajpura, and so do the Umballa manufacturers, not to speak of hills upon hills of pure quartz suited for the best sort of glass near Kangra and Gwalior. We should only grow wise to properly utilise what Nature places at our disposal in such a great abundance. The chief stumbling blocks, now, in our way to sure success are the want of practical knowledge, of cheap furnace making and the dearth of skilful blowers. There is only one way for their solution, and that is, by establishing a *Central Glass-blowing Institute*. This Institute should have two teachers to begin with, one experienced-blower for training Indian labourers and their children in glass blowing, and another for training Indian masons in the art of furnace making. This arrangement will be far cheaper than to send our labourers out to foreign countries for this purpose; while there can be no possibility at all, of our educated young men learning the art of blowing, as in every country it is entirely in the hands of labourers working on comparatively low wages. This Institute will be a sort of an experimental glass factory with two foreign experts not costing more than Rs. 15,000 where a regular army of blowers and furnace-makers will be trained and equipped to be sent out, to spread the glass furnace, like hearth fire all over the country. It can be shown that such an Institute can be worked on commercial lines so that no monthly endowment may be needed. This would be charity in the right direction fraught with life-sustaining gifts of art. These two preliminary difficulties having thus been solved, it bids fair to become a staple industry of India.

I have ventured to propose a special glass-blowing institute, because it is my firm conviction that our honest efforts should be concentrated at one point, on one industry only, as it is simply futile to mix too many subjects and create an unworkable confusion. Oh, how strongly I wish there should be a strict specialization of the technical institutes to insure their real worth and solid utility!

POTTERY.

Pottery and enamel wares were very poorly represented at Benares. Kaolin has to be used if we have to make any advance in the ceramic art. Ranigunj and Gwalior have extensive deposits of China clay. The furnaces that our potters use are very well adapted to the present needs and we have to make only slight modifications to bring them on a level with the Western appliances. This can be done by organising illustrated lectures by foreign-returned youths of India. As pottery is already ahead, we have to take a step in popularising ornamental pottery. To do this, we need an experienced artisan from Japan, to train our potters, in the Japanese methods of painting, enamelling, and brick-burning. It would not cost more than Rs. 5,000

and his two years' stay amidst our artisans would be productive of grand results. I remember the Lahore Exhibition of 1893, where the beautiful vases of Multan were bought at high prices by foreigners almost with a passion. No reason, then, why our pottery should not grace the world's markets.

THE TOILET SOAPS.

This industry was fairly represented and it was pleasant to see the beautiful glass cases of the N.-W. Soap Co. and the Bengal Soap Factory. The Diamond Soaps of Bombay were good. But it is one drop in the ocean. They cannot supply even a small fraction of the great demand which is more than what two hundred factories may meet with. The plant for the toilet soap, including steam engine, if imported from Japan, does not cost more than Rs. 6,000, and the satisfactory working of the plant is well shown by the Bengal Soap Factory for which I brought one with me two years ago. The growing profits of the Bengal Soap Factory are, indeed, encouraging and our capitalists should look to this industry with business earnestness. If the Exhibitions fail to awaken the capitalists or to show new industrial routes to the Joint Stock Companies, I don't see any substantial good they may do in the growth of our industries.

Matches, umbrellas, buttons, metal-cutting as spoons, lamps, needles, pins, nibs—have not received that amount of attention which is their due. And so are the industries of leather-tanning, paper, cement and straw work not developed to the required extent. The methods in vogue with our tanners are very crude. Simple chemicals like sodium sulphide used to preserve sun-burnt hides in the lime vats, or those used in finishing the leather are quite unknown to them. A few technical lectures to our tanners will throw new light upon their industry. If such industries are to grow, they will grow at the hands of the common people in charge, through such means only. Cement is cruelly neglected while it may be a great paying concern with the abundance of extremely cheap raw materials available in the country.

THE INDIAN CURIOS.

Under this heading, I class the beautiful ivory work of Vizagapatam, horn work and inlaid ivory work of Cuttack, stone wares of Agra and Gaya, embroidery and tapestry of Benares, silver ware of Kashmir, wood work, etc., which, as productions of the art, are sure sources of wealth. Some of them are too costly and cannot be made commercial on any large scale. This was also the difficulty which Japan had to confront. Her curios being very valuable were not paying in the beginning. But they made exact patterns of their precious art-productions at very cheap prices, and to-day the Japanese curios is a great item in their exports. Our artisans do not know yet the value of perfect neatness, simplicity of design, faithfulness to nature, close intimacy with the technique of art and the value of artistic finish and packing. I think this lack of artistic knowledge is a great obstacle in the way of popularising our curios in the West. To do this, the best thing would be to send a dozen of our best artisans to Japan, for at least five years' stay there and learn the making of Japanese curios under Japanese workmen. On their return, they will

blend the Japanese and the Indian designs in very charming productions. I missed the exactness of design in the Indian curios ; and a sort of blazing beauty that is so conspicuous in the Japanese artisans, will be very costly and of little use.

But the beautiful needle-work and exquisite embroidery of Japan is done by women and it is not difficult to set up a department of embroidery and needle-work, in any girls' school with a lady artist from Japan as the teacher. One great thing that we have to learn from Japan is to produce, side by side with our precious curios, the cheaper editions of the same for the general market. Situated as we are, it is my firm belief that unless we let the Japanese exercise a predominating influence over our fine arts, and we put ourselves entirely under their training, there seem no prospects for any immediate and organic improvement in our arts.

Have I suggested too many things at once? No. If the *Swadeshi* sentiment is real and if our leaders have the flaming ambition for organising our industries and arts into perennial sources of national wealth, then it should not be difficult at all to establish a dozen specialised Technical Institutes under the Japanese supervision and to have a dozen Technical Lectureships on behalf of the Industrial and Agricultural Exhibitions.

In conclusion, let me say, that the future of the Industrial Exhibition of the Congress, is undoubtedly a very hopeful one, in spite of all its shortcomings. Before something better and more is done, let us always have the pleasure of a cursory glance on the whole of Industrial India and thank with all our heart, the selfless workers and organisers of such patriotic, instructive and constructive institutions.

APPENDIX X.

THE GENERAL SECRETARY'S LETTER TO THE MEMBERS OF THE PROVINCIAL COMMITTEES OF THE INDIAN INDUSTRIAL CONFERENCE.

DEAR SIRS,

I send herewith for your consideration and such action as may appear suitable to you, a copy of the resolutions passed at the Industrial Conference held at Benares on the 30th of last month. For the purpose of giving effect to the recommendations made and the course of action laid down in these resolutions, Provincial Committees have been constituted for Bengal, Bombay, Madras, the United Provinces, the Punjab and the Central Provinces and Berar. You and the gentlemen mentioned on the margin form the Provincial Committee for You and the gentlemen mentioned are given the power to add others to your committee and to establish sub-committees wherever it may be considered desirable to do so. I beg your committee will kindly let me know what steps have been or are proposed to be taken in the matter. I would further suggest that your committee will select a secretary and communicate his name to me in order to facilitate communication and obviate unnecessary correspondence.

The work before the Provincial Committees is so vast that they cannot be expected to undertake the whole of it at once. With a view to secure systematic efforts and concerted action I would beg to know in what direction and on what lines your committee proposes to commence immediate work and in what order it considers that the other recommendations of the Conference should be given effect to. The views of your committee will be communicated to the other Provincial Committees whose views will be sent on to you.

I might be permitted to point out what work should be taken in hand by our Provincial Committees. The extension of scientific and technical instruction and the increase in the supply of articles of indigenous manufacture which are turned out at present should claim our first attention.

(A.) SCIENTIFIC AND TECHNICAL EDUCATION.

In regard to scientific and technical education it is hoped that the Government of India will be pleased to make before long substantial grants to the Local Governments and Administrations for the establishment of technical colleges and schools within their respective jurisdictions and to establish at least one Polytechnic Institute and academy of research for the country. In the Resolution which the Government of India issued two years ago on the report of the Committee on Industrial Education, they say :—" Such a scheme as has been sketched above both for larger industrial enterprises and for

smaller handicrafts must, the Governor-General in Council thinks, in the main depend upon Government and not upon private management." The different Provincial Committees should, it is suggested, approach their respective Governments and move them to take action in the matter and to give effect to the direction contained in the aforesaid resolution. But it is possible that some time may elapse before Government decide what course to follow, and it would obviously be undesirable to wait till Government take action or to depend entirely upon Government initiative and support. Bengal it seems will have before long at least one scientific and technological college established and maintained by private donations and subscriptions, and it is to be hoped that the other Provinces will make similar efforts to supply their deficiencies. To enable the Provincial Committees to determine their course of action I would mention some facts.

Bombay has got two institutions of the status of colleges where technical instruction is given—the Victoria Jubilee Technical Institute of Bombay and the College of Science at Poona. In the former provision is made for teaching mechanical and electrical engineering and textile manufacture; in the latter there is fairly due provision for mechanical engineering. There are also at Ahmedabad, Surat, Poona, and Sholapur technical schools where what might be called elementary and secondary instruction is given. I ought not to omit the Kalabhuwan at Baroda which in addition to mechanical engineering gives instruction in some industries also. In Berar there will be started soon the Victoria Memorial Technical Institute at Amraoti, where instruction will be given in mechanical engineering, carpentry, smithy, turnery and general fitter's work. In the secondary private school opened a few months ago at Amraoti by the Berar Education Society it is proposed to add a weaving class in addition to the provision for general manual training and to have also classes for carpentry, smithy and turnery training. I mention all these things for this reason that as the resources of our people are very limited, we should husband them properly, and first direct their application in those directions where no provision exists at present. For instruction in mechanical and electrical engineering and manufacture of cotton or other textiles there is no facility in the three great presidencies of Bengal, the United Provinces and the Punjab, while the circumstances of our country require that attention must preferentially be bestowed on these. The Victoria Technical Institute of Bombay has applied itself mainly to these three courses. There was for some years provision made for teaching enamelling; but this course had to be abandoned owing to certain difficulties. The capital expenditure for establishing an institute like the Bombay one—and it is not very lavishly or sumptuously equipped—would not fall below 8½ lakhs. The maintenance and the recurring charges would not be less than Rs. 50,000 a year. Even an institution like the Amraoti Victoria Institute which aims only at giving instruction in the mechanical engineering course in the higher school and in the courses of carpentry, smithy and fitter's work in the lower school, will require one lakh of rupees for capital expenditure and rupees 14,000 a year for recurring charges. Twenty lakhs of rupees would be required before a technical college which goes no further than the Bombay Institute can be established. Instead, therefore, of

APPENDIX XI.

THE GENERAL SECRETARY'S CIRCULAR REGARDING INDUSTRIAL SURVEY.

DEAR SIR,—In continuation of the enquiries made and information requested in my printed Circular of January last,* issued to the Members of the Industrial Provincial Committees and printed in several papers for general information, I send herewith a set of questions framed for the purpose of collecting the information which it is essential that the Industrial Conference should have to deal in a methodical, satisfactory and effective manner with the work with which it has charged itself. I trust that you will be so good as to give early attention to this matter and send your reply at as early a date as possible, so that the information so collected might be compiled, classified and assorted before the beginning of October next. If the information sought for is received within the period mentioned, it is proposed to issue the classified compilation to the several Provincial Committees in time to enable the members to make specific proposals and recommendations based on it.

Yours faithfully,

R. N. MUDHOLKAR,

General Secretary, Indian Industrial Conference.

Questions to be Answered.

A.—AGRICULTURE.

1. What is the condition of the agricultural industry in your district?
2. Has the whole or the greater portion of the culturable area been brought under cultivation?
3. What is the general quality of the soil?
4. What is the general condition of the land-owning and cultivating classes?
5. To what extent are the lands held on a proprietary tenure by the cultivators themselves, to what extent by privileged tenants, and to what extent by mere tenants at will?

Vide Appendix X.

6. What steps are being taken in your district for the improvement of agriculture by—

- (a) Supply of cheap capital ;
- (b) Extension of scientific and practical instruction ;
- (c) Employment of improved appliances ;
- (d) Resort to recuperative processes like manure, etc.

7. To what extent has advantage been taken of the village co-operative credit system, and what amelioration has it effected in the condition of the peasantry ?

B.—MANUFACTURING INDUSTRIES.

8. Name the existing manufacturing industries in the different towns and villages of your district under the following heads :—

- (1) Textile fabrics—Cotton, Wool, Silk, and Jute.
- (2) Vegetable and animal products.
- (3) Leather, horn and paper.
- (4) Pottery, porcelain and glass.
- (5) Metals.
- (6) Chemical industries.
- (7) Furniture and decorations.
- (8) Materials used in construction.

9. What is their present condition ?

10. What was their condition in the past ?

11. What is the approximate number of people employed in and dependent on them severally ?

12. What is the approximate amount of capital employed in them severally ?

13. State how far they have been affected by competition with imported articles.

14. What are the markets for the products of these industries, i.e., do they supply only a local demand, or are they sent to other markets in noticeable quantities ?

15. What facilities exist to increase their supply if an increased demand arose ?

16. How far, in your opinion, are the existing industries capable of expansion ?—

- (a) by making advances to the artizans at low rates of interest ;
- (b) by the improvement of the appliances in use ;
- (c) by the imparting of special instruction, and
- (d) by the employment of power machinery ?

spending funds on small schools in different localities the most suitable course to adopt at present would be to have one fully equipped Technical college for Northern India and two secondary colleges, or High-schools at Allahabad and Lahore. In the first college, in addition to the three courses mentioned above, there should be provision for teaching at least two more:—(I) Mining and metallurgy and (II) Industrial chemistry.

The requirements of Southern India are similar to those of Upper India. The matter for the Madras Committee to consider is whether the leaders of the educated community should not personally appeal, to the rulers of the great states of Hyderabad, Mysore and Travancore, and obtain their help for the establishment of a fully equipped science and technological college. It would be well to have in addition to such college at least two secondary technical schools, one in the northern part of the presidency and the other in the southern.

As distinguished from general technical schools and colleges stand the crafts schools. There are several so-called industrial schools; but the majority of them are failures. A few of them are doing good work; but in regard to the majority the Government of India have pointed out how very defective they are. Efforts should be made to have the course of instruction in these places placed on a sound basis. The lines on which these schools should be conducted, how they are to combine effective practice in workshops with instruction in the principles on which a craft or industry is based is shown in the resolution of the Government of India.

Educational institutions in India are still conducted on methods which were prevalent in England till the other day. Those methods are found defective; and as in England facilities should be provided for the training of the eye and the hand, the development of the faculties of observation and experiment, and to bring the pupils of our schools more in contact with nature. The introduction of object lessons and the incorporation of drawing and manual training in the school curriculum claim our close attention. For manual training in general schools the course laid down in the hand-book of Drs. Thomson and Alexander (College of Science, Poona) might be followed with great advantage.

(B.) DEVELOPMENT OF EXISTING INDIGENOUS INDUSTRIES.

In the absence of the long asked for industrial survey the only way for carrying out this object is to employ such agencies as our people possess for collecting information from the different parts of the country regarding the main industries (besides agriculture) which give employment to any considerable body of persons. It is necessary to know what articles are prepared or manufactured, their quality, the approximate number of people employed thereon, the present state of the industries and their capability of improvement and expansion. If such information is obtained from the different Districts, I and the Assistant Secretary, Mr. Chintamani, will work in collecting it and issue half-yearly or yearly directories based thereon. I beg you will kindly give all the information you can in regard to these matters and request such of your friends and acquaintances as are qualified to help the object of the Conference, to give us the

benefit of their knowledge and experience. There are several industries which will be in a far more thriving condition than now if their products are consumed in larger quantities. So far as the restricted consumption of Indian articles retards the development of an industry the information collected is calculated to further such development.

(C.) ORGANISATION OF CAPITAL.

The third matter which deserves immediate consideration is what steps should be taken for raising the capital which is required for the creation of new industries and the improvement and development of old ones. So far as individual initiative and local organisations are supplying this want no action is called for just now from the Provincial Committees of the Conference. But there are important industries, like the Mining industry for example, in which Indian capitalists have hardly ventured to put forth any efforts, but which have assumed or are assuming an importance which makes it incumbent upon us to take serious counsel and to devise ways and means to obtain a due share for our people in these valuable industries. To take the instance of the Mining industry it is not to be expected that Government will permit the mineral resources of India to be undeveloped, because our people have not taken care to equip themselves with the requisite knowledge and experience, and cannot raise the necessary funds either through lack of means or want of enterprise. Foreign companies, possessing all these requisites, have already taken the field, and if we do not stir ourselves betimes we shall see the Mining industry of the country passing into the hands of foreign capitalists. The amount of capital required for this purpose will have to be very large; and this can be raised only if an united effort is made by the leading people of all the provinces. A Central Association in which such persons are combined and evince their practical interest by taking shares, will generate confidence and attract the help of the monied classes and the co-operation, according to their means, of the middle classes. Such an association will further have the advantage of possessing an influence which will facilitate the grant of concessions by Government, and it will enjoy a credit which would enable it to obtain loans on easy terms either in this country or from abroad whenever any occasion arises for the same. I beg your committee will discuss this matter with the leading men in your province and discover whether the suggestion made meets with their approbation and support.

I do not here make any reference to the textile industry, because I consider that Indian capital has already commenced to flow in that direction and further development may be left to the operation of natural causes. I regard the Mining industry as deserving of immediate attention, and I therefore give prominence to it.

I am, dear sirs,

Yours faithfully,

R. N. MUDHOLKAR,

General Secretary-

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208	1 from top	depositories	repositories
208	15 "	weild	wield
209	13 from bottom	companies	companies
210	8 "	effecting	effecting
225	1 "	(professional)	professional
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227	7 from top	and	and
229	17 from bottom	objects	objects
230	4 from top	to	on
240	15 "	much	more
241	8 "	constitutions	communities
246	2 "	officers	offices
248	8 from bottom	my	may
259	5 "	attract	attract
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17. What industries existed in your district formerly but have since decayed?
18. What are the causes of their decay?
19. Is it practicable to revive any of them profitably?
20. If so, suggest measures to bring about their revival.

C.—MINERALS AND OTHER NATURAL PRODUCTS.

21. Name the mineral and other natural products of your district which are or can be manufactured into finished articles of consumption and use.
22. Which of these are manufactured in your district?
23. Which, if any, of these are sent to other parts of the country for manufacture?
24. Which of them are exported to foreign countries in their raw state, and re-imported as finished articles?

D.—CAPITAL.

25. What Banking facilities are there for the support of the industries in your district?
26. Have any Urban Industrial Banks been started in any town of your district under the provisions of the Co-operative Credit Societies Act?
27. If so, give particulars in regard to their organization, the capital employed, the conditions of lending and borrowing, etc.

E.—TECHNICAL EDUCATION.

28. What facilities are there for training young men in the various industries that exist in your district?
29. If there are any special schools for the purpose, give particulars in regard to their curricula.
30. Is instruction given both in the practice of and the principles which underlie an industry, or, is it theoretical merely or merely empirical?
31. What success has attended these schools?
32. Are industrial and commercial classes attached to any of the schools in your district?
33. If so, give full particulars in regard to them.

34. Have any students been sent abroad from your district to acquire technical, industrial or commercial education?

35. What are their qualifications and were they tested?

36. Who, or what agency, has sent them, and under what conditions, if any?

37. In what countries are they being trained?

38. What arrangements are made to utilise their special technical knowledge by the supply of capital or otherwise, to start or develop the industries in which they receive special training?

39. Are there at present in your district any persons which have received special training in any industry? If so, what are the industries in which they have been trained?

40. How are they employed at present?

41. If their knowledge is not being utilised, what steps can be, or are proposed to be taken, to utilize it?

F.—INDUSTRIAL ASSOCIATIONS.

42. Is there any industrial association in your district? If so, give particulars in regard to its objects, rules, funds, past work and present activity?