



**Report of the Metals and Engineering  
Industries Sub-Committee of the  
Provincial Industries Committee  
Bombay**

**BOMBAY**

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## INTRODUCTION: 117

*Appointment of the Sub-Committee.*—On the 13th of June, 1945, the Government of Bombay, in the General Department, appointed the Provincial Industries Committee, by Resolution, No. 5898/83, to undertake a rapid industrial survey of Bombay Province and determine the steps which require to be taken for the further industrial development of the Province. At the first meeting of the Committee held in Bombay on the 19th July, 1945, it was decided, in order to give effect to the terms of reference, to allot the work of the Committee to seven Sub-Committees, which were duly constituted as follows:—

- (i) The Metals & Engineering Industries Sub-Committee,
- (ii) The Textile Industries Sub-Committee,
- (iii) The Chemical Industries Sub-Committee,
- (iv) The Food & Forest Industries Sub-Committee,
- (v) The Cottage & Small-scale Industries Sub-Committee,
- (vi) The Miscellaneous Industries Sub-Committee, and
- (vii) The Special Sub-Committee.

*Appointment of Members.*—The Metals and Engineering Industries Sub-Committee commenced work from 1st November 1945. The following gentlemen, drawn from important business concerns, were appointed as members of the Sub-Committee:—

### *Chairman.*

Mr. N. D. Sahukar.

### *Members.*

Sir Dhanjishah Cooper,  
Mr. A. L. Guilford,  
Mr. M. A. Fazalbhoy,  
Mr. H. N. Chinoy,  
Mr. S. C. Driver,  
Mr. A. Schwarz,  
Mr. Z. T. Kajiji,  
Mr. P. R. Kamani,  
Mr. R. P. Nevatia,  
Mr. K. H. Shah,  
Mr. N. F. Mooraj.

### *Secretary.*

Mr. M. P. Vazifdar.

All the members of the Sub-Committee were resident in Bombay Province. At a later stage, when the Sub-Committee was well advanced in its work, Mr. Guilford left India for the U. K. on leave. As at that time, the Sub-Committee was nearing its final stages, it was decided that Mr. Guilford's place should remain unfilled. The Sub-Committee wishes to place on record its deep sense of appreciation of the valuable service rendered by Mr. Guilford during his term of office.

*Terms of Reference.*—The terms of reference to the Sub-Committee were—

- (a) To recommend existing industries in the Province which should be further expanded and new industries which should be started during the post-war period.

(b) To recommend such industries as can best be organised as (i) large-scale Industries and (ii) small-scale or cottage industries.

(c) To suggest the most suitable sites for the location of the various industries after taking into consideration the availability of labour, water supply, electric power, raw materials, markets and the desirability of preventing congestion in thickly populated area.

(d) To advise whether the industries recommended should be promoted by Government or private agency; and, in the latter case, whether Government should participate and, if so, the nature of the help which would be required.

*General Remarks.*—The Sub-Committee held altogether 10 meetings. A programme was drawn up of visits by members to various factories located in Bombay city for the purpose of gathering first-hand information about manufacturing facilities, the state of plant and equipment, the organisation of production and, in general, for discussing with the management the various difficulties met with in production and selling. In order to expedite the visits, the members of the Sub-Committee were divided into industrial groups of three to four each who were assigned the work of visiting factories coming under their respective groups. Altogether, the members of the Sub-Committee visited 22 factories. Most of the concerns, which were approached for permission to allow the members to visit their workshops, kindly extended the facility and the Sub-Committee wishes to thank them for their co-operation. There were some concerns which refused permission, as according to them, some of the members of the Sub-Committee were engaged in competitive businesses. We strongly deprecate this attitude and we would like to record that, at its very best, the only purpose of these rapid visits was to obtain some idea of the industrial potentialities of the Province, and that there was no likelihood at all of the information acquired being misused.

At the preliminary meetings of the Sub-Committee, a Questionnaire drawn up by the Member-Secretary of the Provincial Industries-Committee for circulation to industrial establishments in the Province was considered. To suit the purpose of our work, we drafted a concise Questionnaire which we decided to circulate to all metals and engineering concerns in the Province in place of the Questionnaire drawn up by the Member-Secretary. In view of certain unforeseen difficulties, we were unable to carry out this decision and the Questionnaire prepared by the Member-Secretary was sent to nearly 500 metals and engineering concerns located in the Province of Bombay. Of these, about 175 Questionnaires were returned to us duly answered, some in part and some in full. Our investigations revealed that a good proportion of the large and medium scale establishments located in Bombay city and its suburbs, in which the majority of these types of Provincial industrial concerns are situated, responded to the request for information. On the other hand, the small-scale establishments, particularly those situated in the district, were not as responsive. In spite of our efforts, we were unable to prepare a comprehensive production census of metals and engineering products manufactured in the Province, which we originally planned to do, on account of the complete lack of uniformity in answering the Questionnaires. Some of the concerns presented their figures of production in terms of value and some in quantity and no amount of persuasion on the part of our investigators could prevail upon most of them to divulge their

figures of production in the manner required by us. This does not, however, mean that the answers given were entirely useless from the point of view of our inquiry. There is no doubt that we were able to gather a good deal of information from these answers, particularly on such matters as the difficulties met with by industries in their day to day production and the post-war plans contemplated by them.

As the Sub-Committee was required to complete the Report in a short time and as the terms of appointment definitely laid down the undertaking of only a rapid industrial survey of the Province, we were unable to interview witnesses and record their formal evidence, which we should certainly have liked to do if we had more time at our disposal. For the same reasons, no attempt was made to invite memoranda from commercial associations and organisations interested in the industrial progress of the Province.

Although the Provincial Industries Committee appointed the Special Sub-Committee to inquire into the question of the location of industries, we considered the location of industries to be an important part of our inquiry and as such, wherever possible, we have made recommendations relating to the best possible sites where metals and engineering industries should be located subject of course to the expert opinions and recommendations of the Special Sub-Committee. In regard to the question whether industries should be organised on a cottage or small-scale basis, we decided that this term of reference would be expertly dealt with by the Cottage and Small-scale Industries Sub-Committee, appointed for the purpose. As such, throughout the Report, wherever we have recommended either the expansion of existing industries or the establishment of new industries, we have had in mind the establishment of industries on a medium scale or large scale basis only except in some rare cases. We however, affirm our faith in the usefulness of cottage and small scale industries in a country like India and would like to say that Government should continue to pay attention to this subject.

Since this Report is addressed to the Government of Bombay, we have stated, wherever necessary, the names of individual concerns with their separate figures of production. We request that when this Report is published the names of factories would be deleted in order that important trade information may not be divulged.

We have endeavoured, as far as possible, to compare the state and extent of the Provincial metals and engineering industries with the state and extent of such industries in the rest of India. We are of the opinion that this would be the best way to bring into focus the state and development of the Provincial industries and that it is only by this method that deficiencies would be noted and recommendations made for their removal. We have also investigated into the possibilities of demand outside the Province of Bombay, as it is our opinion that the Provincial market though large, is but limited, and that areas contiguous to the Province could also be profitably served by Provincial industries. We recommend that Government should consider this point in detail at the time of the formulation of their post-war Provincial industrial plans.

As the time at our disposal was limited, we were unable to check the figures of production of metals and engineering items, submitted to us, which are incorporated in this Report. Some of these figures are recorded in the answers to the Questionnaires received by us. Figures of other items were taken from official documents and from the personal observations made by

members. In regard to official documents, the Report on Metallurgical and Engineering Industries by Dr. P. J. Thomas prepared under the aegis of the Department of Supply, the Government of India, was of great value to us in our work. As this is an official Report, and as we had neither the time nor the facilities to collect statistics of national importance, we drew upon this Report for some of the statistical figures. In regard to post-war estimates of the likely demands for various metals and engineering items, we should like to make it clear that these are approximates only and that these are acceptable to us as we consider them within the bounds of possibility.

In the Report, we had to refer to certain subject which did not directly fall within our survey. This was, however, necessary in view of the importance of a number of centrally managed subjects which directly affect industrialisation. As it was not given to us to make any recommendations to the Government of India, which we could not avoid in a few instances when dealing with these subjects, we have throughout the Report addressed our recommendations to "Government". We trust that these recommendations would be construed in the right manner, i.e., those recommendations which could be dealt with by the Provincial Government should be so considered and in the case of recommendations that could be considered by the Government of India only, we desire that the Provincial Government should make representations to the Central Government, on the basis of our recommendations, and thus promote industrial development in the Province.

As this Report contains valuable information about the state and extent of the Provincial metals and engineering industries and also indicates the commercial possibilities of establishing new industries and of expanding the existing ones, we recommend to Government that it should be published, without delay, in order to bring it to the notice of all those parties who are interested in the industrial development of the Province. We once again stress the need for early action in this matter as otherwise the force and basis of our recommendations would be weakened.

*Scheme of the Report.*—For the sake of convenience, the Report is divided into two Parts containing 24 Chapters. The First Part refers to the various metals and engineering industries considered by the Sub-Committee. The Second Part mainly deals with the important factors affecting industrial development on which we have prepared very concise notes to draw attention to some of the problems needing an urgent solution. At the end of each Chapter is given a summary of the Main Recommendations made in respect of each subject. We have also prepared a Note on the Availability and Utilisation of Metals Scrap which has been appended to the Report in the form of a supplementary. With a view to drawing pointed attention, we have, throughout the Report, underlined all the important recommendations made to Government.

*Acknowledgment.*—In concluding this introduction, we desire to put on record our appreciation of the services rendered by our Secretary, Mr. M. P. Vazifdar, who spread no pains in organising and facilitating our work. He underwent personal inconvenience to collect statistical data and valuable information pertaining to our work. He prepared a number of valuable notes on all the subjects considered by us. He was of great assistance in the preparation and drafting of this Report and we are fortunate in having his services placed at our disposal by Government. We have also much pleasure in recording our sense of appreciation of the work done by the staff of the

Sub-Committee. All these members were animated by a sense of public duty and they carried out their tasks in spite of numerous difficulties and obstacles encountered by them in their day to day work.

M. P. Vazifdar,  
Secretary.

N. D. Sahukar.  
D. B. Cooper,  
M. A. Fazalbhoj,  
H. N. Chinoy,  
S. C. Driver,  
Z. T. Kajiji,  
P. R. Kamani,  
R. P. Nevatia.  
K. H. Shah,  
N. F. Mooraj.

Mr. Guilford and Mr. Schwarz being out of India  
have not signed the Report.

Bombay, the 31st August, 1946.



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**REPORT OF THE METAL AND ENGINEERING INDUSTRIES SUB-COMMITTEE  
OF THE PROVINCIAL INDUSTRIES COMMITTEE.**

**CHAPTER I.**

**THE IRON AND STEEL INDUSTRY.**

**SECTION A.**

**BASIC INDUSTRY.**

1. In any country the entire structure and development of large-scale industrialisation depends upon a well-established basic iron and steel industry. There is perhaps no industry which is so vital, alike in peace and war, than the basic iron and steel industry which constitutes the very foundation of modern civilisation. Well-advanced industrial nations of the world owe not a little of their progress to this industry which has rendered yeomen service to their economic lives through decades. Implements of modern warfare have made steel a vital requirement for survival. Armies have to be equipped with steel weapons and transported on steel built ships or on railways operating with the help of steel rails, steel bridges, steel wagons and a host of other steel products.

Today the United States of America boasts of a stupendous industrial activity largely on account of its mammoth steel industry which produced before the War up to 60,000,000 tons per year and which during the whole War produced a record total of nearly 400,000,000 tons. The U. K. has perhaps the largest concentration of the iron and steel industry in such a small land area producing up to 17,000,000 tons per year as against the pre-war peak of 30,000,000 tons in Germany. As compared to these figures, the production of finished steel in India is insignificant. At the end of the second World War, which increased steel production, in all nations at War, by leaps and bounds, the production of finished steel of all classes in India, including the quantity produced in ordnance factories, in furnaces and obtained from scrap, was not more than 1,300,000 tons per annum, which, it is expected, will be raised to 1,500,000 tons per annum, in the very near future, when the Duplex Plant of the Steel Corporation of Bengal Ltd., is put into operation. The following statement shows the steel production of the country under various heads in the pre-war years and in 1944 :—

	Per Annum	
	Per-War Tons.	(1944 Estimated) Tons.
Structurals	150,000	225,000
Bars and Rods	150,000	222,000
Plates	70,000	82,000
Sheets Black and Corrugated	150,000	183,000
Rails and Fish Plates	120,000	149,000
Railway Fittings	28,000	.....
Tin Plate	50,000	80,000
Wire	10,000	17,800
Castings	5,000	7,000
Nails	10,000	14,000
Nuts and Bolts	5,000	29,000
Ordnance	2,000	30,000

2. The basic Iron and Steel industry in India is principally located in Bihar, Bengal and Mysore State. The Tata Iron & Steel Co., Ltd., which is the largest in India and is the largest single unit in the British Empire, is self-contained in ore supplies, which are not only abundant but also are one of the finest in the world having an iron content of nearly 60 per cent. The works of the Company carry on the most varied type of production manufacturing various different alloy and tool steels, to which we will refer later. During the War, the Company's activities were further extended by the addition of a magnesite plant for making pea-size magnesite and magnesite bricks and by the setting up of the wheel and axle plant. The Steel Corporation of Bengal Ltd., which is next in importance, commenced operations in 1939 and by 1942 had 4 basic open hearth furnaces in operation. The Company obtains its pig-iron requirements from the Indian Iron & Steel Co. Ltd. which concentrates on the production of pig-iron on a large-scale. When the development schemes of the Steel Corporation of Bengal Ltd. fructify, the company's production of finished steel is expected to go up to 500,000 tons per year, which will include the manufacture of alloy steels. The third and the last plant is the Mysore Iron & Steel Works which smelt pig-iron by charcoal instead of coke. The Company possesses excellent ore supplies at its very door steps and enjoys an obvious marketing advantage in the whole of South-India. In spite of these advantages, the production capacity of the Company is comparatively very small being around 30,000 tons per annum. In the near future, it is expected to be increased to 50,000 tons by the installation and operation of one new basic furnace and two electric furnaces. Out of these three concerns, only two viz., the Tata Iron & Steel Co., Ltd. and the Mysore Iron & Steel Works could be classified as primary producers as they smelt pig-iron and make steel. On the other hand the Steel Corporation of Bengal Ltd. purchases its pig-iron to make steel. There are at present operating in this country altogether 10 blast furnaces, of which 5 belong to the Tata Iron & Steel Co., Ltd., 4 to the Indian Iron & Steel Co., Ltd., and 1 to the Mysore Iron & Steel Works. In addition to these sources of supplies, some of the re-rolling mills have set up electrical furnaces producing a variety of special types of steels. Their total production capacity excluding steel castings is estimated to be over 50,000 tons per annum.

3. Although the Indian basic iron and steel industry is very small as compared to the industry in most of the industrially advanced nations of the world, it is important in the variety of products produced. The most outstanding development of the War period has been the production of alloy and tool steels, the production of which rose four-fold to 12,000 tons per year. At the same time, high speed steels, high and plain carbon steels, nickel steel plates, stainless steels, special high alloy nickel manganese steels, acid steels, etc., were produced for the first time in the country to meet the large demands of ordnance factories, machine tool manufacturers, war factories, etc. We are given to understand that the industry has matured plans for the manufacture on a commercial basis of even electrical sheets for transformers, generators, motors and electrical machinery. In all these developments, the Tata Company has taken a very leading part and produces to-day a wide variety of different alloy and tool steels, a summary of which is given below:—

- (i) Plain Carbon Tool Steels.
- (ii) High Speed Tungsten and Cobalt Tool Steels.

- (iii) Hot and cold Tungsten and Chrome Die Steels,
- (iv) Stainless Chromium Steels.
- (v) Magnet Steels,
- (vi) Chrome Steels,
- (vii) Heat Resisting Steels,
- (viii) Special Diamond Hard Steels,
- (ix) Shear Blade Steels,
- (x) Nickel Chrome Molybdenum Steels,
- (xi) Nickel Chrome Case Hardening Steels,
- (xii) Nickel Molybdenum Case Hardening Steels,
- (xiii) Manganese Molybdenum Steels.

This is a striking development and although the quantity is small, India may well pride herself in being able to produce such a wide variety of steels which are required urgently by her engineering and heavy industries. We are strongly of the opinion that when more and more quantities of specialised steels become available in India, new industries will develop and the development of new industries will further accelerate steel production and expansion of allied industries. This upward trend once set in motion is likely to feed on itself opening out possibilities of far reaching industrial developments.

4. The establishment of an iron and steel industry is not a simple matter. Raw materials and transport costs form such a high proportion of finished costs that if economics of production are to be realised to the full, any projected iron and steel industry must be principally located in close proximity to the following sources of supplies:—

(i) It is imperative that the industry should be located in close proximity to coke and iron ore supplies as these form a very high percentage of costs of finished products. It is also essential that the supplies of these materials should be workable and should be of good quality. Fluxes like dolomite, limestone, etc., even if they were located far away would not affect costs to the same extent.

(ii) Adequate transport facilities are very important and as such the industry should be located as far as possible in an area well served by communications.

(iii) An abundant and perennial supply of fresh water is also necessary. Unless this is assured, the industry will find it exceedingly difficult to operate.

5. It appears to us from the information at our disposal that with the exception of Bihar and Western Bengal, there is no other area in the whole of India, where the basic iron and steel industry could be successfully established satisfying fully the conditions stated above, except perhaps in the Central Provinces which appear to have the next best claims for the establishment of an iron and steel plant. To start the industry in any other area would be to transport coke and iron ore over vast distances, which proposition, in the present state of the transport system in India, with its high freight rates and undeveloped waterways, would be highly uneconomical. Although the industry in U. S. A. is located in a remote area and obtains its principal raw material from a distance of about 1,000 miles, this has been made possible by an excellent waterways system which has reduced costs of transport to the minimum. Unless, therefore, we have a well-developed transport system which eliminated this disadvantage of excessive concentration of supplies of raw materials in one region, by facilitating their transport

at cheap rates over vast distances, there is little possibility of establishing economically anywhere else in India a basic iron and steel industry. This opinion holds true to-day when a thorough Geological Survey has not been undertaken for finding other sources of supplies of coke and iron ore which could be commercially exploited.

6. We now consider the proposal to start a steel industry in the Province at Kalyan which has been lately suggested in some quarters. The proposal is to establish a small steel plant at Kalyan manufacturing 400,000 tons of finished steel per annum. Certain preliminary surveys undertaken reveal that there are good deposits of iron ore at Redi near Vengurla in South Ratnagiri District and also at Banda in Savantwadi State. As far as coke is concerned, in the absence of any close sources of supplies, it is suggested that coke may either be obtained from Bihar or imported from South Africa, the latter course being cheaper as sea freight would be less than rail freight in India over a distance of 1,000 miles. The projected plan is to produce 100,000 tons of finished steel from re-smelting scrap in open hearth steel furnaces fired with fuel oil and 300,000 tons from pig-iron obtained from the sources indicated above. As electric power is available, it is also intended to produce a small quantity of high-carbon and tool steels in electric furnaces. Since we are unable to express any expert-opinion on this scheme, we recommend that Government should, in view of the large demand for iron and steel in Western India and the desirability of working a basic iron and steel industry in the Province, appoint immediately a Committee consisting of eminent steel producers and technical experts to go into the whole question and make known their findings.

7. That there is a great need for an iron and steel industry in the Province, there is little doubt. It is estimated that the immediate post-war Provincial requirements of iron and steel would be anywhere around 400,000 tons per annum. Then there is the export market in the middle eastern countries for which Bombay would serve as an excellent export port. Further, in any consideration of the probable demands, one must not forget the large number of subsidiary industries that would be established and which would consume the products of the industry and take advantage of its location. As an example, we may cite the instance of the Tata Steel Works around which have been established a number of subsidiary engineering industries like the manufacture of tin plates, rods and wire products, wagons, wheels and axles, etc. From all these points of view, we once again stress the importance of the industry to Bombay Province and, if conditions are favourable, we would strongly recommend its establishment in the near future. We feel, that there would be little over production in the country if the industry is established in the Province as it is estimated that in the post-war years Indian demands of iron and steel would be around 2,500,000 to 3,000,000 tons per year. We note that the Government of India have set this figure as their target of the post-war production of iron and steel in India.

There would be little difficulty in obtaining a plentiful supply of labour and sufficient private capital would be readily available. It might become necessary to have some form of Government control of the unit but the matter needs careful investigation and we leave this question to the

consideration of the proposed special steel committee. The need of the moment would be to import up-to-date new plant and machinery and acquire a suitable site in which of course Government would be required to render all the help necessary. In our opinion Kalyan, which is suggested, offers a good location. It is favourably located at the junction of two important lines one going to the East and one to the South from which areas will be obtained the principal raw materials. Its nearness to Bombay port through which a considerable portion of coke supplies are likely to be obtained is another very favourable point in its favour. There is also available near Kalyan a plentiful supply of fresh water. It should also be quite possible to increase the generation of electric power, by harnessing the water power resources of the nearby Western Ghats, to meet the power requirements of this industry.

## SECTION B.

### THE STEEL RE-ROLLING INDUSTRY.

8. In view of the present excessive concentration of coke and iron ore supplies it may not be commercially possible, for some time to come, until the Geological Survey of India is complete and new reserves are found, to regionalise the production of iron and steel in India. There is, however, no reason why regionalisation of processing and consuming iron and steel industries should not only be economically feasible but also highly desirable.

The Indian Steel Re-Rolling Industry was established about 20 years ago mainly with a view to salvaging scrap left with railways and primary producers, which was being exported principally to Japan in huge quantities. The scrap was available at very cheap prices with the result that the re-rollers were able to compete successfully with the primary producers. By the year 1939, the number of Mills so established in India rose to about 100. Of the re-rolling mills then in existence, only about 22 or 23 had formed themselves into an Association, called the Steel Rolling Mills' Association of India. The rest of the mills were very small, and were more or less operating on a cottage industry basis catering to the local needs of the markets in which they were situated. In 1941, with the growing demands made by the War, the Government of India felt it necessary to control the iron and steel industry in the country. Consequently the control of the re-rolling industry was also undertaken. The Government of India issued a notification to the effect that only those mills, which were members of the Steel Re-Rolling Mills' Association of India, would be recognised by them and would be given necessary assistance for the procurement of raw materials and distribution of production. As a result of this, the membership of the Association rose to about 100. The production capacity of the various mills differs widely. There are mills producing 30 tons a month, and there are mills producing 2,000 tons a month. Some of the mills are rolling mostly from billets utilising small quantities of scrap as a supplementary raw material. A few of the mills have even put up their own open-hearth furnaces for the production of billets. About 8 mills have installed electric ore furnaces for the production of billets for their own consumption and for castings. The cheap price of melting scrap prevailing before the War, together with the foreign advantage enjoyed by some of the mills, owing to their

geographical location, also made it possible for some of them to produce mild steel billets in electric furnaces at low costs.

9. To organise the industry, a classification was drawn up, according to which the re-rollers were grouped into the following categories\* :—

(i) Main producers consisting of the two primary steel producers, viz. the Tata Iron & Steel Co. Ltd., and the Steel Corporation of Bengal Ltd.

(ii) " A-I " Re-Rollers, consisting of, (a) the Indian Steel & Wire Products, Ltd., (b) Messrs. Guest, Keen, Williams Ltd., (c) the Eagle Rolling Mills, Ltd. and (d) the Indian Rolling Mills Ltd. The first three are situated in the Eastern Zone, and the fourth one is situated at Nagapattinam in South India.

(iii) " A " Class Re-Rollers consisting of eight mills, out of which only one concern, viz. the Mukund Iron & Steel Co., Ltd. is situated in the Province. Most of these re-rollers operate electric furnaces whilst some of them have even installed open hearth furnaces.

(iv) " B " Class Re-Rollers. They number about 32, of which the firms, viz. the Indian Hume Pipe Co. Ltd., and the Crown Iron & Steel Works Ltd., are located in the Province.

(v) " C " Class Re-Rollers. They number about 52, of which none is situated in the Province.

10. Thus, in Bombay Province, there are altogether three steel re-rolling mills, viz. the Mukund Iron & Steel Co. Ltd., the Indian Hume Pipe Co. Ltd., and the Crown Iron & Steel Works, Ltd., which are all situated in Bombay city. The first two of these re-rollers have installed electric furnaces. The annual all-out steel re-rolling capacity of these mills on a three shift basis comes to about 60,000 tons of bars, rods, flats, strips, etc. As against this output, the Provincial market for steel rolled products is estimated to average around 300,000 tons per year.

The Provincial industry, as the industry in many other parts of the country, is passing through difficult times on account of the complete stoppage of all supplies of billets. Since billets are not allowed to be imported, the industry is mainly thriving on consuming its billet stock-pile and on billets manufactured from steel produced from scrap in electric furnaces. As the supplies of raw materials are inadequate, the industry in the Province is to-day operating at about 30 per cent. of its capacity. The Provincial industry further suffers from the higher costs of power supplied by hydro-electric stations as compared to the costs of power supplied to the industry by thermal stations in the eastern areas. To make matters worse even the power supplied is inadequate for present operations, let alone any contemplated future expansions in production.

11. We now consider some of the special items which the Provincial re-rolling units could manufacture with advantage. Considering the baling hoops industry, we observe that there are only a couple of firms in India manufacturing, in moderate quantities, baling hoops for the cotton and jute

\* Since writing this, we are given to understand that the Steel Re-Rolling Mills' Association of India has recommended a new classification which has been accepted by the Iron & Steel Controller. The classification is:—

- (a) Full members (those who would be supplied billets and no scrap);
- (b) Associated members (those who would be supplied scrap and no billets).

All the three Provincial firms have been classified as Full members.

industries. Although the manufacture of jute baling hoops appears to be a profitable item for any manufacturer to undertake, no firm has ventured to enter the field except J. K. Iron & Steel Co., Ltd., of Cawnpore, which after great initial difficulties is now manufacturing jute baling hoops in its Skoda rolling mills. The present capacity of their production is about 7,000 tons a year and this is capable of being increased to about 12,000 tons per year if billets are available in sufficient quantities. As far as cotton baling hoops are concerned, it is observed that with the exception of the Mysore Iron & Steel Works there is no other re-rolling mill in India undertaking the manufacture of this important and profitable item. The present production of this firm amounts to about 5,000 tons per annum as against the total demand in India of about 18,000 tons.

After having considered the matter in detail we are of the opinion that Bombay Province offers good advantages for the manufacture of cotton baling hoops. Not only does the Province offer a vast market for hoops in view of the fact that it is the largest cotton baling centre but Bombay port has one more advantage in that billets could be imported from abroad at lower rates as compared to supplies from Indian producers, on account of the cheapness of sea freights as compared to rail freights. We understand that the Mukund Iron & Steel Co., Ltd., is planning to instal a plant at their Bombay works for the manufacture of cotton baling hoops. In view of the large consumption of baling hoops in Bombay Province and also in the rest of India, we are of the opinion that the future development of this industry in the Province should be further investigated and encouraged.

Another profitable item would be to increase the output of steel castings. It is well known that steel castings are much more durable and better in quality than iron castings. Although the demand for steel castings in the country is very large, the quantity produced is as low as about 8,000 tons a year as compared to the American production, before the War, of well over 1,000,000 tons per year. In the Province there are only two firms producing steel castings, their total output being 500 tons per annum. Of these the Mukund Iron & Steel Co., Ltd., is planning to increase its output ten-fold and if this is achieved the Provincial output would be around 2,700 tons per year. Even then there will be room for improvement as the post-war demand in the Province for steel castings is expected to be around 4,000 tons per year.

12. In regard to the future expansion of the Provincial re-rolling industry, we are of the opinion that although there is room for the establishment of new factories to meet the Provincial demand, it would be better to expand the capacity of existing units rather than set up new mills, unless of course the new mills are sure of obtaining supplies of billets and are modern and efficient units. It appears to us that any long-term policy for the industry should have as its basis the keeping in production of efficient units only rather than the inconvenient setting up of additional inefficient, inexperienced small units for reasons which are explained in the following paragraph.

We are not aware of the post-war plans of the Provincial industry. We are, however, given to understand that the Mukund Iron & Steel Co., Ltd. has already begun the installation of a new steel re-rolling plant, having a capacity of 20,000 tons per annum, the main equipment of which was obtained from U.K. In addition to increasing its output of steel castings by ten-fold, this firm has also planned to instal a cotton baling hoop plant.



to which reference has already been made. All these are very welcome signs and it would be well for the other concerns also to follow suit for there is a really profitable gap between the Provincial demand and the supplies from the Provincial industry. In this matter, we feel that Government should render all the assistance that is required of them, particularly in such matters as the easy acquisition of land, the supply of adequate electric energy at cheap concessional rates, the granting of facilities for the rapid imports of plant and machinery from abroad and securing for the industry an adequate supply of billets.

13. To-day the biggest problem facing the industry is the shortage of billets in the country. The steel Re-Rolling Mills' Association of India has been informed by the primary producers that, for some time to come after the War, they would not be able to supply the re-rolling industry with billets, as most of their production of billets would be consumed by themselves and what is left over would be given to associated industries located at Jamshedpur. This shows that so long as the production of billets in the country does not increase to a sufficient extent, it will be necessary to import billets from abroad in large quantities in order to feed the re-rolling mills. We, therefore, strongly urge Government to relieve this severe bottle-neck by taking some such suitable action, as on principle, the re-rolling industry is, in the national interests, entitled to have a fair share of the billets available. The Provincial Government must make very strong representations in this respect to the Central Government. We further feel that salvage of re-rollable scrap is necessary in order to provide as much steel to the provincial consumers as possible. It may, therefore, become necessary for Government to place an embargo on the exports of steel scrap, with a view to supplementing our steel production. Before any action is taken, this matter should be very carefully investigated by Government in consultation with the various interests concerned. To establish the industry on right lines all mills should be expressly given to understand that, unless they improve their efficiency within a stated time and to a standard to be fixed for them, they would not be given any further assistance.

At the present time the greatest need of the steel re-rolling industry is its re-organisation on right lines. It is desirable, when planning the future of the industry, to draw up a specific programme indicating what particular sections and what particular types of steels should be rolled by various regional units and the main primary producers. The Provincial rollers should concentrate, as soon as a substantial demand develops, on the rolling of special sections like window channels, collapsible gate sections, buckets handle sections, umbrella ribs, etc., and also of complex sections and smaller sections of angles, tees, etc. which are not at present made in the country. There is also a potential demand for carbon steel flats for hoes and chaff cutters blades which could be profitably undertaken by the re-rollers as the demand is small. But until such time as the demand for special sections is small, the industry should be allowed to re-roll ordinary sections as well, not only with a view to making full use of its existing re-rolling capacity but also for supplementing steel production in the country.

## SECTION C.

## ASSOCIATED INDUSTRIES.

14. In addition to the re-rolling mills there are a number of associated industries vitally dependent upon supplies from the main producers. These industries are—

(a) *Wire and Wire Products.*—In India, the chief producer in this field is the Indian Steel & Wire Products Ltd., of Jamshedpur which manufactures its products from billets obtained from Tatas. The capacity of the works amounts to more than 50,000 tons per year of all sorts of wires, nails, bolts, nuts, rivets and rods. Further, there are two other well-organised small firms of which one firm viz., the Indian Hume Pipe Co. Ltd. is situated in Bombay city. This Company has a wire drawing plant which is utilised for turning out wires for use in the manufacture of Hume Pipes. We understand that the Mukund Iron & Steel Co., Ltd. has also installed a modern up-to-date wire drawing plant imported from U.K. with a capacity of about 3,000 tons per year of all types of wire. This plant is shortly expected to go into production. In addition, there are about a dozen more unorganised small producers of wire in India of which only one is situated in the Province in Bombay city and has a capacity of 1,000 tons per annum producing 10, 12, and 14 S.W.G. wire. As regards the post-war plans of the wire industry, it is understood that in addition to the immediate extra production by the Mukund Iron & Steel Co., Ltd., to which reference has been made earlier, the Indian Hume Pipe Co., Ltd. is also likely to increase its production of wire but this increased output will most likely be used up in the manufacture of hume pipes.

There are also about ten concerns in India manufacturing wire nails of which about six are located in the Province. The capacity of four of these Provincial concerns amounts to nearly 900 tons per annum of wire nails ranging from  $\frac{1}{2}$ " to 8". In regard to the post-war plans of the Provincial wire nail industry, we are given to understand that the Wire Nails Ltd., one of the Provincial concerns, is planning to increase considerably its production of wire nails, which is negligible now, and has already ordered out new plants and machinery from abroad and acquired the necessary plot of land in the north of Bombay city. If the plans of this firm are carried out successfully, it is expected to play a prominent part in the future Indian wire nail industry.

It is evident that now since the War is over, there is a likelihood of competition from foreign products, especially from Belgium, Czechoslovakia and U.S.A. which may affect seriously the Indian industry. To meet this event, we are strongly of the opinion that Government should closely watch the situation and not promptly in the event of any large-scale cheap imports. For some time to come the greatest problem facing the industry would be the supplies of steel.

(b) *Bolts, Nuts, Rivets, etc.*—A very important industry associated with the steel industry is the manufacture of bolts, nuts, rivets, machine screws, dogspikes, washers, etc. These products are extensively used in building construction and other engineering works. In the pre-war period, there was only one organised manufacturer in this line viz., Guest Keen, Williams

Ltd., of Calcutta which is an associated company of Guest, Keen Nettlefolds of U.K. which is the largest manufacturer in this line in the U.K. Before the War our imports amounted to about 22,000 tons of all types of bolts, nuts, rivets, machine screws, washers, etc. The outbreak of the War greatly accelerated the tempo of the Indian production which increased from about 12,500 tons in 1942 to 30,000 tons approximately in 1944, as against the approximate consumption of 50,000 tons in 1944. The difference of about 20,000 tons was mainly obtained from U.S.A. under "lease-lend" facilities.

Out of the three principal producers, all of which are situated in Tatanagar and Calcutta, Guest, Keen, Williams, Ltd., is the largest organised unit. In their post-war expansion scheme, they have considerably expanded their principal Calcutta works and have also set up a well-organised factory at Bhandup, a suburb of Bombay city. We are given to understand that most likely they will not operate their Bhandup Works as the Government of India have recently increased freight rates on steel from Calcutta to Bombay. In that event, they are likely to dismantle their up-to-date plant and take it to Calcutta. Although Bombay city is such a vast engineering and house building centre, there is no firm manufacturing these items anywhere in the Province. In order to establish the industry in the Province, for which there is an urgent need, we strongly recommend that Government should negotiate with this firm for the outright purchase of the factory, if they intend to dismantle it, for the ultimate purpose of handing it over to a public limited company. This will not only secure for the Province a very vital industry with great possibilities of future expansion in the wake of housing and engineering development schemes but will also regionalise the production of these important products which are at the moment mainly concentrated in one area. Of course any successful fruition of this deal will depend upon the availability of steel from abroad or from Tatanagar at cheap rates. In any event Government should immediately take positive steps for establishment of this industry in the Province. The absence of this industry in the Province has created a serious bottleneck in the Provincial engineering industries which has got to be cleared soon.

(c) *Tinplate.*—Tinplates or tinned sheets are mild steel sheets coated with tin. The lower quality grades have a thin coating and the higher quality grades have a thicker coating. Tinplates have a wide variety of uses in the manufacture of containers or tins for oil, petrol, biscuits, ghee and a host of other products. South Wales is the focal point of the industry in the whole world. It has no other special advantages except that the tinplate labour available there is the finest in the world being largely hereditary in skill. In India the industry was established after the end of the 1914-18 War with the help of about 100 convenanted men who were brought to India from the U. K. to operate the Tinplate Co. of India Ltd., which was jointly floated by the Tata Iron & Steel Co., Ltd., and the Burma Oil Co., Ltd., the latter owning the majority rights. To this day, this is the only Company in the country producing tinplates and sheets. The Company has achieved remarkable efficiency and is capable of producing any gauge although the normal demand ranges for 20 to 34 B. G. products. A great experiment has been performed in the training of

labour with the result that by 1932, the covenanted foreign labour staff had been reduced to one per cent. of the labour force. That efficiency has not suffered is shown from the fall in the cost per ton. The two important raw materials used in the industry are steel sheet bars and tin. The former is obtained from Tatas under a long-term agreement and the latter was obtained before the War from Singapore and Penang. The outbreak of the War caused some anxiety in respect of the supply of tin but the position has now eased. The production graph of the Company has steadily increased and it is estimated that in 1944, the production would be about 80,000 tons as against the pre-war average of five years amounting to 51,000 tons per year approximately. At the present rate of production this Company is capable of satisfying nearly 90 per cent. of the country's requirements. As such, it would not be worthwhile to consider the establishment of a factory in the Province. Besides, the raw materials are not available anywhere in the Province and will have to be hauled over great distances. The manufacture of tinplates is such a highly specialised item that without the experience, which the Tinplate Co. enjoys at the moment, no new firm can manufacture except at a prohibitive cost. However, the question of starting this industry in the Province may be considered only after a steel sheet mill industry has been established in the Province.

#### Summary of Main Recommendations.

(a) Government should, in view of the large demand for iron and steel in Western India and the desirability of working a basic iron and steel industry in the Province, appoint immediately a Committee consisting of eminent steel producers and technical experts to examine the proposal for the establishment of a basic iron and steel industry at Kalyan.

(b) Bombay Province offers good advantages for the manufacture of cotton baling hoops in view of the fact that it is the largest cotton baling centre and also because billets could be imported from abroad at lower rates through Bombay Port. The development of this industry in the Province should be further investigated and encouraged.

(c) There is room for an increase in the manufacture of steel castings in the Province.

(d) For the future expansion of the Provincial re-rolling industry, we recommend the expansion of the production capacity of the existing units instead of the establishment of new factories. Government should render all facilities to the industry, particularly in such matters as the easy acquisition of land, supply of adequate electric energy at cheap concessional rates, rapid imports of plant and machinery, etc.

(e) Government must take suitable action to supply an adequate quantity of billets to the Provincial re-rollers.

(f) As re-rolling from scrap will be necessary, Government would be required to place an embargo on the exports of steel scrap. Before any action is taken, this question should be carefully investigated by Government.

(g) As soon as a substantial demand develops, Provincial re-rollers should concentrate their attention on the rolling of special sections, which are not at present made in the country. But, until such time as the demand for

special sections is small, the industry should be allowed to re-roll ordinary sections as well.

(h) Government should closely watch the situation and act promptly in the event of any large-scale cheap imports of wire and wire products.

(i) If Messrs. Guest, Keen & William Ltd. plan to dismantle their Bhandup Works, established for the manufacture of bolts, nuts, rivets, etc., Government should negotiate with this firm for the outright purchase of this factory for the ultimate purpose of handing it over to a public limited company. In any event Government should immediately take positive steps for the establishment of this industry in the Province.

(j) It is not worthwhile to consider the establishment of a tinplate industry in the Province, until a steel sheet mill industry has been properly established.

## CHAPTER II.

## THE NON-FERROUS METALS INDUSTRY.

✓15. Since times immemorial, metalliferous ores have been worked in this country and, with the passage of time, the people of India acquired great skill in the metallurgy of iron, steel and some non-ferrous metals.

As a result of the policy of laissez-faire hitherto pursued by Government, the prospecting and mining of ores in India, as well as working them into a semi and finished state, have been left to the initiative of private enterprise. Indian entrepreneurs have generally fought shy of large-scale mining and metallurgical activities. The few concerns which have ventured into the field are mostly foreign-controlled and concentrate mainly on the mining of minerals and ores like mica, manganese and chromite which are mined and exported in a raw state to foreign countries, where there is a large and profitable market.

✓16. Considering the extent of the country and its population, the progress of India's minerals and metal industry, during the last 50 years, though not negligible, cannot be regarded by any means as even satisfactory. Amongst the factors responsible for this slow growth, the most important are the following:—

- (i) Lack of bold policy and organised plans for the mining and utilisation of minerals.
- (ii) Haphazard mining of ores with an eye for immediate gains leading to rapid depletion of reserves.
- (iii) Exploitation of valuable minerals by foreign interests who own most of the important concessions in India and hold interests in similar ventures abroad.
- (iv) Lack of effective State assistance and encouragement.
- (v) Absence of basic industries.
- (vi) Paucity of trained personnel.
- (vii) Want of reliable information on the industrial applications of minerals.
- (viii) Absence of statistical data.

Closely allied to these causes and having a vital bearing on the slow development of the non-ferrous metals industry is the complete absence in India of an adequate Geological Survey. We consider this subject to be of such vital importance that special reference has been made to its improvement in the Chapter on Mineral Resources.

17. The production of non-ferrous metals falls into two categories—primary and secondary. Primary production is the extraction of the non-ferrous metal from ore whilst the refining from scrap is termed secondary production. Secondary production also involves the extraction of any individual non-ferrous metal or alloy from scrap and residues which are the by-products of the industry. The non-ferrous metals industry divides itself for consideration into four distinct sections:—

- (a) Primary production.
- (b) Secondary production.
- (c) Non-ferrous semies manufacture.
- (d) Manufacture of consumers' goods from semies and ingots.

## SECTION A.

## PRIMARY PRODUCTION.

18. In the present undeveloped state of the Geological Survey, with the major portion of the country yet to be geologically mapped, India appears to be woefully deficient in regard to the essential non-ferrous metals such as copper, lead, zinc, tin, nickel, etc., which are vital metals in peace and war. The known workable deposits of the ores of these metals are either inadequate in quantity and quality or are altogether conspicuous by their absence except bauxite, manganese, and mica, which are found in sufficient quantities and of high grades. The result is that very little reduction of virgin metals from ores is undertaken in India and the smelters established in the country are consequently very few.

Bombay Province appears to be still worse off as there are no known commercially workable deposits of non-ferrous ores except those of bauxite and manganese, of which manganese alone is mined. In addition, Bombay Province is as deficient in smelters as the rest of India, except for an antimony smelter located near Bombay city, which is the only one of its kind in India. To get an adequate idea of the state of the mining and reduction of non-ferrous metals, we give below the position of the Indian and Provincial Industry in respect of the primary production of some of the important non-ferrous metals, like copper, lead, zinc, tin, antimony, etc. There are in addition a variety of other metals such as nickel, barium, tungsten, titanium, etc., which are not considered in this survey, as they are not of such basic importance as deserving immediate consideration and development. Since aluminium is an important subject we have thought fit to consider it separately.

19. *Copper.*—In the modern industrial state, copper and copper alloys find numerous uses and there is hardly any industry in which these metals are not employed in one form or other. The principal ore of copper is copper pyrites. The most promising deposits are known to be located at Khetri and Sikkim, but are yet to be investigated in detail. The smelting of copper is carried on in India by only one firm, viz., the Indian Copper Corporation Ltd., at Ghatsila. The production of this firm averages about 6,000 tons of copper per year, after treating nearly 350,000 tons of ore which has a metal content of only 2.5 per cent. The copper produced is not electrolytic but fire-refined and, therefore, has very limited uses in modern industries. Even then, the copper produced barely satisfies one-tenth of the country's requirements. In 1938-39, imports of copper, both wrought and unwrought, excluding telephone and telegraph wires, amounted to about 8,500 tons and that of brass aggregated 16,000 tons. It is reasonably expected that the post-war annual consumption would average anything up to 40,000 tons of copper of different sorts. As against this, the Indian production, in a limited range, will not exceed 6,000 tons per year. This is indeed a very precarious position. It demands that steps should be taken immediately to investigate in detail new sources of ores with a view to increasing the production of copper in India. However, to supplement the present production, we strongly recommend the installation in Bombay Province of a smelter producing electrolytic copper from imported ores and concentrates, pending an investigation into the availability of local ores in sufficient quantity and quality. For economical working, the location of the smelter should be in close

proximity to adequate supplies of water and electric power. As the smelter would operate on imported ores in the beginning, location near a port would be advantageous. If need be this production should be supplemented by secondary production from scrap.

20. *Lead*.—Its many suitable qualities like anti-corrosiveness, high resistance to chemical attack, low melting point, etc., have made the metal of great use in a number of industries, particularly in the manufacture of accumulator plates, pipes and foils. Although there are some deposits of lead ores located in India, which include galena, they are mostly uneconomic for commercial exploitation. India already possesses a small lead smelter, which was "blown in" during the war in Bihar by the Eastern Smelting Co. of Calcutta. The capacity of the smelter barely exceeds 100 tons a year and is insufficient for India's requirements. In 1938-39, India imported nearly 7,500 tons of lead, both wrought and unwrought. In view of the extremely low production in the country, it is essential that sources of lead ores believed to be located in Rajputana States, Bihar, Central Provinces, Gwalior, etc., should be immediately prospected. We do not view with favour the installation of a small lead smelter in the Province operating on imported ores. It should be understood that lead is such a cheap metal that unless its production is undertaken on a large scale from cheap ores, the smelter would not be able to compete effectively against foreign imported lead. In the present ore supply position, it is, therefore, economically not advisable to set up a smelter in the Province. This matter should, however, be considered when Indian ores in sufficient quantities are available.

21. *Zinc*.—On account of its high resistance to atmospheric corrosion, the metal has proved to be of valuable use particularly for coating galvanised sheets and in the preparation of bearing metals, brass etc. India does not possess a zinc smelter. It is true that the country's present known deposits of zinc, in the absence of a detailed survey, are few and uneconomic. Indian zinc mines appear to have been worked before the 18th Century and then abandoned. There are some workable deposits near Zawar (Udaipur State) and in the Riasin District (Kashmir State). Detailed investigations are yet to be undertaken to ascertain the quantity and quality of these zinc ores. In 1938-39, our imports of zinc amounted to about 26,000 tons. It is estimated that the annual consumption in the post-war years would be anything up to 50,000 tons. In view of the fact that large quantities of zinc would be required in the post-war period for such purposes as galvanising iron and steel products, manufacturing non-ferrous alloys (brass, bronze, bearing metals), etc., there is an urgent necessity of establishing a zinc smelter in the country. In regard to the requirements of the Province, we estimate that about 7,000 tons of zinc would be required in the Province in the first post-war years for the manufacture of such items as brass and zinc sheets, etc. We therefore, recommend that Government should examine the economics of setting up a suitable zinc smelter in the Province to meet this demand. To work this smelter, not only should our known deposits be investigated and developed, but also, arrangements should be made to import the zinc ores from Burma for reduction in the Province.

22. *Tin*.—Tin has very useful industrial application. Owing to its active corrosion resistance, its use is widespread as coating for steel and copper alloys. It is widely used in the tinning of vessels and in the manufacture of condensers, solders, anti-friction metals, etc. We understand that there



are no workable deposits of tin located in India. There are some deposits in the Hazaribag District (Bihar) but they do not hold promise for profitable exploitation. The country mainly relies for its requirements on supplies from Burma and Malaya. In 1938-39 imports of tin, in all forms, amounted to about 3,000 tons. Tin-smelting has, however been attempted on a small scale by the H. G. Refinery, Konnagar. The refinery mainly deals with residues of Indian origin. We are of the opinion that until such time as Indian tin deposits are found, it will be necessary to import tin ores from Malaya, East Africa, etc., and smelt them in India. We are also of the opinion that for some time to come detinning of tin plate scrap, though expensive will have to be continued in India to supplement our scanty supplies of tin. For this purpose, we recommend that Government should prohibit the exports of tin plate scrap and permit its imports free of duty. To make the industry thoroughly independent and base it on very sound lines, it is of course essential to commence immediately the prospecting of tin ores. As far as the Province is concerned, we are of the opinion that, for some time to come, the tin requirements of the country are not expected to be large and it would not be economically feasible to establish a tin smelter in the Province.

23. *Manganese*.—India is reckoned to be one of the two producers in the world of high grade manganese. Manganese by itself has no application at present, but its alloys are very extensively used. Its most important use is in the production of steel, in which nearly 95 per cent. of the world's production of manganese is consumed. India possesses very large and rich deposits of manganese ores, which are scattered over many areas particularly in Bombay Province and Central Provinces. Deposits in some areas are so abundant that only surface mining is necessary to mine the ore. The mining operations are principally undertaken by two foreign-controlled concerns, one of which, viz., the Shivrajpur Syndicate Ltd., is situated in the Panch Mahals District in the Province. It is, however, unfortunate that 95 per cent. of the ore mined in India, is exported to foreign countries. It is estimated that since 1900, nearly 30,000,000 tons of high grade ores have been exported out of the country. Only a small proportion is consumed in India for the production of ferro-manganese and for other industrial uses. In the interests of the future industrial developments of India, we strongly condemn this exploitation by foreign interests, who are draining our vital reserves of a highly important metal. We consider that active steps should be taken by Government to encourage its conversion into ferro-manganese, which is very widely required by Indian industries.

Further, the question of producing electrolytic manganese in the country has also become important. A Bombay firm is planning to put up a pilot plant for the production of about 1,000 lbs. of high purity electrolytic manganese per month. We recommend that Government should render all useful assistance to this firm or any other firm that subsequently undertakes the manufacture of ferro-manganese in the Province.

24. *Antimony*.—Pure antimony has practically no commercial application. It is largely used in small quantities as an alloying element. The important alloys produced are copper-tin-antimony, Britannia metal, etc. Antimonial lead is also consumed by ordnance factories. The reduction of antimony is the only primary production carried on in the Province of Bombay. Considerable deposits of this ore of good quality and medium metal contents are

located at Chitral. Deposits are also known to exist at Lahaul. The mining of these Chitral deposits, though very expensive on account of the inaccessibility of the mines, was undertaken during the War on account of the cutting off of imports. The ore is transported all the way to Bombay where it is smelted by the Star Metal Refinery at Vikhroli, a suburb of Bombay City. This company operates a smelter with a capacity of 225 tons per year. The annual output averages around 200 tons as against the demands in India which approximate to 800 tons per annum. During the War, the industry, which is the only one of its kind in the country, paved its way, on account of the high prices of antimony. Now that the War is over, the question of survival in a competitive market becomes important. Foreign antimony is bound to be sold at lower prices on account of superior advantages of location, accessibility of mines, methods of production, etc. The Tariff Board has already commenced an examination of the industry's case for protection. We are of the opinion that if the industry is not to go out of business some sort of aid is necessary either by way of protection or subsidy. India's requirements in the post-war period are not expected to exceed 400 tons per annum and this company would be in a position to supply them. We understand that the Company is planning to import an up-to-date Ore Flootation Plant from U. S. A. We recommend that Government should render the Company whatever assistance it requires in the purchase of this plant and equipment.

25. With the exception of the mining of high-class manganese ore by the Shivrajpur Syndicate Ltd. in the Panch Mahals District, and the smelting of antimony ore by the Star Metal Refinery near Bombay city, there is no other mining or smelting activity of major importance carried on in the Province at the present time. This should not, however, lead to the impression that the Province lacked such activities in the past or that conditions for such activities are not suitable event at present. Ancient historical records illustrate that there are certain areas in the hilly tracts of north and east Gujrat, in the Panch Mahals District, and in the regions of the Narbada and the Tapti Rivers where copper, lead and zinc ores were treated in ancient days by craftsmen on a small scale. The processes of manufacture were mostly in the hands of Guilds or Castes who guarded them closely as vital trade secrets. With the advent of modern metallurgical processes and their widespread application in India, these methods of mining and smelting of ores largely became matters of the past and what we have now are lingering tales of wealthy and flourishing towns which have left mounds of slag as evidence of their past glory.

Bombay Province has good prospects of mining some of the important non-ferrous metals ores. It is known that there are quite good possibilities of discovering lead, zinc and copper in the Panch Mahals District and in the Chota Udaipur Region, but no survey has yet been undertaken on a large scale to indicate the commercial possibilities of mining these ores. Bauxite deposits are known to exist in sufficient quantities near Bombay city, particularly in the Western Ghats, at Ratnagiri and in the Kolhapur State. A few of these bauxite deposits have already been acquired by the Indian Aluminium Co., Ltd., which is controlled by foreign interests, but manufacture on a large scale has not yet been undertaken. In addition there are certain known deposits of important non-ferrous ores located in areas adjoining the Province which could be profitably developed. Thus, lead ores are known

to exist in the Manbhum and Drug Districts of the Central Provinces. With co-operation between the two Provinces, these ores could be profitably developed. There is no doubt that once a comprehensive geological survey is undertaken and sufficient data is available, there will open up a good field for the mining and reduction of important non-ferrous ores.

## SECTION B.

### SECONDARY PRODUCTION.

26. In every well-advanced industrial nation, refining of scrap is carried out on a very large scale to supplement the supplies of vital non-ferrous metals, the ores of which are either insufficient or non-existent. In some countries, large-scale secondary production has been undertaken in spite of the existence of very good deposits of important workable non-ferrous ores, because it has always been regarded as a useful addition to non-ferrous metals' production. An example of the result of concentrated efforts in this direction is found in the case of Germany. As no tin is available in Germany, successful attempts were made, before the War, to recover tin from tin-plate scrap by an electrolytic process which gave Germany vital supplies of tin. There is perhaps no reason why adequate attention should not be paid to developing this industry in India and particularly in the Province. It is known that large quantities of non-ferrous scrap accrue in the Province everywhere and little attention was paid to its recovery, before the War, with the result that most of our scrap was exported at very low prices to foreign countries particularly to Germany and Japan and then was reimported in the form of refined metals.

Recently, and particularly during the War, when imports were largely cut off, a few Provincial firms undertook the recovery of White Metal scrap side by side with the recovery of Yellow Metal scrap. The most important amongst these firms are the Indian Standard Metal Co. Ltd., the Kamani Metals & Alloys Ltd., the Indian Smelting & Refining Co. Ltd., the Indian Metal Refining Ltd. etc. The main activities of these firms relate to the refining of a variety of non-ferrous scrap for the production of white metals, phosphor-bronze ingots, gun-metal ingots, solders, etc. It is not possible for us to ascertain figures of production of all the secondary producers in the Province as most of them not only undertake refining but also manufacture semies for which separate figures have not been given to us. During the War the industry rendered very vital services and undertook the refining and allowing to British Standard Specifications of all types of non-ferrous scrap for the railways, ordnance factories and vital defence works. In this work the Provincial factories had a good share and we are glad to record that their work has been of a high order. We are of the opinion that in the post-war period the production of these firms will in a large measure supplement our small virgin production of non-ferrous metals. We, therefore, strongly recommend that they should be assisted by Government by all possible means, particularly by allowing duty-free imports of non-ferrous metal scrap and also by prohibiting the exports of such scrap. Here we should like to stress the urgent necessity of reducing railway freights on the movement of scrap which will reduce costs of production. Further, we are given to understand

that the refining firms in Bombay Province have to incur high costs of production due to larger melting loss incidental to their present equipment and higher labour charges. We, therefore recommend that Government should assist these firms by providing facilities for the import of upto-date electrical furnaces, the operation of which will reduce costs, and also by granting licences for additional electrical power and by making such power available at cheap rates. If electrical furnaces are operated, there will obviously be an expansion in production which is badly required in the Province.

### SECTION C.

#### NON-FERROUS SEMIES MANUFACTURE.

27. The outbreak of the War made very large demands on the Indian and Provincial non-ferrous metals industry for the supply of various useful products manufactured from semies which were mainly imported in the pre-war period. As supplies of semies were entirely cut off and in some cases drastically reduced, a number of Indian concerns rapidly assembled plant and machinery, most of which was made in India, at high costs, to undertake the processing of all types of non-ferrous alloys. In this activity some Provincial concerns claimed a good share and it was only due to their efforts that the production of a number of non-ferrous products was made possible. In semies, the most important items are sheets and strips of copper, brass aluminium, lead and zinc. Next in importance come rods, bars, pipes, wires and castings. During the War the greatest development has been in the manufacture of wires, strips and rods, which were hardly manufactured before the War. It has not been possible for us to estimate the output of the various Provincial factories but a rough calculation would put the Provincial production as satisfying about 30 per cent. of the needs of the Province. We are of the opinion that to make the Province self-supporting in semies, sheet production, particularly of brass and copper, requires to be substantially increased.

On a careful study of the organisation and equipment of some of the mills manufacturing semies, we are of the opinion that a number of Provincial re-rolling mills have outlived their usefulness and are inefficient for re-rolling work. As there is an evident need for increasing the manufacture of semies in the Province, we recommend the setting up of new modern rolling mills. Another point is that the policy regarding imports of semies should be very carefully guided. We understand that import licences in India and export licences in the U. K. for brass sheets have already been issued for the year 1946. If this policy is allowed to be continued for a longer period without any planning, there is a danger of depression setting in which will inevitably affect seriously the progress of the Indian non-ferrous semies manufacturing industry. We are of the opinion that Indian industries would be well served in the long run if they lessen their reliance on foreign semies. It is evident that if imports are controlled the industry would experience a shortage of semies for some time. But once new automatic mills are established, the industry would be able to complete the adjustment of rolling capacity without much delay. Manufacturers in Bombay Province are strongly advised to consider this suggestion from the long-term point of view.

28. We now consider the state of the Provincial semies manufacturing industry *vis a vis* the Indian industry. For this purpose, we are only describing the salient features of some of the important and useful semies turned out by the industry today:—

(i) *Rods and Bars (Brass and Copper)*.—During the War the Indian industry was able to supply most of the country's requirement of round brass rods and bars. Hot-rolled bars were supplied by two firms, both of which are situated outside the Province. The bulk of cold-rolled brass and copper bars, below 1/2" diameter, was supplied by about four Indian firms, of which two firms viz., Messrs. Kamani Metals & Alloys Ltd. and Messrs. Jayant Metal Mfg. Co., Ltd., are located in Bombay city and suburbs. The present annual Provincial production amounts to about 400 tons of brass rods and bars and about 300 tons of copper rods and bars. It is likely that in the post-war period consumers would not accept these rods and bars in view of the fact that the sizes in which they are manufactured are unsuitable for normal requirements and also because the finish is generally poor. In order to enable these producers to face foreign competition and manufacture the industry's requirements to suitable specifications it is absolutely essential that facilities should be granted by Government for the import of an Extrusion Press. It appears from a careful study of the demands in India, that there will not be a need for more than one 2,000-ton capacity Extrusion Press and, therefore, when considering the import of this costly equipment, careful investigations about the probable demands in India should be undertaken. It is known that during the War a number of firms applied to Government for licences to import this equipment, but import licences were not granted on account of the exigencies of the War. In this connection we refer to the 2,275-ton capacity Extrusion Press installed in the Katni Ordnance factory. It is desirable that Government should make known their plans regarding the disposal or future utilisation of this Press. If it is disposed of, it should preferably be taken up for operation in the Province under suitable Government control. If this equipment is operated in the Province, it will not only supply all the needs of the Province, which will be about 1,000 tons per year, but will also meet a large proportion of the Country's requirements of brass and copper rods and bars. In the event of this Press being operated in the Province, it will be essential for the Provincial Government to advise the Central Government against the import of any other Press with a view to preventing any overproduction.

(ii) *Sheets and Strips (Brass and Copper)*.—The largest producer of hot-rolled sheets in India is the Indian Copper Corporation Ltd. The total production of this firm amounts to about 8,000 tons, rolled up to nearly 21 SWG. We are given to understand that this firm is planning to put up a new cold-rolling mill, which will raise the production to about 12,000 tons per annum. In addition to this, Venesta Lead Mills Ltd., of Kamarhatti specialises in the manufacture of sheets and strips to very fine gauges. They roll their brass and copper sheets to as low as 30 SWG, with precision. It is likely that once aluminium is available in sufficient quantities, they will revert to the manufacture of foil required in the lining of tea chests, for which they are very well-equipped.

It is well known that there is a very large demand in India for all types of brass sheets, strips and circles for the manufacture of a variety of household utensils, stoves, cutlery, etc. The output of these yellow metal sheets, which averages to about 10,000 tons per year in India, is barely sufficient to supply even half the pre-war consumption in India. There are altogether about four large firms producing brass and copper sheets and circles in India, of which two firms, viz., Messrs. Kamani Metals & Alloys, Ltd., and Messrs. Lallubhai Amichand are located in Bombay city and suburbs. In addition, there are about three other firms operating on a small scale in the Province. The present annual Provincial production amounts to about 2,000 tons of brass sheets and circles and 1,500 tons of copper sheets and circles. As against this production, the annual Provincial needs for these semies amount to 5,000 and 4,000 tons respectively. We are, therefore, of the opinion that arrangements should be made to manufacture sheets and strips up to 30 SWG. and for that purpose we recommend the import and installation in Bombay Province of two up-to-date rolling mills for a total production of 7,000 to 8,000 tons of brass sheets and circles and about 4,000 tons of copper sheets and circles.

(iii) *Brass and Copper Wire.*—There is a very large demand in India for ordinary brass and copper wire which is mainly used in the Jari manufacturing industry and in the manufacture of rivets, screw wire, nails, etc. There are altogether about eight concerns in India producing brass and copper wires, of which two concerns viz., Messrs. Jayant Metal Mfg. Co. Ltd., and the Surat Jari Industry are located in the Province. The annual production aggregates to 300 tons of brass wire and 500 tons of copper wire, which just suffices for the Provincial demand. The wire produced, though two to three times costlier as compared to imported wire, is generally speaking of good quality. Though the industry does not allow for any expansion, it badly needs modern continuous wire-drawing equipment, for replacing the present equipment, to bring down the high costs of production. We understand that Messrs. Jayant Metal Mfg. Co. Ltd. has already placed orders for copper wire drawing machines in the U. K. to produce wire up to 45 SWG.

(iv) *Lead Sheets.*—Lead sheets are very widely used by chemical industries. The principal firms undertaking the manufacture of lead sheets in India are about four in number, out of which two concerns, viz. Messrs. Kamani Metals & Alloys Ltd., and Messrs. M. Gulamali Abul-husein are located in Bombay city. The main production of the country is concentrated on the manufacture of 2' to 3' wide lead sheets. We are of the opinion that Provincial manufacturers would do well to roll 8' wide lead sheets, for which there was bound to be a very good demand in the future.

(v) *Lead Pipes.*—Lead pipes are mainly consumed in household water fittings. Before the War the country's requirements were mainly supplied by imports. Today lead pipes are being manufactured in the country at Calcutta by only one firm which produces nearly 500 tons of lead pipes ranging between 3/8" to 6" in internal diameter. There seems to be room in Bombay Province for a plant producing lead pipes of various dimensions. We, therefore, recommend that Government should take steps to encourage the establishment, under private ownership, of a lead pipe manufacturing concern.

(vi) *Bearing Metals, Phosphor Bronze, Gun Metals, etc.*—There are about seven firms in India manufacturing these metals in ingot form of which four firms, viz. the Indian Standard Metal Co., Ltd., Messrs. Kamani Metals & Alloys Ltd., the Indian Smelting & Refining Co., Ltd., and the Bombay Metals & Alloys Ltd., are located in Bombay city and its suburbs. The industry rendered very useful service during the War by producing large quantities of these metals in the form of ingots. The three chief difficulties encountered by the industry today are the high prices, which the firms pay for the basic metals, difficulties in the imports of electrical furnaces and inadequacy of electric power. We recommend that Government should take all possible steps to solve these difficulties as a number of consumers' goods industries in the Province are dependent upon the products of this industry.

(vii) *Aluminium Sheets, Circles, Foils, etc.*—The whole subject of the manufacture of aluminium series has been considered separately in the Chapter on the Aluminium Industry.

#### SECTION D.

##### MANUFACTURE OF CONSUMERS' GOODS FROM SERIES AND INGOTS.

29. Various types of non-ferrous metals are widely used in the manufacture of consumers' goods of which undoubtedly the manufacture of domestic utensils is the most important. It is estimated that nearly 90 per cent. of the brass and copper sheets produced are consumed for this purpose. There are a number of firms located in Bombay Province which specialise in the production of domestic utensils. The most important amongst these are Messrs. Devidayal & Sons, Messrs. Lallubhai Amichand, Messrs. Anand Shivaji Desai, Messrs. Kamani Metals & Alloys Ltd., all of which produce utensils on a factory scale basis by deep drawing and spinning. There are also a number of small workshops spread all over the Province which produces domestic utensils on a cottage-industry basis. Brass and copper sections are also used in manufacturing building hard-ware for the manufacture of which Bombay Province is well-known throughout India. The Acme Manufacturing Co. Ltd., and Messrs. Jayant Metal Manufacturing Co. and a few others are the important concerns engaged in this type of manufacture. In some districts of Bombay Province, casting of metal ornaments is practised on quite a considerable scale consuming at least 300 tons per year of non-ferrous metals, which is mostly collected brass scrap. In the manufacture of locks of brass and gun metal and nickel silver fittings, which are also thriving consumers' goods industries, Messrs. Godrej & Boyce Mfg. Co. Ltd. are the most important manufacturer.

We observe that the Provincial engineering industry and railway workshops make quite an extensive use of non-ferrous metals' castings and a number of foundries in the Province are catering for this demand. Railway foundries are generally quite well-equipped but this cannot be said of the foundries operated by private companies, which mostly work by hand-moulding methods. We consider the import of foundry machinery, such as sand preparing equipment, moulding machines, grinders, sand blast equipment etc. as most essential and recommend that Government should encourage the import of such

machinery by allowing duty-free imports. We are strongly of the opinion that only when mechanisation is introduced will it be possible to produce castings to relative close tolerances, which will be necessarily required, if mass production industries, such as the Motor Car Industry, the Electrical Industry, etc. are to be successfully established in Bombay Province.

During the War there was a large demand for die-castings in big quantities for defence purposes and a number of Provincial firms entered this important field of metal processing. We are given to understand that a few concerns, viz. Acme Manufacturing Co. Ltd., Messrs. Godrej & Boyce Mfg. Co. Ltd., the Indian Standard Metal Co. Ltd. and Messrs. Kamani Metals & Alloys Ltd., have already set up die-casting machines. The prospects of this industry appear to be very bright as the die-casting process allows the manufacture of components to be carried out very cheaply.

In conclusion, we state that for the successful working of these industries it is absolutely essential that raw materials should be made available to these manufacturers at economic costs. It is, therefore necessary for Government to take positive steps for the cheap production in the Province of all non-ferrous metals.

30. There is no doubt that if the Provincial non-ferrous metals industry is to develop, in the future, on right lines, a great deal of Government assistance would be needed. There are some important matters like tariffs, railway rates, etc. which will have to be dealt with by the Central Government. There are some other important matters which fall within the sphere of the Provincial Government who would be required to take suitable action. To begin with, an up-to-date Geological survey of the Province should be immediately undertaken by Government. Once this survey is complete, it is absolutely essential, if sufficient ores of important non-ferrous metals are found, to set up smelters in the Province for the reduction of these metals. This subject is so very important that in the event of suitable ores not being found in the Province, and in adjoining areas, Government should even encourage the imports of foreign ores for reduction in the Province. If sufficient supplies of raw materials for the manufacture of virgin metals are assured from this source, it is logical to levy an import duty on virgin metals which are to be produced in the Province at the same time permitting duty-free imports of the ores. To supplement the production of virgin metals, secondary production from scrap should also be encouraged in the vicinity of such industrial towns as Bombay, Ahmedabad, Poona, Sholapur. Further, it would be necessary for Government, if sufficient quantities of scrap are unavailable from indigenous sources, to allow duty-free imports of scrap from abroad. We also strongly recommend the desirability of making the Province self-sufficient in the fabrication of semies and in the manufacture of consumers' goods. The industry is capable of manufacturing the entire Provincial requirements of



semies manufactures such as sheets, foils, wires, cables, tubes and other non-ferrous products and there is no reason why suitable Government aid should not be given to develop those industries by levying protective import duties on semi-manufactures and finished goods or only allowing the imports of such goods as are not being produced in the country.

Besides, there are numerous difficulties in the way of the industry which must be removed. The easy imports of plant and machinery from abroad is a serious problem facing all industries and Government action is badly called for to relieve the situation. Most of the Provincial concerns have reported to us that not only are supplies of electric power inadequate for present operations, let alone any further expansion, but also that the cost per unit is higher than the cost per unit in Southern India and even in Calcutta which has thermal unit stations. It should be appreciated that the non-ferrous metals industry is a big consumer of electric power and, therefore, cheapness of power makes all the difference between profit and loss. Also, additions to connected electrical load are urgently called for in most cases. We are also of the opinion that the lowering of internal freight rates and continued purchases by railways and Government departments of their requirements of non-ferrous metals are bound to give a great stimulus to the industry. As far as Government financial participation is concerned, we are sure that all the capital needed for expansion could be obtained from private sources. As some sort of Government help to the industry is, however necessary, Government control will be required in industries producing virgin metals.

#### Summary of main recommendations.

(a) Steps should be taken immediately to investigate new sources of ores of copper. To supplement the present production of copper in India, we strongly recommend the establishment, in Bombay Province, of a smelter producing electrolytic copper from imported ores and concentrates pending an investigation into the availability of local ores.

(b) Sources of lead ores believed to be located in Rajputana States, Bihar, Central Provinces, Gwalior, etc., should be immediately prospected. We do not recommend the installation of a small lead smelter in the Province operating on imported ores.

(c) Government should closely examine the economics of establishing a suitable zinc smelter in the Province.

(d) It will be necessary, for some time to come, to continue the detinning of tin plate scrap to supplement our scanty supplies of tin. For this purpose, Government should prohibit the exports of tin plate scrap and permit its imports free of duty.

It is not economically feasible to establish a tin smelter in the Province on account of the small requirements of India.

(e) Government should immediately prohibit the export of manganese ores mined in the Province. Government should encourage its conversion into ferro-manganese.

(f) The antimony reduction industry established in the Province should be aided by way of protection or subsidy. Government should give facilities to this industry for the purchase of foreign plant and equipment.

(g) Adequate attention should be paid to the secondary production in the Province of non-ferrous metals from scrap. Government should permit duty-free imports of non-ferrous metals scrap and prohibit its exports. Further, railway freights on the movement of scrap should be reduced. Government should also assist the Provincial secondary producers in getting up-to-date electric furnaces and making available to them more electric power at cheap rates.

(h) A number of Provincial re-rolling mills producing non-ferrous semies are inefficient for re-rolling work. For increasing the manufacture of semies in the Province, we recommend the setting up of new modern rolling mills.

(i) Imports of semies should be controlled by Government in the interest of the Indian non-ferrous semies manufacturing industry.

(j) It is absolutely essential that facilities should be granted by Government for the import of an Extrusion Press. The Press should be operated in the Province under Government control.

(k) Two up-to-date rolling mills should be imported and installed in Bombay Province for the production of 7,000 to 8,000 tons of brass sheets and circles and about 4,000 tons of copper sheets and circles.

(l) The brass and copper wire industry requires modern continuous wire drawing equipment to bring down costs of production.

(m) The Provincial lead sheets industry would do well to roll 8' wide lead sheets, for which there would be a very good demand in the future.

(n) Government should take steps to encourage the establishment, in Bombay Province, under private ownership, of a lead pipe manufacturing concern.

(o) Government should take all possible steps to solve the difficulties of the producers of bearing metals, phosphor bronze, gun metal, etc., as a number of consumers' goods industries in the Province are dependent upon them.

(p) Government should encourage the import of foundry machinery for the production of non-ferrous metal castings.

(q) Government should take positive steps for the cheap production in the Province of all non-ferrous metals.

(r) If suitable ores of non-ferrous metals are not found in the Province, Government should even encourage the imports of foreign ores for reduction in the Province.

(s) If the reduction of virgin metals is thus undertaken in the Province, it is logical to levy an import duty on virgin metals, which are to be produced in the Province, at the same time permitting duty-free imports of the ores.

## CHAPTER III.

## THE ALUMINIUM INDUSTRY.

31. Aluminium is a general purpose metal and its accepted uses as metal and in the form of strong alloys are now innumerable. In view of its lightness, durability, effective corrosion resistance and electrical conductivity, it is gradually being utilised in many important industries replacing the heavier metals. Aluminium acquired great prominence during the War, when its use became indispensable in aircraft and other industries, where lightness is a vital factor. The post-war world has already begun a wide-spread use of aluminium in important industries like automobile, aircraft, chemical, household utensils and goods, electrical, etc.

32. The principal raw materials required in the production of aluminium are bauxite and cryolite. Cryolite is required in small quantities and is not available in India. In regard to bauxite, which is the most important raw material used in the production of aluminium, it is well known that there are large workable high-grade deposits scattered in numerous parts of India, particularly in Bombay Province at Belgaum, Thana and Kaira and in Kolhapur State, at Katni in Central Provinces and at Ranchi in Bihar. Our reserves of bauxite have been estimated to be about 250 million tons with a content of more than 50 per cent., which is the minimum required for economic production. With such large deposits of bauxite, it is but natural to expect a large-scale development of the aluminium industry in India, but unfortunately this is not the case. Some development has taken place, but it is negligible and is in part controlled by foreign interests in production as well as in the ownership of ore concessions. It is no doubt true that the successful development of the aluminium industry is vitally dependent on the availability of cheap electric power, which in the present backward state of hydro-electric development in India, is not possible. It is a disappointing feature that in spite of large and rich workable deposits of bauxite being available in the Province together with possibilities of abundant and cheap electric power, the production of aluminium within the Province has not yet been undertaken by any concern. Instead, the Province possesses a well established domestic aluminium utensils' industry, which mainly - operated before the War on imported semies.

33. There are three distinct stages in the manufacture of aluminium products:—

- (a) The manufacture of alumina from bauxite and the reduction of alumina to aluminium ingots,
- (b) The fabrication of sheets, circles, etc., from aluminium ingots, and
- (c) The conversion of sheets, circles, etc., into aluminium consumers' goods.

It is a peculiar feature of the Indian industry that ever since its establishment, development has started from and has been mainly concentrated on the third stage instead of proceeding from the first stage to the third stage.

34. The production of virgin aluminium (first stage) dates from the year 1937, when the Indian Aluminium Co., Ltd., was established in India as the result of joint investigations of Indian aluminium resources undertaken by British and Canadian experts. In the same year an Indian concern

viz., the Aluminium Corporation of India, Ltd. was also floated. The main objects of these two firms were the production of aluminium in India and the manufacture of aluminium products. The Indian Aluminium Co., Ltd. drew up a scheme by which alumina was to be produced from bauxite at Ranchi, after which it was to be sent far down south to the Company's plant at Alwaye in Travancore State to avail of cheap electric power for the production into aluminium ingots. These aluminium ingots were then to be despatched to Calcutta for rolling into semies in the Belur Rolling Mills owned by the Company. It took some time before the most important part of the scheme fructified. Thus, it was only in the beginning of 1943, that virgin aluminium was produced by this firm at Alwaye from imported alumina. The Alwaye Works possess nearly 46 furnaces. Although the projected capacity of the Works amounts to nearly 5,000 tons per annum, we understand that the present production is only 1,700 tons against the present capacity of 2,500 tons per annum. This low production is chiefly due to the shortage of alumina and inadequacy of supplies of electric power. As already stated, a very peculiar feature of the operation of this factory is that until recently it produced aluminium ingots from imported alumina, as the manufacture of alumina had not yet commenced at Ranchi. We are not aware of the present position, but it was expected that the Company would commence the production of alumina in India very shortly.

The Aluminium Corporation of India Limited, which is the only other firm producing aluminium, made aluminium ingots for the first time in September 1942. The Company's works are situated at about 7 miles from Asansol, and bauxite is supplied to it from the Corporation's mines at Ranchi which are about 200 miles away. The main lines of production of the Company are the manufacture of alumina, the reduction of alumina into aluminium ingots and the fabrication of sheets and circles. The estimated capacity of the Works is about 3,000 tons per year of aluminium ingots, which will be obtained after processing nearly 12,000 tons of bauxite. A distressing feature is that the Works of the Company are operated on electric power generated from coal. It is estimated that if, 3,000 tons of aluminium ingots are produced by this Company, the consumption of coal would be about 1,000,000 tons per year. In view of the extreme shortage of coal in India, it is doubtful, whether the Company's future progress will be smooth. Except for these two companies, there are no other concerns in India producing virgin aluminium.

35. The manufacture of aluminium semies is being carried on at numerous centres in India. The fabricators generally operate on a small-scale and they roll aluminium sheets on the same mills on which they roll brass and copper sheets. There are also a few rolling mills in Bombay Province, but their operations are not on a very large scale. The most important amongst these are Messrs. Devidayal & Sons, Messrs. Husein Metal Rolling Mills, the Universal Metal Rolling Mills, the Metal Rolling Works, etc. Some of these not only roll aluminium sheets, etc. but they also roll brass and copper sheets and manufacture a variety of domestic utensils. As these firms have not supplied us separate figures of their production of aluminium semies, we are unable to give figures of production of such articles as sheets and circles, foils, tubes, rods, shapes, wires, cables, castings, etc. Although the

industry is quite well established, it is problematical whether the production is enough to meet the requirements of the Province. From a rough survey we are of the opinion that there is room in Bombay Province for a rolling mill producing 3,500 tons of aluminium sheets and circles, for which there is the largest demand and, if aluminium is produced in the Province, as proposed later on, we strongly recommend the establishment of such a rolling unit. If such a unit is established, it will increase our Provincial production of aluminium semies like foils, tubes, rods, wires, cables, etc. which are being produced in the Province at present but not in sufficient quantities. There is, however, quite a well established aluminium castings industry and a number of secondary producers of non-ferrous metals as well as fabricators of semies undertake not only the production of aluminium castings but also castings of other non-ferrous metals.

36 Amongst the variety of aluminium goods manufactured from semies, domestic aluminium utensils are the most important. During the War, the industry made a very valuable contribution to the War effort by supplying, for the requirements of the Defence Forces, such aluminium products as,

- (a) Jettison tanks,
- (b) Water bottles and utensils for servicemen,
- (c) Aluminium wires,
- (d) Castings for distilleries,
- (e) Fuse pads used for gun-firing, etc.

Now that the War is over, some of these products will cease to be in demand and the industry will revert to its most important manufacturing line viz. domestic aluminium utensils. There is a number of concerns in India which specialise in the manufacture of domestic aluminium utensils, of which some are located in Bombay Province. Before the War, the industry mainly subsisted on imported semies from which a variety of household utensils were manufactured. The outbreak of the War, however, created a serious situation with the complete stoppage of imports of all types of semies. The industry was compelled to find new sources and undertook on a very large scale the recovery of aluminium scrap in India. Furnaces were installed to melt and refine the scrap and the metal produced was then processed into sheets and circles in rolling mills, which were hastily set up at great cost, with equipment, most of which was made in India. As a result of these efforts, the industry is now practically self-contained in regard to its supplies of semies for the manufacture of aluminium products. Some of these concerns are not only producing domestic aluminium utensils and other products but are also fabricating their own sheets and circles thereby enjoying a definite advantage in costs. The domestic aluminium utensils industry is well established and it is unlikely that it will meet with any competition from foreign products.

37. In 1935, the production of aluminium in the world amounted to about 250,000 tons of which Germany supplied nearly 70 per cent. By 1938, production considerably increased and in that year the world consumed about 600,000 tons of aluminium. The outbreak of the War gave a great impetus to the industry and world production increased considerably. Today amongst the Empire countries, Canada leads in the production of aluminium in spite

of the fact that Canada has no workable deposits of bauxite and gets its ores principally from South America. Economical and cheap production has been made possible in Canada by the abundance of cheap electric power.

It is estimated that even if both the Indian Companies operate at full capacity, our production will not exceed 8,000 tons per annum. As against this, the demand in the post-war period is estimated to be about 15,000 tons per year. Considering all the factors affecting the economical production of aluminium, we strongly recommend the establishment in Bombay Province of one aluminium reduction plant with an annual capacity of about 3,500 tons. We have already seen that there is an abundance of rich and workable deposits of bauxite in close proximity to Bombay city. Although War time requirements have put an undue strain on our power resources with the result that additional electric supplies are not readily available, we feel that the shortage will not offer any insuperable difficulty, as there are vast potentialities of hydro-electric development in the Province, which will have to be worked by Government to make possible any general large-scale industrialisation. In this connection we invite the attention of Government to the urgent necessity of developing and working the Koyna River Hydro-Electric Project, which is being actively considered for development under the Electric Grid Scheme. We understand that abundant deposits of high-grade workable bauxite are available in close proximity to this area which could be profitably exploited by drawing upon the cheap electric power which will be generated. If a reduction plant for aluminium of this capacity is established in the Province, we also recommend the installation of a rolling unit with a capacity of 3,500 tons per annum of all sorts of aluminium semies. It is likely that, on account of the very favourable location of bauxite and cheap electric power, virgin aluminium produced in the Province would be even cheaper than that produced by the two existing concerns, whose costs of production are two to three times higher than production costs in U. S. A. or Canada.

38. We are of the opinion that to successfully establish a reduction plant in Bombay Province, considerable Government assistance would be necessary. In the first place, it is essential for Government to undertake a comprehensive geological survey with a view to determining the quantity and quality of the workable deposits of bauxite. Location of the industry and the import of up-to-date plant and equipment are two other very important questions. We recommend that the industry should be located in an area well served by cheap electric power. In this connection, we recommend the establishment of the industry in the area served by the Koyna River Hydro-Electric Project referred to earlier. This will not only secure valuable economies in production but will also serve to decentralise the industry. If the plant is located in this area, the purchase of suitable land will not be difficult. Government however, will have to provide all facilities for the purchase of plant and machinery from abroad as well as grant permits for the purchase of building materials locally. An industry of this nature should be well served with communications, particularly those leading to centres where the important fabricators of sheets, etc., are situated. Lastly, we are of the opinion that although sufficient private capital would be available, some sort of Government control is necessary.

### Summary of main recommendations.

(a) We recommend the establishment in Bombay Province of one reduction plant for producing aluminium with an annual capacity of about 3,500 tons.

(b) We also recommend the establishment in Bombay Province of a rolling unit with a capacity of 3,500 tons per annum of all sorts of aluminium series.

(c) To successfully establish this industry in the Province, Government should undertake a comprehensive geological survey to determine the quantity and quality of the workable deposits of bauxite.

(d) The industry should be located in an area well served by cheap electric power. In this connection location near the Koyna River Hydro-Electric Project would be very advantageous.

(e) Government should provide all facilities for the purchase of plant and machinery from abroad as well as grant permits for the purchase of building materials locally.

(f) Some sort of Government control over the industry is necessary.

## CHAPTER IV.

## THE PRIME MOVERS INDUSTRY.

39. A Prime Mover is a machine for developing power which is the basis of industrial activity. In the modern industrial state the importance of the Prime Movers Industry cannot be too adequately stressed. In this mechanised world, the generation of motive power alone is the measure of the industrial capacity of a nation. No country could rightly claim to be really industrialised if it lacked this industry or possessed it in a negligible form. Modern warfare no less than the days of peace has strikingly shown the importance of this industry and the vital part it plays in industrial progress.

40. The various important types of machines which fall under the category of Prime Movers are,

- (a) Water, Steam and Gas Turbines,
- (b) Steam Engines,
- (c) Electric Motors,
- (d) Electric Generators,
- (e) Internal Combustion Engines comprising Diesel Engines, Marine Diesel Engines, Petrol Engines, Petrol-Paraffin Engines, Town's Gas Engines, Suction Gas Engines, Alcohol Engines, etc.

For all practical purposes, the Prime Movers Industry in India is established on a negligible scale. Although what is being manufactured, in an organised manner, is of good quality, the types and range of prime movers turned out barely cover even a small part of the field of the prime movers industry. Of the above categories of prime movers, electric motors and electric generators, of which electric motors of small power alone are manufactured in India, have been considered in the Chapter on the Electrical Machinery and Accessories Industry. Of the remaining, as far as we are aware, except for internal combustion engines, particularly the diesel engine, there are no other types of prime movers produced in the country on an organised scale. It is quite likely that the reason for this is the complete lack of a sustained demand for any of the other types of prime movers, which are not only required in negligible quantities but also in various types and ranges making it impossible to undertake economic manufacture on a well organised scale. The result is that a very large part of our requirements is obtained from abroad. In 1938-39, our imports of oil engines only (excluding marine) amounted to 2,583 units valued at about Rs. 43,00,000. Of these the U. K. supplied 2,010 engines valued at about Rs. 33,00,000. In steam engines, our imports for the same year came to 54 units valued at about Rs. 6,32,000. Of these the U. K. supplied 48 units valued at about Rs. 5,67,000. The imports of gas engines were negligible.

41. Considering the manufacture of various types of prime movers in India, we observe that whereas small sized electric motors, as stated in the Chapter on the Electrical Machinery and Accessories Industry, are manufactured in some parts of the country, diesel oil engines, for all practical purposes are only manufactured in Bombay Province on an organised large scale. At one time there were altogether five concerns engaged in the manufacture of various types of diesel oil engines in India. Of these, two concerns viz. Messrs. Kirloskar Bros. Ltd., of Kirloskarwadi, and the Jamshedpur Engineering and Machine Mfg. Co. Ltd., of Tatanagar, stopped production during the



War. Of the remaining three concerns, Messrs. Copper Engineering Ltd., of Satara, is the only concern in India manufacturing diesel oil engines on a really large organised up-to-date scale. The remaining two concerns, one of which is situated in Cawnpore and the other in Lahore, manufacture on a very small scale low B.H.P. crude oil engines. The range of machines manufactured by these two Cawnpore and Lahore concerns is also not wide. In addition to these two concerns and Coopers there is one more firm, viz. Messrs. Ruston & Hornby, located in Bombay city, which assembles, from imported components and parts, 10 B.H.P. and 13 B.H.P. horizontal oil engines of Ruston & Hornby make. Messrs. Ruston & Hornby obtain the cast iron engine bodies in India from Messrs. Richardson & Cruddas of Bombay. The output of Messrs. Ruston & Hornby amounted to about 180 engines in 1945. These are the only concerns manufacturing or assembling complete internal combustion engines in India.

In addition there is a number of small and medium scale mechanical workshops spread all over the country, which manufacture component parts and spares of internal combustion engines. The most important activity is repair work on internal combustion engine spares. It is doubtful whether any of these concerns have potential capacity to undertake the manufacture of internal combustion engines although all of them have acquired some technical experience.

42. Thus, Bombay Province possesses at present two well organised concerns, viz. Messrs. Cooper Engineering Ltd., and Messrs. Ruston & Hornby, the former manufacturing complete engines and the latter assembling engines of a foreign make. From the country's point of view, Coopers' activity in the prime movers industry is really very important. Their success in this line is solely due to their continued efforts to avail themselves of the right type of experienced foreign technical help from the initial stages of manufacture. The present line of production of Coopers is the manufacture of solid injection 4-cycle horizontal medium-speed diesel engines ranging from 7 B.H.P. to 256 B.H.P. We are given to understand that Coopers are manufacturing the entire unit in their own factory, only importing crank shafts, fuel oil injectors, fuel oil pumps and a few other components. We are not given figures of production of the latest year but it was estimated that in the year 1944 Coopers produced nearly 650 engines of this type. The quality of the engines satisfies the specifications laid down by the Inspection Directorate of the Indian Stores Department which are based on the British specifications. We are given to understand that this firm is supplying nearly 20 per cent of the Indian demand for these types of engines. Nearly 25 per cent. of the production is distributed in Bombay city and the rest is supplied to the remainder of the country. At the present moment there are no exports of these engines but we are given to understand that the export market is capable of development if there is a larger production.

43. The manufacture of diesel engines requires certain specialised types of steels, some of which will have to be imported until such time as indigenous production is undertaken. The industry needs, of first importance, cold drawn bright mild steel bars. As these were not allowed to be imported, during the War, the industry had to make use of black bars which had to be machined and ground dead to size. Obviously, these operations inflated costs to a considerable extent for this item forms a good proportion of the cost of the total of expensive materials used in the manufacture of engines. The next important

material is solid drawn seamless steel tubings for the fuel injection system. As this was not manufactured in India and as imports were cut off, the industry made use of copper tubes which, although a good substitute, were still not upto the standard of the solid drawn seamless steel tubing. Then there are the bright studs and nuts for which all sorts of improvisations had to be made during the War as these were not manufactured in the country. The position was so unsatisfactory that the industry received no end of complaints on account of the imperfections of the studs and nuts utilised. The last important item is carbon steel which is produced in India. The supply of this steel was stopped during the War but now the position has eased.

In addition to the above, the industry requires a number of specialised component parts, such as gib headed and flat keys, force feed lubricators, piston rings, fuel oil pumps, fuel oil injectors, etc. Some piston rings were manufactured in India during the War but the quality was not good. As none of these components are at present manufactured in the country upto the required standard, the industry relies mainly for supplies on imports.

44. Considering the future expansion of the industry in the Province, we are given to understand that Coopers are embarking on an extensive programme which will include the manufacture of horizontal slow speed engines and a wide range of high speed vertical multi-cylinder engines. In addition, a very large establishment is proposed to be set up in Poona by Messrs. Kirloskar Bros., Ltd., for the specialised manufacture of diesel engines. We are given to understand that this firm has contracted with the Oil Engine Export Ltd., of the U. K. for the manufacture in India of diesel engines of some of the well-known English makes. It is understood that they will be in a position to turn out oil engines from 10 B.H.P. to 1,500 B.H.P. Once this scheme is put through, Bombay Province will have a really worth-while diesel engine industry.

45. On the basis of the statistics of the pre-war consumption of diesel oil engines in India we are of the opinion that there is yet some room for an increase in the production of these types of engines in the post-war period considering the possibilities of an export market and the increase in demand in the wake of industrial development. There is also a large field for the manufacture of other types of prime movers which have got to be considered at some time or the other. We admit that the limited demand in India for these other types of prime movers will preclude their consideration as an economical manufacturing possibility for some time to come. We, however, feel that a demand will be set up in the wake of the gradual industrialisation of the country. We therefore, recommend that manufacturers already engaged in the manufacture of Internal Combustion Engines should actively consider and plan their production schedules of these other types of prime movers to satisfy the future market.

46. For the successful establishment in the future of an extensive Prime Movers Industry which will produce not only an increased variety of diesel engines, for which there will be the largest demand in the country, but also most of the various other categories of prime movers, there are certain essentials which must be satisfied. To begin with, this industry requires a considerable amount of foreign technical help. Design and specification developments and alterations in manufacturing technique and basic principles of operations are so rapid and changing that, to be successful, in the present undeveloped industrial stage in India, the industry has got to avail of foreign co-operation.

How this is to be attained is a matter of policy which should obviously have as its primary objective the retention of Indian control over the industry. The first requisite is that prospective Indian manufacturers of prime movers should obtain the latest designs and drawings of the various categories of prime movers from important foreign manufacturers. Further, it is necessary that design and specifications should be accompanied by the latest plant and equipment suitable for manufacture and up to date manufacturing technique which is also equally vital. We recommend that Government should not only promote an effective liaison between Indian and foreign manufacturers but also provide facilities for the imports of the latest plant and equipment to make possible an ordered and economic development of this industry.

47. Considering the question of raw materials and component parts, we have already seen that some of the raw materials and parts will have to be imported. This list is not exhaustive as the materials and components pertain only to the diesel engines. When the manufacture of other categories is taken up, this list will be increased, and it is our recommendation that arrangements should be made in India for the manufacture of all the raw materials, of which special types of steels will be most important, so that they may be available to Indian manufacturers at as low rates as paid for by the foreign producers. Further, it is our strong recommendation that Government should, in the initial period, either completely remove or drastically reduce the custom duties on all imported components, the manufacture of which is not economically possible at present in India.

48. For any further expansion of the industry in the Province, and even in India, manufacturers should bear in mind the desirability of concentrating on the manufacture of only one type of prime mover under one roof. Specialisation is indeed very important. Continuous chopping and changing of plans and productive methods to suit multiplicity of categories of prime movers is economically undesirable. It is only when complete specialisation is achieved that it will be possible to standardise production and attain perfect interchangeability of parts and components which is a primary requisite in this industry. In this connection, we are firmly of the opinion that the future success of this industry depends vitally upon the industry's ability to manufacture perfectly interchangeable parts and components.

49. Another important essential is the desirability of adequate and careful inspection of the parts manufactured. Stage inspection is particularly important to ensure standardization and interchangeability of component parts.

50. In the long run, perhaps no other activity will give such good results as the maintenance of an up-to-date research and test laboratory. In the ultimate analysis, the prime movers industry's future is indissolubly bound up with the reputation of the quality of its products which has got to be on par with that of imported products. At present, such research and test facilities are non-existent except those established by manufacturers for their own use. We are given to understand that the Internal Combustion Engine Panel of the Government of India have recommended the establishment of an Internal Combustion Engine Central Research Laboratory for testing the results of research on internal combustion engines and also for the purpose of testing and certifying engines and their components. It is also proposed that this Laboratory should provide facilities for fundamental research. This scheme has been carefully considered by us. We endorse the recommendations made by the Panel and

are of the opinion that this Research Laboratory will supply a long-felt want in the absence of which opportunities for the establishment of this industry on a diversified large-scale basis would be lacking. We are of the opinion that the Research Laboratory should devote, in addition to its research and test activities, detailed attention to the improvement of the quality of the engines turned out by simplifying and standardising production and should also test and certify the engines produced. It is then only that consumers would be assured of the quality of the products purchased by them. In addition to this organisation, we strongly recommend that each manufacturer of prime mover should possess a really well-equipped test and research laboratory to carry out all tests on the floor and thus guarantee the engines marketed.

51. There is no doubt that this industry, as many others, is in need of first class skilled labour. The manufacture of prime movers essentially requires first class workmanship and even the United States experienced considerable difficulty for a long time in the diesel engine line.

52. The most thorny problem that will face the industry in the future is the manufacture of such component parts as fuel oil pumps, fuel oil injectors, crank shafts, piston rings, force feed lubricators, etc. The absence of these secondary industries in India is largely due to the insignificant nature of the demand for these components. The demand is so small that it is not worthwhile to undertake the manufacture of these items, which, on account of their specialised nature, are heavily concentrated in the U. K. and U. S. A. in a few concerns which undertake, as far as possible, on a large scale, the manufacture of only one component part say piston rings or crank shafts, etc. Until such time as a reasonably large demand for these component parts is set up in India, we do not see any economic possibility of undertaking this manufacture and consequently India will until then have to be dependent upon the imports of essential component parts for the assembly of her various types of prime movers. The question of establishing this secondary industry, as soon as a demand develops, should not, however, be lost sight of and Government should provide prospective manufacturers of these component parts all possible help.

53. The industry will for its successful development, require a great deal of active Government interest. We understand that the Government of India have already decided to regard the prime movers industry as a basic one. They have also decided to consider its development as a centralised subject and have declared their intention to encourage the industry. If these principles of policy are accepted by Government and energetically implemented we have no doubt that Government will actively aid the industry and establish it on a sound and permanent basis.

Now that the War is over, the Indian prime movers industry, even in its very limited form, will have to face the full blast of foreign competition. We are of the opinion that Government must take some positive steps to protect this industry. Whilst we are not in favour of any type of protection by means of import duties or subsidies, we strongly recommend some form of licencing scheme where by foreign producers are allowed to supply only that portion of the Indian market for diesel engines which is not supplied by Indian producers. We further recommend that before this scheme is put into force Government

should make sure that the quality of engines turned out by the Indian trade is up to the standard. At a later stage, when a wider range of diesel engines and other categories of prime movers is manufactured in the country, the licencing scheme should be extended to cover these categories also. In addition to this licencing scheme, we strongly recommend that Government should insist that all purchase of prime movers made in India by Government and semi-Government bodies, public corporations and railways, etc., should be obtained from Indian producers provided the quality of the products is up to the standard laid down.

54. For its successful development, the industry must be organised on a large-scale to secure economies of production. The type of organisation required for standardised manufacture with considerable interchangeability of parts does not admit of smallness in size of the production units.

Although this is a "key" industry, we do not see any necessity, at present, for the participation of Government in the manufacture of diesel oil engines. However, we desire some form of active Government interest in the manufacture of those other types of prime movers for which there is not expected to be a worthwhile demand to develop the industry on the private enterprise basis. We are of the opinion that in the absence of sufficient demand, it is very unlikely that the manufacture of these types of prime movers, though an urgent necessity, will be undertaken in India by private enterprise. However, in the national interest, particularly for national defence, Government are strongly advised to undertake the manufacture in a State-managed factory of such types of prime movers as water, gas and steam turbines, steam engines, petrol engines, etc.

#### Summary of main recommendations.

(a) There is yet some room for an increase in the production of diesel oil engines in the post-war period considering the possibilities of an export market and an increase in consumption in the wake of industrial development.

(b) We recommend that firms already engaged in the manufacture of internal combustion engines should actively consider and even plan production schedules for other types of prime movers to satisfy the future market.

(c) The prime movers industry requires a considerable amount of foreign technical help. We recommend that Government should not only promote an effective liaison between Indian and foreign manufacturers, but also provide facilities for imports of the latest plant and equipment.

(d) Arrangements should be made in India for the manufacture of all such raw materials as are imported, so that they may be available to Indian manufacturers at as low rates as paid for by foreign producers. In the initial period, custom duties on imported component parts, etc., should either be completely removed or drastically reduced.

(e) In the manufacture of prime movers specialisation is very important. We, therefore, recommend the manufacture of only one type of prime mover under one roof. Further, the industry must be able to manufacture perfectly interchangeable parts and components.

(f) Stage inspection is particularly important to ensure standardization and interchangeability of component parts.

(g) Each manufacturer of prime movers should possess a well-equipped test and research laboratory to carry out all tests on the floor and be sure of the quality of the engines marketed.

(h) Government should give all possible assistance to prospective manufacturers of such component parts as fuel oil pumps, fuel oil injectors, crank shafts, piston rings, etc.

(i) We recommend some form of licencing scheme whereby foreign producers are allowed to supply only that portion of the Indian market for diesel engines which is not supplied by Indian producers. Subsequently when other types and categories of prime movers are manufactured, the licencing scheme should be extended to cover these types also.

(j) All purchases of prime movers made by Government and semi-Government bodies, public corporations, railways, etc., should be obtained from Indian producers, provided the quality of the products is up to the standard laid down.

(k) The industry must be organised on a large-scale to secure economies of production.

(l) Government are strongly advised to undertake the manufacture in a State-managed factory of such types of prime movers water, gas and steam turbines, steam engines, petrol engines, etc.

## CHAPTER V.

## THE MACHINE TOOLS INDUSTRY.

55. The machine tool industry of the industrially advanced nations of the world is the result of trials and concentrated efforts extending over a number of years. Industrially advanced nations are gradually realising the basic nature of the industry and its invaluable contribution to the development of all industries. The production of automobiles, trucks, locomotives, prime movers, industrial machinery and a host of other engineering products, which form the nucleus of the modern industrial state, derive their strength from an up-to-date machine tool industry.

56. An organised attempt to manufacture, in India, machine tools of high quality dates from the beginning of the War when a few Indian firms came forward to manufacture machine tools of good quality. The production of high grade machine tools, however, was so small that the requirements of the country were mainly satisfied by imports from other countries. It was in the beginning of 1941, when the shipping position became extremely acute, that the Government of India passed the Machine Tool Control Order in February, 1941, which led to the appointment of the Machine Tool Controller and his organisation which was more or less based on the Machine Tool Control organisation of the U. K. The objects of the Order were to make an inventory of machine tools obtainable in India, regulate and improve production and, in general, secure for the armed forces, ordnance factories and war industries, the best machine tools available from all sources.

57. A general survey of concerns manufacturing machine tools was then undertaken and the Deputy Director General (MTC) notified, in September 1942, the names of certain manufacturers who were capable of manufacturing machine tools to Dr. Schlessinger's standard limits, which were accepted throughout the world by all important machine tool makers. Of these few firms selected for the purpose, two are located in Bombay Province, viz. Messrs. Cooper Engineering Ltd. of Satara, and the Mysore Kirloskar Works Ltd. of Harihar. These firms were selected by the Machine Tool Controller to achieve a large increase in production of Grade I machine tools. In order to assist them, the Machine Tool Controller distributed to these firms certain balancing plant. Investa Machine Tools & Engineering Co., Ltd., of Bombay, was also selected later on by the Machine Tool Controller as being capable of manufacturing Grade I machine tools and was assisted by the Machine Tool Controller in importing foreign plant and equipment for an expansion of its production capacity of Grade I machine tools. At the same time the Machine Tool Controller formulated a policy of fostering the manufacture of first class machine tools in India and with a view to improving the quality and solving the numerous difficulties involved in machine tool manufacture, a team of seven machine tools experts drawn from various machine tool manufacturing concerns in the U. K. was brought to India. These experts were posted at the main manufacturing centres and were instructed to guide and assist all machine tool manufacturers.

58. It is known that India is in a position to manufacture Grade I quality machine tools such as All-g geared screw cutting and surfacing lathes, Capstan Lathes, Drilling Machines, Grinding Machines, Shaping and Planing Machines, Chucks, Power Presses, etc., and also various small tools required for operating these Machine Tools. There are also manufactured in India

a wide variety of other types of machine tools but unfortunately they do not conform to Grade I specifications. Between 1st January 1943, and the end of 1945, India manufactured nearly 16,000 machine tools of various types. The production graph, for the whole of India, increased from less than 100 machine tools (all ungraded) per annum in 1939 to over 6,000 per annum of Grades I, II, III and Ungraded in each of the three years 1943, 1944 and 1945.

59. There are altogether 186 firms in India holding current licences to manufacture machine tools, of which about 20 concerns are situated in Bombay Province. Out of these 20 concerns, four concerns, viz., Messrs. Cooper Engineering Ltd., Satara, the Mysore Kirloskar Works Ltd., Harihar, Investa Machine Tools & Engineering Co., Ltd., Bombay and Messrs. Richardson & Cruddas, Bombay, manufacture machine tools to Grade I specifications. The main lines of production of these four concerns are Capstan Lathes, Screw Cutting and Surfacing Lathes, Shaping Machines, Planing Machines, Drilling Machines, Polishing Machines, Sheet Metal Working Machines, Sawing Machines, and a number of Power Presses. Out of the remaining firms, only one manufactures Radial Drilling Machines to Grade II specifications and two more manufacture Vertical Drilling Machines and Shaping Machines to Grade III specifications. The remaining concerns manufacture a variety of Grinding Machines, Lathes, Shaping Machines, Milling Machines, Drilling Machines, Presses and Hammers, etc., all of which are ungraded machine tools.

Speaking in terms of numbers only, the share of Bombay Province, in respect of Grade I machine tools manufactured in the country, both large and small, irrespective of their size and value, comes to nearly 40 per cent. If, however, a percentage is calculated in terms of the value of the machine tools produced, the proportion will be still higher. This trend of production in the Province is in itself a healthy sign as Bombay manufacturers appear to concentrate on the production of Grade I machine tools in which they claim a share of nearly 40 per cent. A detailed statement is attached as per schedule marked "A" showing the numbers and variety of Grade I machine tools manufactured in India and the share of the Provincial industry.

60. Having stated the present position of the machine tool industry in the Province and its position in the national set-up, we now consider some of the difficulties met with by the industry in its day to day work. There are certain difficulties, like inspection, research, lack of concentration on quality, etc., where some improvement is urgently necessary. We feel that none of these difficulties is insurmountable and that they could be solved without much effort, if there is a greater appreciation by Government and manufacturers alike of the vital nature of the industry and the need for its improvement. These difficulties are met with by manufacturers of machine tools throughout the country and, therefore, if there are to be any attempts at solving them, steps should be taken by the Government of India in co-operation with the Provincial Governments—

(a) *Raw Materials*.—This is perhaps the most thorny problem encountered by all manufacturers. Machine tool production requires a vast variety of special types of steels like chrome steel, carbon steel, tungsten steel, high speed steel, etc., supplies of which, during the War, were strictly rationed. As imports were cut off the industry experienced a serious raw materials shortage. Now that the War is over, the position is expected to improve.



It should, however, facilitate matters, if Government were to provide facilities to manufacturers for the procurement of raw materials of proper grade and quality at prices comparable with those paid for such materials in the U. K. It should also be advantageous if Government were to release for the use of the industry, such materials as high speed tool steels, copper, zinc, tin, etc., which were originally purchased under lease-lend, at prices comparable to those prevalent in the U. K. at present.

(b) *Designers*.—Another serious disadvantage suffered by the industry is the lack of good designers of machine tools. In course of time, we feel that this difficulty will be easily overcome by means of experience and training given to well qualified technicians.

(c) *Plant and Equipment*.—Another pressing necessity of the industry is to obtain adequate and suitable plant and equipment for machine tool production. In this matter, Government would be required to play an important part in providing facilities for the purchase of plant and equipment from whichever foreign countries they are available without any insistence that they should be purchased from sterling areas only.

(d) *Labour*.—The machine tools industry is also in need of skilled craftsmen and well qualified experienced supervisory staff. During the War, much progress was made in training labour in the manufacture of precision machine tools. It is recommended that Government should take a more active part in rendering adequate facilities for the training of labour.

(e) *Inspection*.—Inspection has improved the quality of machine tools. During the War and even now, the Inspection Directorate of the Indian Stores Department is inspecting all machine tools produced for Government requirements. At the same time most of the prominent manufacturers are voluntarily having their machine tools inspected for their own satisfaction as well as for the satisfaction of the consumers. Not only should this system be continued but also manufacturers should resort to "stage inspection" in their own workshops of all machine tools produced by them. This is being done now by very few producers, although it is very important for the production of quality machine tools.

(f) *Research*.—In Bombay Province, very few factories producing Grade I machine tools have well-equipped research and test laboratories, consisting of the latest equipment, to carry out tests of metal analysis and to evolve better and better quality of products. We strongly recommend to manufacturers the desirability of setting up well organised research and test laboratories. It is only then that they will be able to carry out tests of cast iron and be able to ascertain the correct Brinell hardness, the extent of seasoning of metal required, the contents of the metal, etc.

(g) *Market*.—The machine tool industry in India is largely the offshoot of a ready and assured market provided during the War. Now that the War is over, a problem facing the industry has been the preservation and continuation of this home market. In this matter, we recommend the licencing of imports into India of only those Grade I machine tools which are manufactured in India. It is only by this measure, that the manufacture

of Grade I machine tools will be encouraged and those concerns not manufacturing Grade I machines will gradually realise the futility of not improving their quality. We recommend to Government the appointment of a small committee, consisting of representatives of important Indian machine tool manufacturers and consumers, which should be attached to the Machine Tool Controller to assist and guide him in the grant of licences. It is also necessary to set up an organisation for fixing maximum as well as minimum prices of machine tools manufactured in the country in order to ensure the operation of the industry on a commercial basis.

61. In addition to what has been stated above, we desire that Government should take some steps regarding the laying down of standards of specifications for materials, workmanship, tolerances and performance of machine tools comparable with those employed by foreign manufacturers, for the guidance of the Indian makers of machine tools. Government should also prepare a list of suitable specifications for all Grade I machine tools manufactured in India.

With a view to developing the industry on right lines, we also recommend the employment by Government of specialists who are experts on such subjects as (1) foundry practice, both ferrous and non-ferrous, (2) metallurgy, (3) machining, (4) metrology, etc.

During the War, various munition, ordnance and war establishments were equipped with first-class foreign machine tools at Government cost. Some of these establishments, now that the War is over, are likely to experience redundancy of capacity in relation to demand. As it is unfair for them to take a share in private trade and thus engage their plant, it would be advantageous if these machine tools are allocated by Government to machine tool manufacturers in India in order to enable them to balance their plant and equipment. In any event, even in the matter of this disposal, it should be seen that the sale does not jeopardise the Indian machine tool industry.

62. We recommend that Indian manufacturers should establish more and more contacts with some of the well-known foreign machine tool manufacturers. Such contacts were established, during the War, by a few of our prominent machine tool manufacturers with very good results. In the post-war period there is a considerable justification for the continuation and extension of these contacts. In this matter, Government could render very useful aid through their Trade Commissioners abroad, by exploring the possibilities of effecting liaison between foreign and Indian manufacturers. This type of foreign linking should be only of a commercial nature and should not be biased by political considerations. As far as possible, Indian manufacturers should restrict the basis of linking to an outright purchase of designs and plans or contract to manufacture foreign patented machine tools under a royalty. It is absolutely essential that the entire management and financial control should remain in Indian hands.

63. We have already seen that Bombay Province enjoys a good share in the production of Grade I machine tools in India. This is largely due to the sustained efforts of Grade I manufacturers, whose policy upto now appears to be exclusively confined to the production of first-class machine tools. Considering the capacity of the machine tool industry in the Province and possibilities of its future expansion, we are of the opinion that these firms manufacturing Grade I machine tools, have acquired during the War a wealth of experience and technique and are also well-served with finance, resources and industrial "know-how" to undertake successfully any further development of the industry in the Province. At the same time all efforts should be made to improve the quality of the machine tools produced by the remaining firms which is not up to Grade I specifications. Further, for the successful development of this industry on right lines, we recommend to Government that all Grade I machine tool manufacturers should be licensed and that such licences should be issued to only those manufacturers who have the required manufacturing capacity to turn out Grade I machine tools.

64. In the present state of the Provincial industry, we do not view with favour any further expansion by the establishment of new factories for the manufacture of such types of Grade I machine tools as are already being manufactured in the Province. It appears to us that the need of the moment is the future development of the industry on right lines. There is no necessity at this stage of any direct participation of the Provincial Government in the industry either by way of subscribing to the capital or floating a Government company. In most of the important matters such as the licencing scheme, the laying down of standards of specifications, the free supply of raw materials, etc., any action contemplated by the Provincial Government will have to be subordinated to the requirements of the industry and its planning on a national basis which of course rightly falls within the sphere of the Government of India. There are, however, many other matters in which the Provincial Government could render very useful assistance. Thus Government can aid the industry advantageously by facilitating the rapid import of plant and equipment whenever required, by providing test houses, by training labour in the country and by granting facilities for training abroad, by the provision of road and rail facilities, by the improvement in booking facilities at railway stations, etc. A very important aid which deserves special mention is Government help in the easy acquisition of land for expansion purposes.

65. The entire aspect of the machine tool industry needs to be considered from the national point of view. The Government of India, in the Department of Planning and Development, have already appointed the Machine Tool Panel, which has been asked to go into the whole question and make recommendations for the improvement of the industry in India. It is hoped that the difficulties set out above will engage closely the attention of the Panel, which is, in the present circumstances, the most competent authority investigating the structure of this industry.

In conclusion, we should like to state that the essence of post-war industrial planning should be the self-sufficiency of India in the manufacture of Grade I machine tools.

### Summary of Main Recommendations.

(a) Government should provide facilities to manufacturers for the procurement of raw materials of proper grade and quality at prices comparable with the U. K. prices for such materials. Government should also release for the use of the industry, such materials as high speed tool steel, copper, zinc, tin, etc. acquired under lease-lend, at prices comparable with those prevalent in the U. K. at present.

(b) Government should play an important part in providing facilities for the purchase of plant and equipment from abroad.

(c) The system of inspection undertaken by the Inspection Directorate of the Indian Stores Department should be availed of by manufacturers, who should also adopt the "stage inspection" method for an improvement in the quality of machine tools manufactured.

(d) Manufacturers should set up well-organised research and test laboratories.

(e) Government should license the imports into India of only those Grade I machine tools which are manufactured in India. Government should appoint a small committee of prominent manufacturers and consumers to assist them in the licensing scheme.

(f) An organisation should be set up for fixing maximum and minimum prices of machine tools manufactured in the country.

(g) Government should lay down standards of specifications for materials, workmanship, tolerances and performance of machine tools.

(h) Government should engage the services of specialists, who would be experts on such subjects as foundry practice, metallurgy, machining operations and metrology.

(i) To enable Indian manufacturers to establish contacts with foreign manufacturers for the development of the industry, Government should render them whatever help they may require through the services of their representatives abroad.

(j) Provincial manufacturers who are not producing Grade I Machine Tools should make all efforts to produce them and Government should give all assistance to enable them to raise the standard of their machine tools.

(k) Government should assist the industry in the easy acquisition of land for expansion purposes.

## CHAPTER VI,

## THE ELECTRICAL MACHINERY AND ACCESSORIES INDUSTRY.

66. The Electrical Machinery Industry was established in a small way in India before the War. The outbreak of the War resulted in very large demands being made on the industry for all types of electrical machinery and accessories. A number of new concerns, some of which were mere assembly plants of prominent U. K. manufacturers, were established in the country to cater for the demand. In spite of this, the Indian production was inadequate and during the War, a fair proportion of the country's requirements of all types of electrical machinery and accessories was obtained as imports from abroad. Further, whatever items were manufactured in the country were in part dependant upon imported raw materials and semi-finished and finished parts as either the raw materials required by the industry were not available or facilities for the manufacture of finished parts were not as well developed in the country.

67. For the purpose of convenience in considering the possibilities of the manufacture of electrical machinery and accessories, this report is divided into two sections. The first Section deals with Electrical Machinery and is subdivided into four categories, viz. Transformers, Electric Motors, Generators and Switchgears. The Second Section deals with Electrical Accessories and is also sub-divided for consideration separately of industries manufacturing such items as Dry Batteries and Cells, Secondary Batteries, Incandescent Lamps (Electric) and Electric Fans.

## SECTION A.

## ELECTRICAL MACHINERY.

68. The manufacture of any type of electrical machinery requires consideration of the present advanced stage of design and development in other countries, since design undoubtedly has a most important bearing on the subject. It is a question whether there exists sufficient design experience in India to develop further an industry of this nature without it being linked with overseas manufacturers, since the present state of the industry in other countries is the result of many years of experience and proving under test and working conditions. A suitable analogy might be drawn with the automobile industry in which the question of design is not of greater importance than in the electrical machinery industry, and yet it has been so far found necessary to link up with foreign manufacturers in order to obtain the benefit of their designs and long experience. Where manufacture of electrical machinery has already been undertaken in India, it will generally be found that those branches which require the background of design and working experience are operating as direct branch factories of overseas manufacturers and, even so, it is believed, that they are merely assembly plants, which import their products semi-manufactured and complete the assembly in India. We feel that this is more than a mere matter of convenience in these cases but is in fact the only way in which the necessary preliminary experience can be imported into the country. Here again, there is a close analogy with the automobile industry which has not as yet achieved more than the assembling of imported parts.

69. *Transformers*.—It is well known that Distribution Transformers up to 500 KVA capacity and up to 11,000 volts on the H. T. side are required by all electrical undertakings and by industries depending upon electricity. Before the War, transformers were manufactured in India, on a very small scale, by only one concern, viz. the Government Electric Factory, Bangalore, which was established in 1936-37. In the pre-war period, the major portion of India's requirements of transformers was imported from abroad, the value of imports amounting to Rs. 26,00,000 approximately in 1938-39. On the outbreak of the War and on account of the acute shipping position, the value of imports gradually fell to Rs. 10,00,000 approximately by 1940-41. During the War period the industry expanded in the wake of increasing demand made by various industries and on account of larger distribution of electrical energy with the result that by 1942 two more firms were added. They were the Associated Electrical Industries Mfg., Co. Ltd., which commenced operations at Calcutta and Messrs. Crompton Parkinson Works Ltd., which was set up in Bombay. These two firms were associates of important English Electrical machinery manufacturing concerns and a part of their activities in this country consisted of the assembling of their own small and medium sizes of transformers within a limited range of standard designs. The pre-war production of distribution transformers amounted to about 60 units produced by the Bangalore Factory. By 1944, it is estimated that nearly 1,500 transformers valued at Rs. 15,00,000 approximately were manufactured in this country by these three concerns of which the two British associated concerns claimed the largest share. Now since the War is over, the question of survival in a competitive market becomes important. It is certain, however, that the Bombay firm will not be affected as the quality of its production is comparable to any imported transformers.

The principal raw materials required in the manufacture are silicon steel stampings, cotton covered copper wires and strips, insulating materials, solid drawn steel tubings and oil. Of these, only the cotton covered copper wires and strips are manufactured in the country by the Indian Cable Co. Ltd., of Calcutta. Silicon steel stamping, which is the most important raw material used was until 1944 imported. This reliance on imports has now been partially eliminated by the stamping work done in Bombay city from original electrical steel sheets imported from the U. K. and U. S. A. by the Sankey Electrical Stampings Ltd., which is a subsidiary of the important Sankey firm of U. K.

Considering the Provincial market, it is observed that with the development of the Electric Grid System, there will be a larger and increasing field for the use of transformers of small and medium sizes. We are of the opinion that Indian manufacturers can very well find a suitable field for expansion in catering for this need. Unlike the small standard electrical motors, the users of transformers have frequently evinced a desire to incorporate design features which they have found to be desirable under their own operating conditions, based on experience, and such departures from normal manufacturing practice might be difficult to cater for. We are, however, of the opinion that there is a potential field for the manufacture in Bombay Province of a standard range of transformers of the Pole-mounting and Floor-mounting types in reasonable sizes, say up to 500 KVA capacity.. This field offers definite prospects of being profitably developed if the benefit of foreign designs and manufacturing experience could be availed of. In regard to the question of

raw materials, we observe that most of them are available in India except the required electrical steel sheets, insulating materials and oil. In regard to electrical steel sheets, however, India would soon be independent as the Tata Iron & Steel Co. Ltd., have already planned the erection of a special furnace for facilitating the production, on a commercial basis, of electrical sheets required for the manufacture of transformers, motors, generators and other electrical machinery. We are, however, of the opinion that unless there is a reasonably large demand for all the necessary parts, such as castings, stampings, wires, insulation, etc., it would probably be necessary to rely on imported semi-finished products. It will be noted that the parts required for the manufacture of transformers and for electrical motors have a similarity and, if both branches of manufactures were developed, the scope for ancillary industries to manufacture these parts would be thereby widened.

Before we conclude, we should like to mention the special position of the electric supply companies in India in respect of the sales of transformers. Because electric companies give facilities to consumers by selling transformers on an instalment payment system, they have a very large say in the marketing of transformers. It may, therefore, rightly be said that the future of the transformer industry in the country is largely dependant upon the policy of electric supply companies. This is a very remarkable position and it would be well for the Government to consider the laying down of a long-term policy by which electric companies shall be required to give preference to Indian-made transformers provided they comply with the necessary specifications, have passed necessary tests and hold a certificate of quality from a recognised Test House. This will of course be possible only when the Indian transformer industry is able to meet reasonable deviations from the rigid standards it has to adopt, when it is assembling standard parts.

70. *Electric Motors.*—With the development of electrical and mechanical engineering and the general electrical industry, there is bound to be a much increased demand for electric motors in India. Before the War, there was only one firm, viz. the P. S. G. & Sons Industrial Institute of Coimbatore, which undertook on a small scale, the manufacture of electric motors in India. The annual output of the firm was about 200 motors valued at Rs. 40,000 approximately. As against this the value of our imports aggregated to Rs. 63,00,000 in 1938-39 showing the vital necessity of establishing a well-organised large-scale electrical motor industry in the country. Consequent on the large demands set up by the War, five new firms began the manufacture of electrical motors in India. Of these, two firms, viz. Messrs. Crompton Parkinson Works Ltd., and Messrs. Kirloskar Bros. Ltd., Kirloskarvadi, are situated in the Province. The annual output of electric motors of all these six Indian firms amounted to nearly 10,000 units in 1943, valued at about Rs. 20,00,000 of which the share of Bombay Province was considerable. Calcutta came next in importance with an output of 2,400 motors, contributed by two firms of which the Associated Electrical Industries Mfg. Co. Ltd. supplied nearly 65 per cent of the units. In general, Government have been extending their patronage to the industry and in 1943 they purchased about 1,200 motors from Indian manufacturers. For 1944, it was estimated by the industry that the production of electric motors in India would be doubled to 20,000 units. We have no information to check these figures.

The manufacture of electric motors is concentrated on a limited range of standard types, which are mostly three-phase squirrel cage motors. Whether these manufacturers will ultimately expand their range of production beyond what may be termed "small stock sizes" of motors is problematical. In our opinion there is undoubtedly a large field for small-size motors in the Province and it is in this field that an Indian manufacturer may successfully establish himself to cater for the Provincial as well as the Indian markets, particularly if the benefits of designs and experience of foreign manufacturers could be availed of. We observe that the raw materials required for the industry are practically the same as those required for the manufacture of transformers except that large quantities of ball and roller bearings are a special item required by this industry. It will be necessary to import this item for a long time to come. Further, as manufacturing facilities for the making of necessary castings, wire insulation, etc., are not yet developed in the country, it would also be necessary, in the first instance, to import a large proportion of the necessary semi-finished parts.

We are of the opinion that it is only when an electrical motor manufacturing industry is established in the country, on a large scale, that the necessary outlet for the ancillary manufacturers would be forthcoming. It appears to us that, for some time to come, small-scale manufacturers would have to continue to be dependent upon imported parts. Recently the problem of motor manufacture has been simplified by the proposed abolition of the direct current system of supply in British India and, if this is adopted, efforts can be wholly concentrated on the simpler types of alternating current motors.

71. *Generators.*—As far as we are aware, generators have not as yet been manufactured in India. In considering the manufacture of generators of any size, it should be understood that they cannot in practice be divorced from facilities for the manufacture of prime movers, since every generator requires to be driven by some sort of prime mover, either an oil or steam engine, or a steam or water turbine. In other countries, generators are most usually manufactured by groups which themselves contain manufacturing facilities for prime movers and also facilities for combined testing of prime movers and generators. We feel that until an industry for the manufacture of prime movers is firmly established in India, there is little hope of the manufacture of generators being undertaken successfully in this country without Government help. The time when units of small generating capacity were in general use, for small-town electricity schemes, is about to come to an end owing to the proposed adoption of the Electric Grid System throughout India which will necessitate very much larger generating units.

72. *Switchgear.*—The successful manufacture of the heavier types of electrical switchgear calls for very advanced technique in both design and testing, and this field of manufacture is at present much less static than that of electric motors and transformers, as development is still proceeding rapidly. And there is no sign of any finality being reached even for a short period of time. The prospects, therefore, of establishing a heavy switchgear industry in India are not considered practical at present without Government help. We are of the opinion that practical considerations would limit the manufacture of switchgear to the simpler forms of switches and starting equipment for small and medium sizes alternating current motors of standard types, and there appears to be no reason why a parallel industry of this nature should



not grow up alongside the industry, for the manufacture of A. C. motors as dealt with above. This is probably the simplest type of electrical manufacture which can be visualised, but here competition would be with mass produced imported articles which are marketed at cheap prices. Design difficulties are not likely to present any great problem as this field of manufacture is comparatively simple and depends more on mass production methods for cheapness rather than on technical or design abilities.

73. Speaking generally about the location of new factories, we are of the opinion that any expansion of electric motor and transformers industries in the Province should be located in an area within daily reach of a city like Bombay to avail of the skilled and semi-skilled male labour and also intelligent female labour, which are essentially required for these industries. Further, such expansion should be judicially controlled by Government and have Government participation, if desired, in order to ensure the systematic development of the industries within the capacity of the market.

## SECTION B.

### ELECTRICAL ACCESSORIES.

74. *Dry Batteries and Cells.*—Before the War, India's requirements were mainly satisfied by imports which amounted to about Rs. 20,00,000 in 1938-39. There were a few firms undertaking the manufacture of these products but the output was negligible as compared to the demand in India. The outbreak of the War, however, led to a considerable increase in output by the two principal firms engaged in turning out these products. One of these firms, viz., the Estrella Batteries, Ltd., is situated in Bombay city. The operations of the firm were considerably assisted during the War by the D. G. M. P., who supplied it with necessary plant and materials obtained from U. S. under lease-lend and also from U. K. In the year 1945, the Company's output amounted to nearly 20,000,000 cells. We are given to understand that this company is further increasing its output and is setting up a new factory in Bombay city, near the Andhra Valley Power Station at Matunga. The Company is expecting to receive in July of this year new plant and equipment. We are given to understand that when the plant fully goes into production, the output would be considerably increased. The large expansion of production contemplated by the Estrella Batteries, Ltd., would be sufficient, it is achieved, to meet all the post-war demands for these products. However, the question of the establishment of new factories for the production of dry cells may be further examined. The industry is very largely dependant upon imports for the supply of its raw materials as most of these, like carbon electrodes, ammonium chloride, zinc chloride, zinc sheets and strips, acetylene lamp black are available in the country. In regard to manganese dioxide, it is being processed in India, but is of poor quality and unsuitable for the purpose. Certain other materials like card board, paper, resins, etc., are partly imported and partly obtained in India.

75. *Secondary Batteries.*—Before the war there were only two important firms in British India, viz., the Bharat Battery Mfg., Co. Ltd., Calcutta, and the Estrella Batteries Ltd., Bombay, which undertook the manufacture of secondary batteries. Amco Limited, which hitherto has been the largest producing concern, is located at Bangalore. In addition to

manufacturing secondary batteries, Amco Limited also manufactures accumulators for train lighting purposes, dry cells for telegraph and telephone services and dry cells for torch lights. We are given to understand that during the War, and even now, a very small percentage of the demand for railway accumulators is purchased from Indian producers, in spite of the Indian Industry being in a position to supply a good portion of the demand. Before the War, in view of the restricted output and the infancy of the Indian industry, the major portion of the country's requirements of secondary batteries was satisfied by imports, which amounted to nearly Rs. 6,00,000 in 1938-39, with U. K. supplying about 90 per cent. of the imports. War demands, however, led to the establishment of one more factory, viz., the Standard Batteries Ltd., at Santa Cruz, a suburbs of Bombay city. The capacity of the Standard Batteries Ltd., is about 24,000 batteries per year. The Company has ordered a complete set of automatic plant from abroad which is expected to give a much larger output. In addition to this Estrella Batteries, Ltd., is also planning to treble its production of batteries. If the plans of these two Provincial companies fructify, the Provincial production is expected to be around 150,000 units per year. We are given to understand that one new firm, viz., The Chloride Electrical Storage Co., Ltd., is also erecting a modern plant at Calcutta for the manufacture of secondary batteries. The industry is fortunate in being able to obtain indigenously most of the important raw materials required by it such as antimony, red lead, litharge, sulphuric acid, sealing compound, etc. whilst refined lead is principally imported. In the case of antimony it may be pointed out that the price per ton paid by Indian producers for Indian-mined and refined antimony is 100 per cent. higher than that of imported antimony.

With the cessation of hostilities, there is bound to be strong competition from well established foreign manufacturers and we strongly recommend the Provincial companies to modernise their plant and equipment. In view of the vital nature of the industry, Government should favourably consider the grant of protection, if they are satisfied that the industry has achieved a reasonably efficient standard. In regard to future expansion, we are of the opinion that if the post-war schemes of the two Provincial companies materialise, there will be no room for any immediate further expansion of this industry in the Province.

76. *Incandescent Lamps (Electric).*—In 1937-38, India imported about 11,200,000 vacuum electric bulbs and 2,700,000 gas filled electric bulbs, of which Japan supplied 70 per cent. of the vacuum bulbs and the U. K. supplied 46 per cent. of the gas-filled bulbs. In 1938-39, our imports fell to about 7,300,000 bulbs, both vacuum and gas-filled. For all intents and purposes, the normal demand of the country may be put at about 14,000,000 electric bulbs of these two types. The outbreak of the War created a very precarious position with all round cessation of imports. The situation was further aggravated by the vast increase in consumption with the consequence that larger and larger demands were made on the Indian industry. With all-out production, Indian factories were able to increase the production to about 4,000,000 bulbs in 1943 and it was estimated that by the end of 1944 nearly 5,000,000 bulbs would be manufactured. This reveals that the Indian industry is only able to supply about one-third of the normal peace-time requirements of the country.

We understand that there are about ten firms in India manufacturing bulbs of which six are situated in Calcutta and only one firm namely Bijlee Products Ltd. is located in Bombay city. The Provincial output of bulbs is negligible even as compared to the Provincial demand, as the Bombay firm, in point of order based on volume of output, stands last amongst these ten Indian firms. We are given to understand by this firm that they are planning to set up a big factory in the suburbs of Bombay, for which the land has already been acquired. They contemplate the manufacture of the glass shells, tubings and rods for a vast expansion in their production of bulbs. They estimate a production of 5,000 bulbs a day increasing later on to 10,000 bulbs per day. If this is achieved, the Company would be manufacturing anything between 1,500,000 to 3,000,000 bulbs a year. In regard to the future expansion of the industry in the Province, we are of the opinion that in view of the early establishment of the Electric Grid System in the Province, there would be room for the establishment of one or more factories with a similar production capacity. A lamentable feature of the industry is that practically all the raw materials required in the manufacture are not available in India.

Before the War, the industry was doing nothing more than assembly work, importing all its raw materials and component parts such as glass shells, caps, lead in wire, nitrogen and argon gases, tungsten filament, etc. These imports mainly came from U. K., U. S. A., Japan, Germany and other countries. During the War, attempts were made to manufacture glass shells and brass caps in the country and the industry now obtains a part of its requirements of these two components in the country. The rest of the items are still imported. It is doubtful whether in the post-war period, the industry would be in a position to obtain most of its supplies of raw materials and component parts in India. We are of the opinion that any large scale improvement in the industry is logically based upon its independence of foreign supplies of raw materials and component parts and all efforts should be made to develop these within the country.

77. *Electric Fans.*—Before the War, there were seven large firms manufacturing electric ceiling and table fans in India. Of these, only one concern, viz. Messrs. Crompton Parkinson works, Ltd., is situated in the Province. The industry was mainly dependant upon imported parts, the imports of which together with the value of the imports of finished fans amounted to Rs. 25,00,000 approximately in 1938-39. The main exporting countries were U. K., Italy, Germany and Japan with U. K. contributing about 50 per cent. of the total. As in the case of many other industries the War set up a very large demand for electric fans and about seven new concerns were established to satisfy this demand. Of these four were located in the Calcutta area and none was established in Bombay Province. In addition to these 14 concerns operating today, there are a number of smaller concerns, a few of which are located in the Province. The pre-war production of the Indian factories amounted to about 30,000 ceiling fans and 5,000 table fans. This production was raised to about 41,000 ceiling fans and 10,000 table fans by 1943. The Indian industry estimated that its production for 1944 would be over 100,000 ceiling fans and about 30,000 table fans. We have been unable to check these figures but even if about 60 per cent. of this estimate is achieved, it would be a creditable performance. Considering the 1943 production, it is observed that out of the 41,000 ceiling fans manufactured in India, Bombay's share, being the contribution of Messrs. Crompton Parkinson Works, Ltd. amounted to quite a large figure, whereas in table fans, Bombay claimed no

share. In 1944 and 1945 this Bombay company continued its high level of production of ceiling fans reaching a record figure in 1945. In addition there is one more firm in Bombay city, viz., the Electric Fan and Motor Works, which has a fair capacity for the production of ceiling fans. During the War years, Government ordered the Company to stop its production of fans and concentrate on the manufacture of split collars, bushings, etc. We are given to understand that the Company has undergone considerable losses on account of this order as it was fully equipped for the manufacture of welding transformers, spot welding machines, seam welding machines, switchboards, rectifiers, etc., in addition to its suitability for fan manufacture. Considering future expansion we are of the opinion that there is room for the establishment of one or more factories in the Province with a total production capacity of say 5,000 table fans per annum, as these are not manufactured in the Province.

Like the manufacture of electrical machinery and other electrical accessories this industry is also vitally dependant upon imports for most of its raw materials. We have already mentioned the stampings required for the industry. It may be said here that for D. C. fans Tata's black sheets are being used by the industry with satisfactory results. A special item required by this industry is ball bearings. In view of the acute shortage of ball bearings in India, the industry is making an increasing use of plain bearings. In our opinion, this is a retrograde step forced on the industry on account of the limited imports of ball bearings due to the exigencies of War. Another retrograde step forced on the industry during the War was the extensive use of mild steel and ordinary steel in the manufacture of fan blades. Recent technology, however, requires the use of aluminium sheets for the manufacture of fan blades. Most of the insulating materials, viz., leatheroid, empire-cloth, bakelite sheets, etc., are imported although attempts have been made recently to manufacture some of the items in the country. In regard to winding wires we observe that although the Indian Cable Co. Ltd., Calcutta, manufactures covered copper wires, they have been found not very suitable with the result that all the enamelled and silk-covered copper wires are imported from U. K. and U. S. A.

78. It will be evident from this Report that the Electrical Machinery and Accessories Industry is on its way to being established in India. Although the main lines of activity are concentrated on simple types of machinery and accessories it may be said that valuable experience is being acquired which will stand the industry in good stead for its future development. In all these developments Bombay Province is enjoying a reasonable share on account of the activities of one big firm.

However, we are not satisfied with the rate at which expansion in this industry is taking place. Since vast electrification schemes are being planned by Government for the Province, it will be necessary for Government to see that *pari passu* with the execution of these electrification schemes, active steps are taken for the establishment and expansion, wherever required, of industries for the manufacture in the Province of such items as electric motors, transformers, generators, switchgears and other electrical accessories and appliances. Without such industries, the electrification schemes of Government are likely to come to naught, particularly in times of national emergency.

We, therefore, recommend that Government should forthwith take steps to have these industries established on a sound basis, if possible under private ownership, or otherwise with active Government participation, if private enterprise is not forthcoming.

#### Summary of main recommendations.

(a) There is a potential field for the manufacture, in Bombay Province, of a standard range of transformers of Pole-mounting and Floor-mounting types up to 500 KVA capacity, if benefits of foreign designs and manufacturing experience could be obtained. Government should consider the laying down of a long-term policy by which electric companies would be required to give preference to Indian made transformers provided they are of the required standard.

(b) There is a large field for the manufacture, in Bombay Province, of small size electric motors, if benefits of designs and experience of foreign manufacturers could be availed of.

(c) Until an industry for the manufacture of prime-movers is firmly established in India, the manufacture of generators cannot be undertaken successfully without the co-operation of Government.

(d) The prospects of establishing a heavy switchgear industry in India are not practical at present without Government help. Practical consideration would limit the manufacture of switchgears to simpler forms of switches and starting equipment for small and medium size alternating current electric motors of standard types.

(e) The best location for an industry manufacturing electric motors and transformers would be in an area within daily reach of a city like Bombay.

(f) The question of the establishment of new factories for production of dry cells may be further examined.

(g) There will be no room for an immediate expansion of the secondary batteries' industry. Government should, however, favourably consider the grant of protection to this industry, if they are satisfied, that it has achieved a reasonably efficient standard.

(h) With the early establishment of the Electric Grid System, there would be room for the establishment of one or more factories producing 1½ million to 3 million bulbs a year. However, the industry must lessen its reliance on foreign supplies of raw materials and component parts.

(i) There is room for the establishment in the Province of one or more factories producing about 5,000 table fans per annum.

(j) Government should take active steps for the establishment in the Province, under private ownership, or with Government participation, of factories manufacturing electric motors, transformers, generators, switchgears and other electrical accessories and appliances.

## CHAPTER VII.

## THE COTTON TEXTILE MACHINERY INDUSTRY.

79. It is a disappointing feature of Indian industrialisation that India, one of the largest producers of cotton textiles in the world, does not possess even a semblance of a Cotton Textile Machinery Industry. One would expect that a country operating nearly 205,000 looms and 10,300,000 spindles would at least contain the manufacture of some types of simple cotton textile machinery. But, this is not the case. What the country possesses is a few workshops, scattered here and there, manufacturing, on an insignificant scale, simple types of cotton textile machinery mostly of outdated and discarded designs. Even in this, the development is so scanty that the attempts do not amount to even the scratching of the ground. For all intents and purposes, we may state that before the War 99 per cent. of our requirements of cotton textile machinery were obtained from foreign countries. In 1938-39, the value of imports amounted to about Rs. 2,67,00,000 of which the U. K. supplied nearly Rs. 1,96,00,000. In 1937-38 our imports were higher amounting to nearly Rs. 2,92,00,000 of which the U.K. supplied about Rs. 2,37,00,000. In these figures the imports of spinning machinery amounted to as much as half of the total in both the years.

80. At a time when there is so much hunger for cloth, which has become today a prime necessity next to food, the necessity of increasing the manufacture of cloth, by expanding the manufacturing capacity of the Indian Cotton Textile Industry, has become more than ever. In this state of things, India, as one of the largest producers of cotton textiles, is bound to play a leading role. It is evident that for some time to come, India's productive capacity for cotton textile goods will have to be reserved for her own requirements which are indeed very huge.

31. The following are the principal types of Cotton Textile Machinery :—

(a) Textile Spinning Machinery comprising the following :—

- (i) Opening machinery,
- (ii) Carding and drawing machinery,
- (iii) Roving and spinning machinery,
- (iv) Winding, warping and twisting machinery,
- (v) Sizing machinery.

(b) Textile Weaving Machinery comprising the following :—

- (i) Plain hand looms,
- (ii) Plain power looms,
- (iii) Plain power looms with automatic bobbin changing motion,
- (iv) Dobbies, tappets, box looms, jacquards, etc.,
- (v) Heavy looms for curdroys, carpets, etc.

(c) Textile Finishing Machinery comprising the following :—

- (i) Bleaching machinery,
- (ii) Finishing machinery,
- (iii) Dyeing machinery,
- (iv) Printing machinery,
- (v) Mercerising, calendering machinery, etc.,
- (vi) Hot air drying machinery,
- (vii) Sizing machinery.

82. As far as we are aware, there is only one company in India which has been organised specially for the manufacture of cotton textile machinery. This is the Textile Machinery Corporation Ltd., Calcutta, which has set up two factories, one at Belgharria in Bengal and the other at Gwalior. The Bengal factory specialises in the manufacture of spinning machinery. The factory is manufacturing spindles and we are given to understand that it expects to turn out shortly spinning ring frames and complete spinning plants. The Gwalior factory is concentrating on the manufacture of looms which it is turning out at the rate of 100 units a month. In addition to these specialised concerns, there are a number of workshops and manufacturing establishments scattered in different parts of India which undertake, on a small scale, as a side line, the manufacture of various types of simple cotton textile machinery. Some of these produce complete simple machinery sections whilst others only repair or prepare a segment of a section for replacements. Of these the following are the most important concerns situated in Bombay Province :—

- (i) The Victoria Iron Works, Ahmedabad,
- (ii) The National Engineering Works, Ahmedabad,
- (iii) The Panchal Iron & Steel Works, Ahmedabad,
- (iv) Messrs. Cooper Engineering Ltd., Satara,
- (v) Messrs. Vasant Industrial & Engineering Works, Worli, Bombay,
- (vi) Garlick & Co., Haines Road, Bombay,
- (vii) The Acme Manufacturing Co. Ltd., Wadala, Bombay,
- (viii) The India Foundries Ltd., Bombay.

83. We now consider the extent of the manufacture in India of the various types of cotton textile machinery. In the Textile Spinning Machinery section, very little progress has been made upto now. There is no manufacture of any type of cotton spinning machinery except that quite recently some standard sizing cylinders and spinning frames have been manufactured in India by a few concerns. The most prominent amongst these is the India Foundries Ltd. of Bombay which manufactures sizing cylinders and the Acme Manufacturing Co. Ltd., and the Bengal factory of the Textile Machinery Corporation Ltd., which manufacture spinning frames.

In regard to the Textile Loom Machinery section there is quite a good village and small-scale manufacture of plain hand looms, large quantities of which are required in India for the cotton handloom industry. The manufacture of these simple looms is diversified in different handloom centres and is mainly carried on by artisans with local village help. Plain power looms are manufactured in India by the Gwalior factory of the Textile Machinery Corporation Ltd., and Messrs. Cooper Engineering Ltd., Satara. The annual approximate production of the Gwalior factory amounts to about 1,200 units. Coopers, who started the manufacture of looms in 1930 and are the pioneers in this line in India, manufacture about 600 looms per year. We are given to understand that plain power looms with automatic bobbin changing motion are not manufactured anywhere in India. It is, however, likely that some sections of these automatic looms are manufactured for replacement purposes but the activity is very insignificant. Tappets, box looms, jacquards, etc., are not manufactured in India and there is also no production of heavy looms. Small quantities of dobbies are, however, manufactured by Messrs. Cooper Engineering Ltd., Satara. Some heavy carpet looms are also manufactured by carpet weavers departmentally, for their own use, with the help of village artisans.

The Textile Finishing Machinery is comparatively the best developed. Textile Machinery Section, Of the six types of finishing machinery, the bleaching machinery section is the best developed. Next comes the dyeing machinery section whilst the mercerized calendering section is the least developed. Finishing machinery manufacture is mostly concentrated in Ahmedabad where the Victoria Iron Works, the National Engineering Works and the Panchal Iron & Steel Works are actively engaged in the production of various types of simple finishing machinery. In addition to these concerns Messrs. Vasant Industrial & Engineering Works, Bombay, also specialise in the manufacture of finishing machinery. All these finishing machinery manufacturers produce complete finishing plants like the bleaching plant, the printing plant, the dyeing plant, etc. The finishing machinery manufactured in India is of a good standard.

84. From the above, it will be observed how insignificant is the actual manufacture of cotton textile machinery in India. That this should be so in a well-developed engineering and manufacturing centre like Bombay Province is all the more striking. As already stated the pre-war average of the imports of cotton textile machinery amounted to about Rs. 2½ crores per annum. During the War, there was a fall in imports and the Indian cotton textile industry was particularly starved of replacement parts and new additions. Now that the War is over, Indian mills all of which have built up enormous reserves by ploughing profits back into business, are clamouring for replacements and most of them have matured plans of new additions to plant and machinery. Hitherto, our main supplier of cotton textile machinery has been the United Kingdom. Now the U.K. herself is facing the problem of the immediate necessity of modernising and reorganising the entire plant and structure of her own cotton textile industry, as it has been found to be far backward to the technical efficiency in cotton textile manufacture attained in the U.S.A. It is, therefore, expected that the U.K. will not be in a position to supply for some time to come, even a fair proportion of India's demands for textile plant and equipment as her hands are already full. No other country, except perhaps the U. S. A., will be in a position to fill the breach, as early as is desirable. Since American prices for cotton machinery are much higher than the U.K. prices and since dollars are not freely available, India will have to face a rapidly deteriorating position unless some positive steps to manufacture various types of textile machinery are taken as early as possible.

85. It is with a view to developing this manufacture in India that the following scheme is outlined. We have given our detailed attention to this matter and we are strongly of the opinion that suggestions made are capable of being elaborated and worked. Much as we would have liked to go into details, it was not quite possible, in view of the limited time at our disposal, and therefore, we have only touched the bare outlines of the scheme laying down a broad general policy of development in the post-war period. The subject indeed warrants a more detailed attention and we leave it for the special consideration of entrepreneurs and Government. In this scheme we particularly stress the importance of the necessity of undertaking the manufacture of cotton textile machinery in the Province as there is really a considerable market for development.



To begin with, immediate steps should be taken to start, on a medium scale, the manufacture of modern simpler types of cotton textile machinery. In this respect, we recommend that two sets of textile machinery manufacturing plants should be immediately established one each at the main cotton textiles manufacturing centres of Bombay and Ahmedabad. Each set should consist of one spinning machinery manufacturing plant, one loom machinery manufacturing plant and one finishing machinery manufacturing plant. There is an absolute necessity of regionalising the manufacture of textile machinery into these two groups and then specialising the production into individual separate units which would concentrate on the production of one type of machinery only for best results. The organisation of the manufacture should be on a large scientific scale to avail of the economies of production.

86. We now consider the important factors that will effect the future success of this industry. There is perhaps no Indian industry which is so much wedded to the idea of purchasing foreign machinery than the cotton textile industry. Today, this is due to the fact that there is no cotton textile machinery manufacturing industry worth the name in India. It is, however, our strong belief that even if quality plant and machinery are manufactured in this country, there will be little change from this pronounced preference for a long time to come. The situation is, however, not so bad for there is decidedly a good long-term future if certain essentials are carefully followed. In the first place, more than anything else, prospective Indian textile machinery manufacturers should devote their detailed attention to the question of quality. The machinery to be produced should be, right from the beginning, of the best quality comparable in efficiency and modernity with the best available from any foreign country. This will involve a great deal of sacrifice in time and resources but it will pay handsomely in the long run. In our opinion, it would be to the decided advantage of the future of the industry, if manufacturers concentrate, in the beginning, on the production of a few types of simple latest machinery of the best quality. To achieve this quality, there will be a number of things required amongst which the most important factors will be the installation of the most up-to-date new plant and equipment, the technical "know how" to operate this plant and equipment, considerable research, accurate inspection and final tests. We are certain that if adequate attention is paid to quality, right from the beginning, the natural expansion of the industry would be smooth and the industry would be established on a sure footing.

87. The next important factor and the one that is intimately bound up with the question of quality is the necessity of obtaining the latest designs of the various types of cotton textile machinery. Today the world is thinking in terms of the highest technical efficiency and there would be nothing so harmful to the future Indian industry if it proceeds to manufacture cotton textile machinery based on outdated and discarded designs, which is generally the case today. This suggestion would require a high degree of collaboration with foreign manufacturers of textile machinery. We strongly recommend this collaboration to prospective machinery manufacturers as changes in designs, specifications and technical improvements are really very rapid. Even the U.K. cotton textile industry which is so much advanced as compared to the Indian industry, from the point of view of technical efficiency, has found how backward it is in relation to the American industry, which by incorporating all the latest technical developments is by far the best

equipped today. In this matter, we are strongly of the opinion that our future development in this line, as in all the others, should begin from Z, i.e. incorporate, from the initial stages all the latest technical features and, not proceed from A to Z i.e., from what we call a "primitive" stage to a more advanced one.

88. Once this industry is established on sound lines and is capable of manufacturing the various items of the latest cotton textile machinery of a quality comparable to foreign products, active Government assistance, to ensure the Indian market to the industry will be necessary. It would be premature to discuss the question of protection, but we think that some form of licencing, as has been recommended in the case of the imports of machine tools, would be the most suitable action. We recommend that only such cotton textile machinery and plant should be allowed to be imported into India as are not manufactured in India, in the right specification and of an approved quality. This scheme should be operated in consultation with consumers' interests and the price factor should be very carefully watched lest unfair advantage is taken by the industry of a closed market. We are strongly in favour of licencing of imports as we are sure that even if there are heavy protective duties, resulting in a wide price difference on imported machinery, Indian consumers will prefer to buy foreign equipment for a long time to come.

89. We would also recommend a considerable improvement in business methods and sales approach. It must be realised that textile machinery is a costly item and it is purchased by highly intelligent people to whom fairness in dealing and the purchase of the right type of machinery, absolutely alike to the sample or specifications given, is an important matter. The popularity and fame of the U.K. manufacturers is in no small measure due to these highly laudable business methods.

90. In the time to come, the cotton textile machinery industry if developed, with considerable despatch, in the Province, on the lines indicated above, will be assured of a ready market. From the point of view of future industrialisation, we strongly recommend the establishment of this industry at an early date. Out of 417 cotton textile mills in the country, as many as 209 are located in Bombay Province operating nearly 136,000 looms and 6,000,000 spindles which comes to well over more than half of the entire Indian manufacturing capacity. Even if we assume 15 per cent. as the pent-up replacement factor, which is really a very conservative estimate, we observe that for replacement only the Provincial demand alone would amount, in the near future, to about 20,000 looms and 900,000 spindles. Add to this the additions to the manufacturing capacity suggested by the Government of India by which it is proposed to raise the annual production of mill made cloth from 4,800 million yards to 6,500 million yards which is an increase of more than 35 per cent. The Post-War Planning Committee (Textiles), to which this suggestion was referred, has recommended, in its Preliminary Report, the installation of 2,750,000 additional new spindles to achieve the target figure. Of these it is recommended that 152,000 should be set up in Bombay Zone. Of the remaining, 650,000 spindles are, recommended for the C. P. and South Deficit Zones which would be natural markets for a cotton textile machinery industry established in the Province. What these replacements and additions will amount to in the value of new machinery and

plant can best be left to imagine. This is more so when it is considered that today, prices of even the U.K. cotton textile machinery are  $2\frac{1}{2}$  to 3 times more than the pre-war level. Unless something definite is done, millions of rupees worth of machinery will have to be obtained from abroad.

91. The industry is of vital importance to the Provincial economy. We are strongly of the opinion that Government should render all possible aid to parties interested in the possibilities of manufacture of various types of cotton textile machinery as proposed above. In the event of any comprehensive scheme not materialising, we recommend that Government should even actively interest themselves in the industry and enter this manufacturing field by allying with one of the large manufacturing houses and work this industry with foreign technical collaboration.

#### Summary of Main Recommendations.

(a) Immediate steps should be taken to start, on a medium scale, the manufacture of modern simpler types of cotton textile machinery. We recommend that two sets of textile machinery manufacturing plants should be immediately established one each at the main cotton textile manufacturing centres of Bombay and Ahmedabad.

(b) The machinery produced should be of the best quality comparable in efficiency and modernity with the best available from any foreign country.

(c) The industry should obtain the latest designs of the various types of cotton textile machinery which are to be manufactured.

(d) If this industry is established, we recommend that only such cotton textile machinery and plant should be allowed to be imported into India, as are not manufactured in India, in the right specifications and of an approved quality.

(e) We recommend a considerable improvement in business methods and sales approach.

(f) Government should render all possible aids to parties interested in the possibilities of manufacture of various types of cotton textile machinery. Government should even actively interest themselves in the industry and enter this manufacturing field if a comprehensive scheme of manufacture by private enterprise fails to materialise.

## CHAPTER VIII.

## THE STEEL SAFES CABINETS, ETC. MANUFACTURING INDUSTRY.

92. The origin of this industry dates from the late nineties of the last century, when enterprising blacksmiths all over India and particularly in the Provinces of Bombay, Puniab and Madras, undertook the manufacture of some kinds of safes. With the passage of time, well-organised firms entered this manufacturing field. Newer and better processes of manufacture were evolved and the variety of products produced was widely extended with the result that today the industry not only manufactures highly specialised safes but also produces strong doors, strong rooms, steel cabinets, office furniture, hospital furniture, tubular furniture and a host of other steel products and equipment.

93. Before 1920, India imported large quantities of safes, strong doors and hospital furniture. In addition there were infrequent imports of office equipment like filing cabinets, steel tables and other steel furniture. After 1920, the import of safes and strong doors practically ceased as Indian manufacturers were able to turn out products comparable with the best made anywhere else in the world. However, imports of steel shelves, filing cabinets, steel tables, etc., continued to increase in the early part of the third decade of this century. Indian manufacturers were not slow to tackle this demand and entered the field successfully meeting the whole of the demand and even creating a new demand for steel office equipment. In regard to steel household wardrobes, Indian manufacturers were the first in the world to produce these products as they were even unknown in the West. Before the War, India imported small quantities of tubular furniture as the demand for these products was not large. Large quantities of hospital furniture were also imported into India for a long time until some Indian manufacturers undertook the large scale manufacture of these items after which the imports diminished.

94. The history of this industry is the history of the well-known Bombay firm of Messrs. Godrej & Boyce Mfg. Co., who are the pioneers in this line, having to their credit important improvements and patents. As will be seen later, Godrej & Boyce claim such a preponderant share in the Indian industry that the best study of this industry would be a study of the progress of this firm.

Today this industry is mainly concentrated at Bombay, Calcutta, Madras, Cawnpore, Gujranwala and in the Hyderabad State. The distribution of the industry is as follows:—

Bombay City and Province	...	One very large establishment, viz. Messrs. Godrej & Boyce Mfg. Co. One medium scale unit, viz. the Noble Steel Products Ltd., and about 12 other small establishments each employing from 6 to 50 workmen.
Calcutta City	...	One medium scale unit, viz. the Steel Products Ltd., one small scale unit viz. the Runoo Steel Furniture Co. Ltd., and about 8 other small establishments.

Madras City.	...	One medium scale unit, viz. the Ajax Steel Works Ltd., and about 6 other small establishments.
Cawnpore City	...	One small scale unit, viz. the Bhatia Safe Works Ltd.
Gujranwala District	...	About 24 small establishments, each employing from 8 to 30 workmen.
Hyderabad State	...	One medium scale unit, viz. the Allwyn Steel Works Ltd.

95. Messrs. Godrej & Boyce Mfg. Co. Ltd., is the largest single unit in the whole of India manufacturing nearly 80 per cent. of the total Indian production of these steel products. From the point of view of the value of the products manufactured, it is estimated that out of the total production in India amounting to nearly Rs. 1,25,00,000, Godrej & Boyce contribute as much as Rs. 1,00,00,000 and the rest is supplied by the other half a dozen medium-scale units and about 40 small concerns. The main markets of the products manufactured by Godrej & Boyce are the Provinces of Bombay and Bengal, which take up 45 per cent. and 35 per cent. respectively and the rest is marketed in other parts of India. In regard to the production in the Province, the approximate share of Godrej & Boyce amounts to more than 90 per cent., the share of Noble Steel is about 4 per cent. and the remainder is supplied by the small-sized firms. We now consider some of the most important items of steel products manufactured in the Province.

96. *Steel Safes.*—The early technology of the manufacture of safes was that separate pieces of mild steel plates were joined together by means of angle iron to form the body. Until 1903, these safes, with very slight improvements, continued to be made in India by artisans in small quantities. By that time Godrej and Boyce, who had a small workshop in Bombay city, entered the field and employed a few traditional blacksmiths from Gujarať and skilled locksmiths from Malabar to manufacture safes and internal locks respectively. Continued improvements were effected in the manufacture and this was followed by increasing concentration being paid to the manufacture of fire-proof safes. At the same time the safe manufacturing industry made increasing use of special steels, such as drill and hammer resisting steels, etc., which made vital safe-parts impervious to attacks by electric drills hammers and even oxy-acetylene cutting flames. Today, safes are manufactured broadly in two classes, fire-resisting and non-fire-resisting. The quality of the safes depends as much on the thickness and types of steel used as in the design and the workmanship.

97. *Strong Doors.*—In the late nineties doors of steel plates were manufactured in India by village blacksmiths. With the establishment in India of a number of modern banking firms, the use of strong doors became increasingly prevalent. As the Indian industry was manufacturing strong doors of crude designs, the newly established banks obtained most of their requirements from foreign countries. Here again, Godrej & Boyce were the first to enter the line and led the manufacture of high quality massive vault doors weighing over eight tons, which were proof against all modern forms of attack by electric drills, oxy-acetylene cutting flames, etc.

98. *Strong Rooms.*—Until very lately small-size strong rooms were manufactured in India from steel plates joined together by means of angle iron. When big vaults and safe deposits were established in India, it was

found that these strong rooms were generally not quite suitable. Once again, Godrej & Boyce led in improvements and designed a novel type of strong room. With the use of special types of steel and other metals, these strong rooms and vaults are now as secure against all modern forms of attack as the best of safes and strong rooms made anywhere else in the world.

99. *Steel Cabinets and Almirahs.*—Uptil 1910, a steel safe was the only means of security for the deposit of valuables and cash. As the cost of these safes with a small storage capacity was beyond the means of a large number of people, Godrej & Boyce patented a new type of steel cabinet which gave the desired security at a comparatively low cost. These cabinets enjoyed many of the safety devices of the safe and also allowed a large storage space of an ordinary household cupboard. Gradually a variety of improvements was introduced in the manufacture of these cabinets, etc. In this line, the question of providing absolute protection against dust and vermin has engaged closely the attention of important manufacturers. Some manufacturers have done a great deal of research to make their cabinets, etc. completely inaccessible to dust and vermin from outside.

100. *Office Furniture.*—Coupled with these developments began the manufacture of office almirahs and other miscellaneous office furniture like record racks, filing cabinets; steel chairs, steel tables, revolving chairs, card index cabinets, letter racks, waste paper baskets, etc. The result was that today all the paraphernalia of a modern office could be supplied completely in steel.

101. *Hospital Furniture.*—In the first decade of this century a few types of hospital furniture began to be manufactured in India. After 1930, Godrej & Boyce undertook the construction of hospital furniture on modern lines. Today India manufactures, a variety of hospital furniture consisting mostly of hospital beds, fowler-position beds, cardiac beds, operation tables, ophthalmic chairs, X-ray cabinets, surgical trolleys, surgical cabinets, instrument tables, bedside lockers, bed screens, blood-transfusion stands, etc.

102. *Tubular Furniture.*—The latest development in the manufacture of steel furniture is the production of tubular furniture, both enamelled and chromium-plated, for household use.

The main items manufactured consist of sofa sets, centre pieces, tables, settees, dining tables and chairs, sideboards, dinner wagons, tea trolleys, etc.

103. The basic raw materials utilised in the manufacture of all these types of steel equipment is steel, which is generally required in the form of M. S. plates, stainless steels sheets and rounds, hard and soft compo steel, M. S. angles, flats, squares, rounds, channels, etc. The industry also requires a large number of hinges, nuts, black and galvanised wires, rivets, etc. There are also required a number of chemicals and other metals and miscellaneous materials such as zinc and lead paints, oil-bound enamels, gun metal and nickel-silver ingots, copper and brass ingots and sheets, springs and tubes, fire proofing materials, etc., etc.

Now that the War is over and the industry is open to competition from imported steel furniture and equipment, the industry desires facilities for the imports of special types of paints and enamels, some steel products, brass, gun-metal and nickel-silver ingots, rubber tubings, steel and brass tubes, machine screws and rivets, etc., as most of these items are not available in

the country and as the cost of the imported articles is much cheaper than the cost of the materials available in India. Thus we are given to understand that whereas foreign manufacturers are able to obtain their requirements of gun-metal and nickel-silver ingots at about Rs. 42 and Rs. 54 per cwt., respectively, the prices paid for gun-metal and nickel-silver ingots available in India are about Rs. 98. Then, there are the shortages in the supplies of raw materials. We are given to understand that the industry finds it difficult to obtain sufficient quantities of steel, non-ferrous metals and other raw materials as a result of which it is unable to undertake all-out production for which there is a large need today. We recommend that Government should take immediate steps to procure for the industry all the industrial raw materials described above, and also facilitate the imports of such items as cold-rolled mild steel sheets, synthetic glossy paints and specialised machine tools which are available only from the U. S. A., at prices comparable to those paid for these items by foreign manufacturers. We also recommend the complete removal of restrictions in the grant of licences for the imports of such machine tools and raw materials required by the industry as are not manufactured in India. We are also of the opinion that the industry as a whole would benefit if custom duties levied on the imports of raw materials required by the industry are, at least in the initial period, either completely abolished or reduced to a bare minimum.

If the measures advocated here are taken, the industry will not only meet successfully the entire demand in India for these products but also cater to a large export market in countries bordering the Indian Ocean littoral like Ceylon, Burma, Malaya States, Iran, Iraq, Palestine, etc., and even further afield to Indo-China, South China and Afghanistan.

104. We are not aware of the post-war plans of the Indian or the Provincial industry. We are, however, given figures of the annual production Messrs. Godrej & Boyce plan to attain within five years commencing from 1st January, 1946, provided they are enabled by suitable facilities to obtain plant and machinery and raw materials. As this firm claims a preponderant share in the total Indian and Provincial production, we are of the opinion that an approximate idea of the future plans of the industry will be contained by studying the figures supplied to us by this firm which are as follows:—

Products.	Approximate annual Production in units.
Locks	6,00,000
Shelving Racks	2,00,000 R.Ft.
Beds (Hospital, Household, etc.)	1,00,000
Hospital, Home and Office Furniture	40,000
Almirahs, Cabinets & Office Cupboards	30,000
Filing Cabinets	25,000
Coffers	15,000
Cash Boxes	15,000
Safes	7,500
Safe Deposit Lockers Cabinets and Strong Doors.	2,000

We are given to understand that they plan to move their entire factory to the suburbs of Bombay, where a very large plot of land has already been purchased. We are also given to understand that the Company plans to put up assembly plants at Calcutta, Madras, and Delhi.

105. Considering the activities of the other Provincial manufacturers, we observe that all of them with the exception of the Noble Steel Products Ltd., suffer from a complete inadequacy of up-to-date plant and equipment. The processing of steel, which is an important manufacturing process in this industry, is done by these concerns in such a crude manner, for lack of equipment, that the quality of products is comparatively not good. These manufacturers also suffer from lack of technical knowledge, which keeps them constantly backward. Further, in-sufficiency of capital prevents these concerns from effecting the necessary improvements. As a consequence of these factors and also due to the small quantities of products turned out by each company the costs of production of most of these concerns are higher than those of better equipped concerns. During the War, on account of the large demands in India, these concerns were able to market their products at higher prices than those charged by Godrej & Boyce, whose prices were pegged by Government. These manufacturers are sure to meet with strong competition in the post-war period, once normal conditions in the Indian market are restored. We therefore, strongly recommend them to improve their processes of manufacture. We recommend that Government should render them whatever assistance they require to achieve this and particularly help them in the procurement of raw materials at fair prices and in the imports of plant and equipment and also, give them technical guidance.

#### Summary of Main Recommendations.

(a) Government should take immediate steps to procure for the industry all its requirements of industrial raw materials and also facilitate the imports of such raw materials and machinery as are not available in India at prices comparable to those paid for these items by foreign manufacturers.

(b) The industry would benefit if custom duties levied on the imports of raw materials required by the industry are, at least in the initial period, either completely abolished or reduced to a bare minimum.

(c) All Provincial manufacturers with the exception of Messrs. Godrej & Boyce Mfg. Co., and the Noble Steel Products, Ltd., are strongly advised to improve their processes of manufacture to withstand competition. Government should render these concerns whatever assistance they require to achieve this and particularly help them in the procurement of raw materials at fair prices and in the imports of plant and equipment and also give them technical guidance.



## CHAPTER IX.

## THE BICYCLE INDUSTRY

106. In spite of a natural need for a cheap mode of transport, the bicycle manufacturing industry was conspicuous by its complete absence until the beginning of the War when three firms undertook the manufacture of cycles in India on a large scale. Before the War, the entire demands of the country were satisfied by imports. In 1938-39, the number of cycles imported either entire or in sections amounted to about 138,000 units valued at about Rs. 48,20,000. Of these imports, the U. K. supplied about 136,800 units valued at Rs. 47,89,000. In addition, the value of imports of parts of cycles and accessories, excluding rubber tyres, aggregated at Rs. 47,89,000, of which the U. K. supplied parts etc. worth Rs. 28,53,000.

The India Cycle Mfg. Co. Ltd., which is the smallest of the three concerns, was established in 1938 at Calcutta. The Company manufactures cycles, cycle components and accessories. The Hindustan Bicycle Manufacturing and Industrial Corporation Ltd. was established in 1939 with its works situated at Patna. The Company was fortunate in receiving all its up-to-date equipment from abroad just before the outbreak of the War with the result that it was able to turn out its first cycle in 1940. The Company is well equipped for the production of complete cycles with an annual capacity of about 60,000 units which is capable of being increased to about 85,000 units with further additions to plant and equipment. The Company also manufactures spokes, nipples and tubings and also such accessories as bells, pumps, tool bags, oil cans, reflectors, stands, luggage carriers, etc.

107. The third company, viz., the Hind Cycles Ltd., which is the largest in India, is situated in Bombay city. The Company is managed by Messrs. Birla Bros. and was floated in the year 1939. In 1940, the Company commenced receiving from abroad the ordered plant and equipment and in the same year production started. The Company's production capacity is more than 70,000 cycles per annum. We are given to understand that in the first year of production, the Company manufactured nearly 2,400 cycles. The figure has risen gradually ever since then although the peak production capacity has not yet been reached. In addition to complete cycles the Company manufactures a number of bicycle spares.

108. The principal materials required for the manufacture of complete cycles are—

- Steel tubes,
- Bright finished M.S. bars,
- Cold beading wires,
- Cold rolled steel strips,
- Hot rolled steel strips and sheets,
- Double pickelled M.S. sheets,
- M.S. bars suitable for forging,
- M.S. sheets.

In addition to the above, the complete assembly of cycles requires the following ready parts and accessories :

- Free wheels,
- Steel balls,
- Chains,
- Rubber goods such as tyres, tubes, brakes, grips, etc.

We are given to understand that except for hot rolled steel strips and sheets, M.S. bars suitable for forging, M.S. sheets and rubber goods, all the other raw materials, ready parts and accessories are imported, principally from the U. K. and U. S. A. The manufacture of cycle also required a number of process materials like staining enamels, plating and polishing materials, brazing materials, hardening chemicals, etc., of which only a few of the plating and polishing materials are imported and the remainder are available in India. From the above, it appears that at the present moment the industry is largely dependent upon foreign imports for many important raw materials.

109. Considering the Provincial cycle industry, we find that Hind Cycles Ltd., which is the only concern in the Province, has achieved a fair measure of efficiency. The quality of the products turned out by this Company is generally dependent upon the availability of good quality raw materials. The Company is concentrating its attention on the production of all parts of Hind Cycles to British Standard Cycle Specifications, with the result that the parts are interchangeable and are capable of being fitted into any British standard cycles, such as Hercules, Raleigh, etc. At the same time any of the parts of these English models are capable of being fitted into the Hind model. Our investigations reveal that the Company's workshop at Worli is well equipped to undertake most of the specialised operations required in this type of manufacture. We are of the opinion that if the Company receives adequate encouragement and support from the Central and Provincial Governments, it is sure to play a very important part in the economy of the Province and of India.

110. To achieve this, however, a number of serious problems facing the industry need to be solved. The most important of these problems is the unavailability of raw materials, ready parts and accessories in sufficient quantity and quality. Release orders, import permits, priorities, and other formalities are all necessary to obtain the raw materials, ready parts and accessories, the major portion of which is imported. This results in considerable delay with loss in production. Then there is the question of high prices paid for these raw materials, ready parts and accessories. It is evident that as long as these are imported, the prices paid by Indian manufacturers are bound to be higher on account of freight and other charges, than the prices paid for by manufacturers in competing countries. The Provincial firm has submitted to us that nearly 40 per cent. of the parts, accessories etc. used in the manufacture of cycles is manufactured in India and the rest is imported. Inasmuch as duties and freight charges have to be borne on the balance of 60 per cent. of the materials, etc. used, which are imported, it is inevitable that the industry incurs higher costs of production. We are, therefore, of the opinion that if the industry is ever to compete successfully, at a later stage, with foreign cycles, it must lessen its reliance on imported raw materials, ready parts and accessories. In our opinion, this is such an important matter that it should engage the attention of the industry very closely. To reduce costs of production, we recommend that the industry should take positive steps to establish manufacturing facilities in the Province for the procurement of the raw materials, ready parts and accessories required in the assembly work. We admit that this will be a difficult problem and will involve a large expenditure, but this is, in our opinion, the only way by which costs could be reduced to give competitive strength to the industry with a view to establishing it on a sure economic

basis. We also suggest modifications in the designs and manufacturing technique wherever compatible, of the cycles manufactured with a view to making the maximum employment of the raw materials available in India.

The industry suffers from another serious disadvantage. As organised at present each of the three Indian manufacturing concerns produces practically all the parts required in the assembly work. We observe that there is no specialisation at all in the manufacture of the large number of parts, as is done in all the important foreign cycle producing industries, with the consequence that costs of production tend to be higher in India. We realise that in view of the present limited output, it would not be economically possible to specialise the manufacture of all these parts and accessories by setting up other semi-manufacturing units. The problem could be, however, solved by decentralising the manufacture of a few of the simpler parts and accessories which could be undertaken by small manufacturing units equipped with not too costly plant and equipment. This will leave these three establishments to undertake the manufacture of only those parts, etc., for which they are adequately equipped. If the industry makes a conscious effort to implement these proposals, we recommend that Government should render them all the assistance required to carry out the scheme with despatch.

111. In regard to Government participation we are of the opinion that the industry would best develop on the private enterprise basis as organised at present. There is, however, an urgent necessity of the Provincial and Central Governments rendering all assistance required to develop the industry on right lines. We have already referred to the desirability of immediate Government aid in the procurement of raw materials, parts and accessories. In addition to this, Government would be required, as in the case of many other industries, to grant facilities for imports from abroad of plant and machinery like Multiple Spindle Automats, Single Purpose Machines, Presses, Tube Rolling Machines, etc., which the industry needs and which are not manufactured in India. This is a very pressing matter and the industry would not be able to achieve all its production plans if Government assistance is not forthcoming. In view of the commencement of imports of completed bicycles from abroad, we feel that this subject does not brook any delay and Government should take some immediate steps.

112. With the end of the War, the sheltered market which the Indian industry enjoyed till recently has opened its doors to foreign imports. This has perturbed Indian manufacturers a great deal because to compete effectively with foreign producers, at the present stage of their organisational development, they have either to operate at a loss and claim a share of the Indian market by low-priced sales or entirely go out of business by selling at a price higher than the price at which foreign cycles are sold in India. To make matters worse, Indian manufacturers have to contend with the vigorous export drive to which the U. K. which is the principal competitor, is committed. For some time to come, it is definite, that the U. K. will be the largest foreign competitor in the Indian market. Under the post-war plans adopted by the British cycle industry, it is expected that nearly

2,500,000 cycles of vastly improved materials and designs will be manufactured by the U.K. in the year 1946. The major portion of these cycles will be exported and India is one of the countries where large numbers are likely to be marketed.

On the basis of the average pre-war imports of cycles into India, which did not exceed 150,000 units per year for the years 1936-39, we estimate that, the post-war normal requirements of the country would be in the neighbourhood of about 300,000 units per year. This figure is indeed very small as compared to the size of the country and its requirements. It is not possible to conceive a larger demand unless of course there is a revolution in the purchasing power of the masses accompanied by large-scale rural development. As against this demand, the Indian industry, comprising the three cycle companies, confidently expects to produce nearly 85,000 units in 1946 rising to 125,000 units in 1947, and to 175,000 in 1948. If these production figures are achieved, the industry will, if enabled suitably by means of protection as recommended later, satisfy a gradually rising proportion of India's demand.

113. For an assured market the Provincial industry has asked for Government action for the quantitative restriction of imports of cycles from other countries to the extent of the demand supplied by the Indian industry. We recommend to Government the acceptance of this demand of the industry provided the machines produced by the industry are of an approved standard. Further, we are of the opinion that the industry's case for protection should be favourably considered. We admit that since the major portion of the raw materials, etc. are imported at present, the industry would not be able to satisfy one of the important conditions of the triple formula of Discriminating Protection, which is still in operation. In spite of this, we are strongly of the opinion that the Tariff Board, which is considering the case of the industry for protection, should give adequate consideration to the important nature of the industry and the vital part it will play in the Indian economy in the future. We urge upon Government the necessity of early action in the matter and state that time, especially now, is the very essence of the whole question and that delay is likely to damage the industry. In an industry of this nature mass production is absolutely vital for low costs and it is only when the industry is able to supply a large market by suitable protection, that its production will increase and costs will fall.

114. In regard to the future of the industry, we are of the opinion that there is room for expansion in the Province. We feel that if the Provincial company achieves its full production capacity of about 70,000 units per year, it will be a notable performance. But, as matters stand at present, it will be some time before this production figure is achieved. Instead of further increasing its production capacity, it would be advantageous if the company concentrates its attention on perfecting the specialised manufacturing technique which will stand it in good stead in the years to come. In our opinion, the greatest attention should be paid by the Company to the question of solving the excessive reliance on imports for supplies of vital raw materials without which we do not visualise any bright future prospects for the industry.

### Summary of Main Recommendations.

(a) If the industry is ever to compete successfully at a later stage with foreign cycles, it must lessen its reliance on imported raw materials, ready parts and accessories.

(b) The industry should take positive steps to establish manufacturing facilities in the Province for the procurement of raw materials, ready parts and accessories.

(c) We suggest modifications in the designs and the manufacturing technique, wherever compatible, of the cycles manufactured by the industry in order to make the maximum employment of the raw materials available in India.

(d) The manufacture of a few of the simpler parts and accessories should be de-centralised and the three Indian assembly plants should only undertake the manufacture of those parts, for which they are adequately equipped. If the Provincial firm carries out these proposals, Government should render it all the assistance required.

(e) Government would be required to grant facilities for the imports of specialised foreign plant and machinery required by the industry.

(f) We recommend to Government the industry's claim for the quantitative restriction of imports of cycles to the extent of the demand supplied by the Indian industry, provided the machines produced locally are of an approved standard.

(g) The industry's case for protection should be favourably considered by the Tariff Board.

(h) For the future, the Provincial firm should, as far as possible, concentrate on reducing its excessive reliance on imports for supplies of materials, etc. rather than go in for an expansion of production capacity.

(i) There is room for further expansion of the industry in the Province

## CHAPTER X.

## THE RADIO INDUSTRY.

115. About 50 years ago when Marconi demonstrated to the world the practical application of electric waves for communication between two points, till today, the period has witnessed glorious developments in the application of this science. Five years later, at the beginning of this century, the Atlantic Ocean was successfully spanned. The practical application of the science of radio communication was concentrated in the first few years towards aiding navigation and all the subsequent developments in this field till almost the end of the War of 1914-18 were mainly connected with the increasingly useful and efficient utilisation of this science for communication and for broadcasting purposes.

116. The development of the Radio Manufacturing Industry in any country in the world is intimately associated with the development of radio broadcasting and to a lesser degree of radio communications. Before considering the state of radio broadcasting and communications in India, we give below a few of the salient features of these developments in the U. S. A., which today leads in the world.

Radio broadcasting came into existence in the U. S. A. only after the end of the War of 1914-18 and, by 1921, organised broadcasting was firmly established. With the passage of time broadcasting took rapid strides with a bullish effect on the radio industry with the result that, by 1932, radios in America were mass produced and even better provisions were made for short-wave reception. Further, by this time Super-Heterodyne receivers replaced most of the previous types of receivers and the average price of radio sets in the U. S. A. came down to about \$120. Beginning from 1932, the number of broadcasting stations operating in the U. S. A. rose considerably. This once again gave a tremendous fillip to the radio industry and, by 1935, the U. S. radio industry manufactured 6,000,000 radio sets of various types valued at about \$300,000,000, and the average price was brought down to about \$50 a set.

Freedom of enterprise and private initiative have been mainly responsible for the various improvements and innovations that have made the progress of the industry in the U. S. A. so remarkable. It is of interest to note that radio broadcasting in America started as a commercial enterprise and still continues to be managed on that basis. A special and predominant feature of radio stations in America is that they are run like newspapers in that they sell their time for advertisements. In America, the most important source of income of broadcasting stations has been and still continues to be derived from the sales of broadcast time. It is estimated that, in 1934, the income derived from this source by all the broadcasting stations amounted to nearly \$43,000,000 and the figure for the period January-October of 1935, aggregated nearly \$40,000,000.

117. Broadcasting in India dates from the year 1926 when two low-powered broadcasting transmitters started functioning at Bombay and Ccutta. These transmitters were operating on a medium waves band and were intended to serve only a very limited area in and around these cities. This beginning in radio broadcasting was mainly sponsored by the Indian radio trade. Although, minor experiments were carried out before 1930 by educational and public institutions and a growing interest was being awakened in

broadcasting, private enterprises responsible for the establishment of the first broadcasting stations in India were not able to continue these early attempts without adequate support which was not readily forthcoming. As the revenue from licence fees, which was the only source of income, proved insufficient for even the upkeep and maintenance of the stations, the Indian Broadcasting Co., was liquidated and sold to the Government of India. During all these years, other countries were taking rapid strides in broadcasting with very favourable reactions on the radio industry. Thus, it is estimated that by the end of 1930, apart from America, the U. K. possessed nearly 3,400,000 radio sets, whilst in India there were in operation about 7,700 sets only. In the absence of suitable programmes for reception, little progress was achieved in India in the next 3 to 4 years, and only about 11,000 sets were imported in 1933. However, the inauguration of the B. B. C. Empire Broadcasts in 1934 created a very favourable reception on Indian listeners with the result that by 1935 the imports of radio sets increased to nearly 25,000 units per year.

118. The year 1935 may well be considered as the turning point in the history of broadcasting in India. It was during this year that the Government of India installed and operated short-wave transmitters of the All-India Radio at Delhi and subsequently in the Presidency capitals of Bombay, Calcutta, and Madras. From 1935 till 1939, the growth of broadcasting in India was rapid, although not striking as compared to western standards, and this was reflected in the imports of radio sets into India, which are given below:—

IMPORTS OF COMPLETE WIRELESS RECEIVERS.

From	Quantity in units.			Value in Rupees.		
	1936-37	1937-38	1938-39	1936-37	1937-38	1938-39
U.S.A. ...	15,303	15,032	11,860	13,71,170	12,25,340	10,30,754
Other Countries.	11,623	14,475	16,250	11,43,273	15,86,075	15,54,774
Total ...	26,926	29,567	28,110	25,17,442	28,11,415	25,85,528

With the outbreak of the War in 1939, and the increasing use to which radio was devoted for War propoganda and news, interest in broadcasting received a further stimulus. Listening interest in India reached a high peak with an all-round demand for more and more radio sets as a result of which the imports of wireless sets in 1939-40 rose to about 43,700 units valued at nearly Rs. 40,62,000. In the beginning of 1940, general import restrictions came into force in India.

119. In 1942, when the U. S. radio industry switched over to defence work, imports were completely cut off. This brought into the field a few Indian entrepreneurs who became actively interested in the manufacture of radio components and accessories and the assembly of radio sets and amplifiers in India. Government and Military departments declared their willingness to place orders with the Indian industry for the manufacture of such radio equipment and parts that could be manufactured or assembled in India. However, in view of the general reluctance shown by Indian businessmen to enter into untried manufacturing fields, efforts made in the manufacture and assembly of radio components and amplifiers were few and far between. The manufacture of certain spare parts and accessories was, however, undertaken and was far in advance of the assembly of radio sets. These activities

were mainly devoted to the manufacture of parts needed in the servicing of equipment. At the same time, during the War, a few firms also undertook the assembly and maintenance of communication receivers, transmitters, etc. required by Military and Government departments. This assembly work was undertaken on the strength of specific orders placed by these departments and there was practically no large-scale production of any of the above equipment for sale to civilian users.

120. Out of the few concerns engaged in this line in India, three firms, viz., the Asian Air Associates, the National Radio & Engineering Co., Ltd., and the Hindustan Radios are located in Bombay Province. Figures of production of these firms have not been given to us but it is known that the first two concerns were mainly engaged, during the War, on the repair and maintenance of signal and other miscellaneous equipment of the R.A.F. and R.I.A.F. and also of other defence establishments. The Hindustan Radios was mainly engaged in the production of various types of resistors and condensers. In 1943, a few more concerns were established in India to undertake radio manufacture of which two concerns are located in Bombay city. They are the Motwane Radio Manufacturing Co. Ltd., and the Transformer Corporation of India Ltd. Of these two concerns, the Motwane Radio Manufacturing Co. Ltd., plans to assemble radio sets in the country but has not yet started actual production. The Transformer Corporation of India Ltd. was mainly set up with the object of specialising in the manufacture of a specific item like the transformer instead of manufacturing all the components required by the radio industry. The Company has already commenced the production of transformers required by the radio trade which have been marketed throughout India. A recent development was the purchase of the Hindustan Radios, a department of the Hindustan Construction Co. Ltd., by the National Radio & Engineering Co. Ltd. The latter Company has now completed arrangements for the manufacture of radio components and the complete assembly of radio sets. We are given to understand that the Company's immediate plan is to assemble about 500 local reception sets per month, which would be sold initially at about Rs. 100 per set. The Company expects to bring down the price to Rs. 70 per set after some time.

It is a disappointing feature that none of these concerns has yet taken up the manufacture of radio components and the complete assembly of radio sets on any appreciable scale. The older established concerns generally lack the specialised equipment required for this manufacture, whereas the newer established concerns have not yet been able to obtain the equipment required in this industry.

121. Today radio broadcasting is acknowledged, throughout the world, as an excellent medium for education, entertainment, propaganda, advertisement and news. Although in India, a radio set is still considered to be an item of luxury and in many parts of the country an object of wonder, we confidently expect that within the next ten years a remarkable change in demand for radio sets will occur with the uplift of the masses and an improvement in their purchasing power, education and living standards. India is taking more and more interest in broadcasting for which facilities have been increased by the installation of additional transmitters. Indian States like Hyderabad, Mysore, and Travancore are already operating broadcasting stations. Other States like Baroda and Kashmere are expressing the keenest interest in broadcasting and are expected to establish, in the near future, broadcasting stations in their territories. That there is still left a vast field



for the extension of radio broadcasting in India, none will deny. Statistics illustrate that, at present, India possesses only 13 broadcasting stations which operate 26 transmitters in all. As against this, America, which has about 3/8ths of India's population, claims altogether about 1,400 regular broadcasting stations. In addition, there are in operation in India a number of transmitters, installed during the War, by the British and American armies. Now that the War is over, these transmitters must have been rendered surplus. We, therefore, recommend that the Government should, if possible, acquire them, as such equipment would prove very useful for broadcasting purposes in India and as it would not be readily available from foreign countries for some time.

122. A comparative table of the number of radio sets working in different countries of the world reveals still more strikingly the backwardness of the country in the matter of the "radio habit". The following are the figures of the radio sets in operation in some of the countries of the world:—

Country.	Population.	No. of radio sets.	No. of radio sets per 1,000 of population.
U.S.A.	142,000,000	60,000,000	423
U.K.	42,000,000	10,000,000	238
Sweden	6,600,000	1,550,700	235
U.S.S.R.	163,000,000	11,000,000	68
India	390,000,000	260,000	2/3rds of a set

(All the above figures are approximate and are the latest available).

Apart from the general state of backwardness of this country, the grinding poverty of its peoples and the absence of a large network of transmitters, there is one more factor responsible for the comparative absence of the "radio habit" in India. It is well known that the prices paid for radio sets in India by consumers are much too high, as compared to the retail prices in the U.K. and U.S.A. to be within the means of even the average lower middle-class, not to speak of the poorer masses who comprise 90 per cent. of the population of the country. Estimates have been prepared of the relation, before the War, of retail prices and per capita income in America and India which brings out this question in bold relief. The per capita income mentioned below relates to the pre-war period and is an approximate estimate:—

Country.	Per Capita Income.	Average retail price of radios.
	Rs.	Rs.
U.S.A.	... 2,000	55
India	... 65	165

This shows that the average Indian consumer has to spend nearly three times as much as the American consumer and when this difference is computed in terms of per capita income, a radio set in India costs to an Indian about 93 times more than to an American.

123. On a comparative study of the possible demands for radio sets in India, we conservatively estimate that even at the present high prices, the demand of the whole country, for sets of 5 valves and above, would be about 75,000 units per year between 1947-49. As this will be the period during which the large proportion of the pent-up demand will be satisfied, we estimate

that in the next three years, i.e. 1950-52, the demand will drop to about 50,000 units per year. By 1952, we expect that the post-war development schemes of the All-India Radio will have been completed. If this is so, we estimate that the demand for these high-powered sets may even go up to about 100,000 units per year by 1955. It should be understood that this demand is for multi-band 5 valve receivers only. In addition to the above, we are of the opinion that there will be a vast demand, in India, for low-powered local reception sets capable of "catching" local stations.

124. At this stage, we are unable to estimate the probable demand for these local reception sets if they are sold at low prices. We are given to understand that nearly 80 per cent. of the listeners in Bombay city are interested in the programmes served by the Bombay station of the All-India Radio. We are certain that if the market is developed properly, by selling units according to the requirements of the buyers, the demand for these sets would be quite large. We are of the opinion that if India is ever to become radio conscious, the masses must be provided with low-powered, single-band, medium wave receivers, which would efficiently "catch" the local station serving a particular area. It is the manufacture of this latter type of receivers that should immediately engage the attention of the industry. In our opinion, to make this scheme successful, there are three important considerations that must be fulfilled:—

(a) To make the industry achieve a fair measure of success, it is absolutely necessary that Government should carry out extensive electrification of the Province. The Electric Grid System, once it is completed, will fulfil this condition. However, until such time as electrification is conspicuous by its absence, battery sets would be the only solution in towns and village areas not served by electricity.

(b) The second important condition is that Government must link the Province by an extensive network of transmitters. In this matter, we suggest that important district towns and commercial centres like Poona, Ahmednagar, Belgaum, Surat and Ahmedabad should be linked by transmitters. To work this scheme, we recommend that the power of the Bombay station of the All-India Radio, which is ridiculously low, should be immediately raised to at least 100 KW and the transmitters recommended in the district towns, etc. should also be adequately powered.

Further, in the planning of programmes, a great deal of imagination and ingenuity is necessary. We emphatically state that the present quality of programmes and announcements is too hackneyed to suit the present tastes of the Province. In this connection we recommend Government to issue periodical Questionnaires which would give a true indication of the requirements and change in tastes of listeners.

(c) The third and most important factor is the necessity of selling radio receivers at an extremely low price. We have already examined the question of the comparative expensiveness of radio receivers in India. Today America is selling 5 and 6 valve multi-band receivers at an average price of \$25 i.e., about Rs. 85. We are of the opinion that if the Indian radio industry is to evoke a satisfactory public response, the Indian manufactured local reception sets should be made available in the market

at about Rs. 70 per unit, with replacement parts available at as low prices. We might state that to develop large sales, the industry would be well advised to consider the instalment payment plan, which would be ideally acceptable to consumers from the payment point of view.

125. With the execution of the Electric Grid system and the post-war development plans of the All-India Radio, there would be a vast field for this industry in the Province. We, therefore, strongly recommend the early establishment of the radio industry in the Province. We are of the opinion that the organisation of the industry should be on a mass production basis. We are also of the opinion that for the systematic development in the industry, it would be advisable to adopt the practice followed in the U.S.A. and U.K., where production is specialised by which each firm manufactures not more than a few types of radio components required in the assembly work resulting in economies in manufacture. Further, the entire industry should be organised with a view to manufacturing in the beginning not more than about 35,000 to 40,000 local reception sets, which should be sold, as already indicated, at an average price of about Rs. 70 per unit.

126. The following are the main component parts required in the assembly of radio sets:—

- Air core coils and transformers,
- Iron core R.F. coils and transformers,
- Iron core A.F. coils and transformers,
- Variable tuning condensers,
- Mica and paper condensers,
- Electrolytic condensers,
- Carbon and wire-wound resistances,
- Volume and tone controls,
- Loud speakers,
- Thermonic tubes,
- Valves and valve holders,
- Insulating sleeveings,
- Rubber washers,
- Coil shields.

As far as we are aware, facilities exist in the country for the manufacture of most of the above components except valves. In regard to the manufacture of valves, it appears that for some time to come, India will have to import this important component until a sufficient volume is created to undertake valve manufacture economically.

We now consider the important question of raw materials required by the industry. Most of the required raw materials are available within the country. We observe that facilities for the processing of these raw materials into radio component parts are either existing or could be easily developed by the firms already engaged in radio repair and maintenance work. The principal materials required in the manufacture of the above radio components are classified as follows:—

(a) Metals, alloys and allied materials such as copper, steel, iron, manganese, chromium, nickel, tin, phosphor bronze, stalloy, magnet steels, zinc, enreka, nichrome, manganese, lead, aluminium, copper, aluminium foil, boric acid and salts, brass, cadmium salts, thinner gauge wire, etc.

insulating materials, such as silk, cotton, rubber, insulating enamels, porcelain, mica, bakelite powder, etc.

(c) Low-loss H. F. insulating materials such as porcelain sealing compounds, bakelite moulding powder, etc.

(d) Other miscellaneous materials such as graphite, thin Kraft paper, litz wires, paper cones, carbon electrodes, rubber latex aquadag, etc.

Of these, we understand that the following are not at present produced anywhere in India but are capable of being produced with a little investigation. We note that investigations regarding the production of these materials have already been undertaken by the Board of Scientific and Industrial Research, by some of the firms interested in radio manufacture and also by the research departments of a few of the Indian Universities. These materials are :—

(a) Eureka, nichrome, manganine, stalloy and magnet steels.

(b) Insulating enamels and bakelite moulding powder.

(c) Low-loss porcelain (steatite, isolantite) and laminated insulating boards.

(d) Paper cones and aquadag.

Of the remaining materials, the following will have to be imported until special manufacturing facilities for their processing is developed in India. These are :—

(a) Thinner gauge wires (SWG 38 and above), tin and aluminium foil.

(b) Litz wires and thin kraft paper.

All the other raw materials are readily available within the country.

127. The question of the Indian radio industry associating with prominent foreign manufacturers has closely engaged our attention. Whilst we admit, that absolute Indian control over industry is necessary for the healthy growth of Indian industrialisation, the benefits resulting from rapid industrialisation calls for some sort of controlled foreign participation in the radio industry. We are, therefore, of the opinion that the co-operation of well-established foreign manufacturers, in this industry, is advisable. Such co-operation would enable the industry, right from the start, to draw upon the latest inventions and progress in manufacturing processes made by these foreign manufacturers without any experimenting involving large sums of money.

128. We now consider what should be the attitude of the Provincial Government towards this industry. We are of the opinion that the industry will not require any financial help from the Provincial Government. Considering the illuminating instances of other countries, we strongly favour the control of the industry by private enterprise. The industry would, however, require a considerable amount of help from the Provincial and Central Governments. In the first place, all the firms proposing the manufacture and assembly of radio components should be granted facilities by Government for the imports of plant and machinery. Although the supply of raw materials is expected to ease considerably, with the return of normal conditions, Government should closely watch the situation and make available to the industry, at low prices, all those materials available in India. In regard to components and materials which will have to be imported we recommend the substantial lowering of custom duties on all imported components required in the manufacture. Further, in the early stages of

development, the industry will require a highly trained supervisory staff. We recommend that Government should grant facilities for the training abroad, in foreign manufacturing establishments, of a few suitable technicians selected by the industry. As regards the grant of protection to the industry, we are of the opinion that if the industry sells its low-powered local reception sets at about Rs. 70 per unit, the present rate of custom duties will operate as a natural protection. It is, however, likely that in the beginning when these sets are marketed at about Rs. 100 per unit, there may be some competition and, therefore, we recommend that Government should closely watch the situation particularly in the early stages of development.

We now consider the most valuable aid which Government can render to the industry. It is estimated that Bombay Province contains approximately 20,500 villages. It is well known that the state of postal and road communications to most of these villages is in a very backward condition. Many a times, with the visitation of floods etc. some of these villages are cut off from the outside world. In normal times, these villages have no access to information of world or national importance except through newspapers which are delivered at infrequent intervals to the limited few literate villagers who can afford them. The important events in the country and in the world, the position relating to food supplies, weather forecasts, elementary commercial information, the various Government development schemes, etc. are all subjects on which these villagers are more or less completely in the dark. We understand that radio receivers have already been installed in a few of the villages of the Province. On a careful consideration of the entire matter, we strongly recommend to Government the widespread extension of this scheme by the installation of at least one pre-tuned single band 5-7 valve set in each village, preferably in a built-in enclosure, next to the house of the Patil. This will not only provide all the villages with the means of acquiring latest information, but will also serve badly-needed entertainment to the villagers. If this scheme is implemented, the local broadcasting stations would do well to improve the present special rural programmes which should be punctuated by instructive and interesting talks. When Government examines this recommendation in detail, it will be observed that this proposal would be an ideal means of communication, between centres of Government and all the areas of the Province, for the dissemination of Government propaganda on vital subjects affecting the Province and the nation. If this proposal is carried through, the Provincial industry would no doubt have an additional ready market for at least 5,000 to 6,000 high powered sets every year.

#### Summary of Main Recommendations.

(a) If India is to become radio conscious, the masses must be provided with low-powered, single band, medium wave receivers, which would efficiently "catch" the local stations serving a particular area.

(b) We recommend the early establishment of the radio industry in the Province manufacturing, in the beginning, low-powered local reception sets.

(c) To make the industry successful, Government must carry out extensive electrification of the Province and also link some of the important district and commercial towns by a net-work of adequately powered transmitters.

In this connection, Government should acquire, if possible, some of the transmitters installed, in India, during the War, by the defence forces.

(d) The power of the Bombay station of the AIR should be raised to at least 100 KW.

(e) To achieve success, the industry must sell these local reception radio sets at about Rs. 70 per unit.

(f) The organisation of the industry should be on a mass production basis. For systematic, economic, development, production should be specialised, by which each firm manufactures not more than a few types of radio components.

(g) The co-operation of foreign well-established, manufacturers is advisable.

(h) Government should grant facilities to the industry for the rapid imports of plant and machinery.

(i) Government should make available to the industry, at low prices, all those materials available in India.

(j) Government should lower custom duties substantially on components required to be imported.

(k) We recommend to Government the installation of pre-tuned, single band 5-7 valve set in each village in the Province.

## CHAPTER XI.

## THE REFRIGERATION (ELECTRICAL) INDUSTRY.

129. In country like India, the necessity and value of refrigeration, in its very many applications, require little elaboration. The vast extent of the land and the unfavourable climatic conditions over a very large area, make refrigeration and air-conditioning vital necessities for the preservation and transport of perishable foodstuffs and also for relief from the enervating climatic conditions. In recent years there is a marked tendency of the public, Indian railways, business corporations, food companies and Government offices resorting to refrigeration in all its many forms. In a not too distant time, one may expect in India the air-conditioning of most of the business houses, particularly those situated in the hotter regions together with the complete air-conditioning of higher class travel and a considerable addition in refrigerator rail cars for the transport of perishable foods.

In India the principal demand would be for household refrigerators which form the largest single part of the refrigeration business in any country. To give an idea as to what cheapness in cost and adequate purchasing power could do to this industry, we consider the recent development in the U. S. A. which is the home of the "ice-box" industry. When the War broke out, the sales curve of household refrigerators manufactured by the U. S. industry was in the ascendant. In 1941, which was the last year of all-out production, before the industry was converted to War time needs, the industry sold as many as 4,000,000 household refrigerators at a value of \$600,000,000. Now that the War is over, it is anticipated that for the first five years, the sales would be anything up to four million units each year levelling to 2,500,000 units after the pent-up demand is satisfied. In U. S. A., the household refrigerating units have secured such widespread consumer acceptance that they are now sold as a commodity. A new development incorporated for domestic use is the "Home Freezer" and it is confidently expected that, in the future, two refrigerators would be in common use in every household in U. S. A. To set up such a demand in India would require perhaps a century, but even if one-hundredth of the U. S. A. demand is witnessed in India, the industry would flourish.

130. The Refrigeration Industry may be divided into the following three principal groups:—

- (i) Household refrigerators;
- (ii) Commercial refrigerating equipment, and
- (iii) Air-conditioning.

There are numerous and varied commercial applications of refrigeration, the most important of which are as follows:—

(a) Foods refrigeration—preservation of perishable foods like fruits, vegetables, meat, fish, milk, butter, cheese, etc.; manufacture of ice and ice-cream; cooling of beverages, aerated waters, wines, etc.; and storage of vaccines, sera, injections, etc.

(b) Comfort conditioning—air-conditioning of offices, banks, restaurants, factories, hotels, theatres, auditoriums, private flats, rail coaches, etc.

The larger types of ice plants, as generally installed in ice manufacturing factories, have not been considered as they do not fall within the purview of this Report.

In addition to the above principal commercial applications, the following are a number of important manufacturing processes, in which refrigeration is extensively employed:—

(c) In the manufacture of confectionary products like chocolates, biscuits, hard-candy, gum drops, chewing gum, etc.

(d) In the manufacture of drugs, pharmaceuticals and films; in film laboratories, in enameling of metals and for cigar drying, etc.

(e) In the manufacture of scientific and ultra-delicate instruments and appliances, where a difference of a few degrees in the temperature may ruin products.

(f) Synthetic rubber plants cannot operate without modern air-conditioning.

(g) "Black-out" factories rely upon air-conditioning to maintain uniform atmospheric conditions.

(h) The War has opened up new possibilities for the employment of refrigeration in the industrial field. "Shrink fitting" which is the opposite of "expansion fitting" is now common. The part to be fitted is chilled to nearly 100° and then inserted at room temperature, so that when it warms up, it fits extremely well.

131. So far as is known, there is no factory in India either engaged in the manufacture or assembly of any type of refrigeration equipment with the result that the entire requirements of the country are satisfied by imports from abroad. For the five years ending with 31st March, 1942, the total imports of household refrigerators alone amounted to about 16,700 units at a total approximate landed value of Rs. 32,50,000, giving an average of 3,340 units per year at a landed value of Rs. 10,50,000. In addition to household refrigerators, India imported, during the same period, air-conditioning and commercial refrigeration equipment valued at Rs. 50,00,000 approximately, giving an average of Rs. 10,00,000 per year. Although the past average consumption of refrigerators and refrigerating equipment in India has been very low, it is in regard to the future demands of the country, that serious attention should be paid towards the question of establishing the industry in India. The successful operation of a refrigeration factory would require a very large demand, otherwise costs of production would be disproportionately high. For some time to come, it is estimated that the demand in India may not exceed more than 5,000 to 7,000 household refrigerators and 1,000 units each of commercial refrigeration and air-conditioning installations. This demand is so insignificant that one refrigeration corporation in U. S. A., viz. The Frigidaire Corporation would supply the entire demand out of less than two days' production. It would be interesting to note that this Corporation, which perhaps leads in the refrigeration line, has an annual output of nearly 1,500,000 units of all kinds. This is of course quite natural in view of the excessively large demand for refrigeration equipment in U. S. A., where it is said that "there are more refrigerators than bath tubs". Unless, therefore, there is a revolution in living standards in this country backed by adequate purchasing power, the demand for a number of years may not be more than 10,000 units per year of all types. It is not possible to break this into Provincial requirements but roughly Bombay Province alone would require about 30 per cent. of the total demand.



The question, therefore, arises whether the establishment of a refrigeration factory in this country would be economical. If the total demand of the country is satisfied entirely by an Indian factory, then this industry could be established on a sound financial basis and much would, therefore, depend to what extent Government are prepared to grant protection to this industry. If for any reason it is not possible to obtain adequate protection, it is recommended that initially this industry be established as a subsidiary to an existing manufacturing industry to make the manufacture of equipment in small numbers economical. We feel that Government financing would not be required as the necessary capital should be forthcoming from industrialists. It may perhaps be considered advisable to obtain technical assistance from foreign countries, in view of the fact that the technical progress of this country has been retarded to a considerable degree as hitherto it has been principally a consumers' market of overseas goods rather than a self-supporting manufacturing one.

132. The following are the principal raw materials required by this industry which are available in India :—

- Pressed steel (for the manufacture of cabinets),
- Case hardened steel (for certain parts like crankshafts, etc.),
- Cast iron (for condensing unit bodies),
- Phosphor bronze (for bearings),
- Copper (for cooling coils),
- Aluminium (for other light-weight fittings).

Inasmuch as the country has abundant supplies of these metals, the industry would not have to depend on imports for a large proportion of its raw materials. There are, however, certain other items required in the manufacture of refrigeration equipment, which would have to be imported, for some time, until they are produced in this country. They are :—

(a) An essential item required in the manufacture of refrigerators is "Fused porcelain on steel". To the best of information available, no firm in India is manufacturing this item to the specifications required for refrigeration equipment and as such the industry would have to rely for some time on imports. It is absolutely essential, however, to establish and develop this industry simultaneously with the refrigeration industry as this particular type of porcelain lining has been adopted as a standard hygienic interior finish for domestic type refrigerators.

(b) There are no chemical works in India producing suitable refrigerants necessary for refrigeration. To be ideal the refrigerant should be non-toxic, non-inflammable and non-irritating. It should also be non-injurious to foods, flowers and fabrics. In addition, it should have a low boiling point, be non-corrosive and mix readily with oil. In the early stages of the manufacture of this equipment the industry mainly utilised methyl chloride and sulphur dioxide as the principal refrigerants out of the many types of refrigerants available. With the passage of time, the physical and chemical properties of these refrigerants were found unsuitable with the result that the industry gradually scrapped the use of these gases. The gas most prevalently used in the industry today is Freon-12 (Dichloro-difluoro-methane), and other refrigerants of this Freon Group with varying properties, which on account of their physical, chemical and thermodynamic properties combined with their many safety and non-hazardous factors have proved themselves to be remarkably ideal refrigerants. They

satisfy all the requirements of an ideal refrigerant mentioned earlier and in addition are odourless and stable. The result is that modern refrigeration equipment charged with Freon-12 has proved to be far more efficient than comparable equipment prior to the employment of this refrigerant. This gas will have to be imported. We understand that the Kinetic Chemical Corporation (U. S. A.) are the only producers of the gas in the world.

(c) In the refrigeration industry, adequate insulation is essential to maintain proper temperatures. None of the known suitable insulating materials are made in India. For example, cork board, which is an excellent insulating material is grown and produced mostly by Spain and Portugal whereas Kapok, Glass Wool and Dry Zero are products of U. S. A. For this item also, India will have to rely upon imports until suitable substitutes are manufactured. The manufacture of the latter types of insulating material should not, however, be difficult.

(d) Other items like fractional horse-power motors and compressors are capable of being manufactured in the country and some companies have already been established for the purpose.

In order that the country may be entirely self-sufficient, it is necessary that all allied products required in the refrigeration industry should be eventually produced or manufactured in this country. The Board of Scientific and Industrial Research should be in a position to lend valuable aid in this connection.

133. It would be difficult at this stage to indicate in what form or shape Government protection or assistance would be necessary to ensure progressive development of the industry. There is no doubt that such assistance would be necessary and that it would depend upon manufacturing details and difficulties to be surmounted when production has commenced and costs ascertained. We have already seen that, for the successful operation of this industry, certain types of raw materials will have to be imported. We are of the opinion that this reliance on imports should not debar the industry from claiming protection, as would be so, if the present Triple Formula of Discriminating Protection is applied. For some time to come, costs are bound to be high, and therefore, the industry would require a strong dose of protection to grow into "an adult". In addition, Government would be required to render all facilities for imports of plant and machinery, and also for the imports of chemicals, insulating materials and porcelain finishes, which should be allowed free of duties or at nominal rates of duties.

134. To secure economies of production and to keep the costs as low as possible, the best type of organisation for the industry would be large scale as in U. S. A., where the industry has been developed on the assembly line principle. In the absence of a sufficiently large market, this type of organisation would not be possible in India for many years. However, this fact should not deter the introduction of this industry as the scope for development is great, and if as recommended initially, it is introduced by a well established firm already engaged in the manufacturing line, it could be developed satisfactorily until it could independently operate economically.

As far as the location of the industry is concerned it is observed that the present state of the market in India makes it imperative for the industry to be located in large consuming cities like Bombay and Calcutta, which are likely to set up the largest demand. The very close proximity of markets would help to decrease transport rates. It is also necessary to develop the industry as far as possible in an area well served by electricity. From these and many other angles, Bombay suburbs would offer an ideal location within the Province.

#### Summary of Main Recommendations.

- (a) The refrigeration industry should be established as a subsidiary to an existing manufacturing industry.
- (b) The industry would require a strong dose of protection for development.
- (c) Government should render all facilities for imports of plant and machinery and also for imports of chemicals, insulating materials and porcelain finishes. Such imports should be free of duties or at nominal rates of duties.
- (d) The best type of organisation for the industry is large-scale.
- (e) The industry should be located in a large consuming centre like Bombay city.

## CHAPTER XII.

## THE SCIENTIFIC AND SURGICAL INSTRUMENT INDUSTRY.

135. The extensive development of the scientific and surgical instruments industry is largely dependent upon the material and cultural standards of a nation. A nation scientifically far advanced or a nation where public health and satisfactory living standards are matters of great importance is likely to set up a very extensive demand for the products of this industry. In the present state of scientific and public health development in India, the demand is consequently insignificant for any large scale manufacture and is mostly for simple types of instruments. But, there is no saying as to what the probable future demand will be in a country of the size of India, once all the vast development plans are successfully executed accompanied by equally vast improvements in living standards and substantial increases in expenditure on public health and scientific and industrial research.

136. As far as is known, there are about a dozen factories in India manufacturing surgical instruments of various types on medium and small scale bases. It is not possible to ascertain the total production of scientific and surgical instruments of all the Indian factories, but there is no doubt that as compared to the present demand in India, which is not much, the Indian production is not extensive. Before the War, the requirements of the country in the matter of specialised and high quality scientific and surgical instruments were mostly obtained from Germany, Japan, U. S. A. and U. K., the approximate import figures for the year 1938-39 being Rs. 18,50,000 and Rs. 12,40,000 respectively.

137. Considering the state of the industry in Bombay Province, it is observed that although there are a number of subsidiary manufacturers fabricating different kinds of glassware for laboratories such as Ampoules, Test Tubes, Distilling Apparatus, Condensers, etc. there are only two well-organised concerns which specialise in the manufacture of scientific glassware of good quality.

138. In regard to the scientific instruments industry, we observe that there is at present only one factory in the Province, which specialises in the manufacture of scientific instruments of good quality. This concern, which is known as the Laboratory Apparatus Works, is situated at Poona and is managed by the well-known Kaycee Industries Ltd. of Lahore. The range of Scientific Instruments manufactured is not extensive, the production consisting of simple types of Galvanometers, Pyrometers, Levels, Transits, Resistance Boxes, Bridges, Travelling Microscopes, Optical Benches, a few Surveying Instruments, Cathetometers, Spectrometers, etc. We are given to understand that the instruments produced are comparable in quality to foreign products. The Company undertakes considerable preliminary work before the design of any particular instrument is finalised for manufacturing purposes. At present the Company is actively engaged in experimental work on achromatic lenses for small telescopes and on simple achromatic objectives for microscopes. Experimental work is also being done for the production of high-sensitivity electrical instruments. In addition to this concern, there are also a number of small factories and workshops which undertake, on a small scale, the assembling of instruments made from components.

139. On the surgical instruments side, it is observed that there are altogether about six factories in the Province, all of which are situated in Bombay city. These are Messrs. E. Eyres & Co., Messrs. L. Lewis & Co., the National Surgical Works, Charing Cross Surgicals, Messrs. N. Powell & Co. and Messrs. Bhatia Surgical Works. Of these, only two concerns, viz. Messrs. E. Eyres & Co. and Messrs. N. Powell & Co., are fairly large and are moderately equipped for the manufacture of surgical instruments. The main output of the industry consists of Forceps of all types, Scissors, Scalpels, Operation Knives, Tourniquets, Obstetric Dental and Gynaecological Instruments, Retractors and a few types of Syringes. Some of these concerns are also successfully manufacturing various types of Hospital Furniture, mostly Hospital Beds of various types and designs and Instrument Cabinets, Instrument Tables, Dressing Trolleys, Stretchers, Chairs, etc. They are also manufacturing Auto-clips, Sterilising Equipment and special types of Eye Forceps and other Eye Instruments, which require the highest degree of skill and precision. In addition E. Eyres & Co. also specialise in the manufacture of Veterinary Instruments and appliances required by the general veterinary services. We are given to understand that the products of this concern find a ready market and are purchased by the Director of Veterinary Services, Bombay Province and also by the Veterinary Departments of other Provinces, studfarm owners, Veterinary doctors and others. With the general improvement in Veterinary Services in Bombay Province, the demand for these products is sure to increase. It is not possible to give figures of output and the value of production of these factories as production is scattered over a variety of products, the values of which are unobtainable.

140. The organisation of the industry is on a medium and small-scale basis, supported in the case of some of the factories by cutlery production which is undertaken as an ancillary line. The extent of the small-scale nature of the industry may be gauged from the value of the output of the largest manufacturer which does not exceed more than Rs. 3,00,000 per year. Although the general standard of the industry was initially poor in quality, workmanship and finish, much leeway has been made from the initial crude attempts and the industry is now on its way, by concentrated efforts, to being well-established, manufacturing some of the products to a really high standard.

141. Most of the important raw materials required by the industry, viz. carbon steel, mild steel, stainless steel, aluminium, brass, steel tubings, electro-plating materials, rods, etc., are available in the country. It is found necessary, however, to import small quantities of very high-quality steels required for the manufacture of a few high-precision instruments. For the successful stabilisation of the industry, it is necessary that indigenous producers should fabricate the exact types of steel required for the industry. This is indeed a serious matter and Government should pay attention to this question to make the industry independent of foreign sources for its raw materials. In times of War, there was perhaps a reason for not supplying the required types of steels but now there can be no justification. We are of the opinion that if manufacturers of these instruments were to make conscientious efforts to buy all their steels in India, if they are available in the right specifications, although they may be a little costly, then the industry will be entirely independent of imports for the supply of all the raw materials required by it. Apart from the supply of the right type of steels, there are legitimate complaints that the required raw materials which are under

Government control are not allotted in sufficient quantities and that there are inordinate delays in supplies. In addition to these raw materials, there are some specialised raw materials like plastics in sheets and rods, synthetic sapphire jewels, thin instrument and resistance wires, which are needed in the manufacture of scientific instruments of good quality. These are required in moderate quantities and are available mostly from countries outside the sterling area. As there are considerable difficulties in importing them, we recommend that Government should grant import licences for their purchase from non-sterling areas.

142. It is a lamentable feature that most of the plant and equipment employed is antiquated and unsuitable for the requirements of the industry. The manufacture of surgical and scientific instruments requires specialised machinery which is not manufactured in India today. In the absence of suitable plant and equipment, some of the manufacturers have been compelled to undertake minor processes by hand resulting in crude and slipshod work. It is inevitable, therefore, that there cannot be any degree of standardisation in the products manufactured. This is further aggravated by the complete absence of test houses or laboratories where instruments can be subjected to exhaustive tests under working conditions to ascertain their accuracy, quality and workmanship. In the present state of the industry, where the majority of manufacturers carry on their trade mostly on the cottage or small-scale basis, it is not possible for even a combination of them, let alone by one of them, to set up a well-equipped test house. The result is that consumers who are mainly of the scientific and medical professions, to whom accuracy is a question of life and death, have never regarded Indian instruments with respect and have resorted to their use largely under the stress of War, when foreign imports were cut off. On the other hand, foreign manufacturers have not only standardised their products but test them thoroughly before despatch. It is a welcome sign of the times that reputable manufacturers themselves have made a demand for standardisation and the establishment of a test house for inspection. In these circumstances, we recommend that a small test house should be set up by Government without delay for the purpose of assisting manufacturers in turning out standardised quality products.

143. A very important limiting factor in the development of the industry is the lack of technical knowledge and skilled workmen. As in many other specialised industries, so in this, the necessity of having trained workmen who know this specialised job is a pressing problem. In comparison with other Provinces, Bombay Province may pride itself in having a better class of trained workmen possessing fair technical knowledge and skill required for the manufacture of these instruments. But, we are of the opinion that more specialised and complicated types of surgical instruments could even be produced, if some technical guidance is made available to various manufacturers. In this matter, it would be very helpful, if a well qualified expert, who is acquainted with the latest technological advances, is appointed by Government as the head of the test house, which is proposed earlier, so that he may give the benefit of his knowledge and guidance to all manufacturers on payment of a small fee.

144. Considering the post-war plans of the scientific and surgical instruments industry in the Province, we are given to understand that practically all the companies are contemplating considerable extensions to their works and production capacities. Some of the concerns have very ambitious post-war plans, and one of them, viz., Messrs. L. Lewis & Co., is actually planning to manufacture a very large number of magnifying and optical lenses in the years to come. With that purpose in view, all of them are planning to import specialised plant and equipment from U. K., U. S. A. and Sweden. In these days of priorities and shipping scarcity, it will be absolutely necessary for Government to give them all facilities for facilitating imports of whatever new plant and equipment they require. All manufacturers have written to us to this effect and there is more than a convincing case for Government to assist them. The unnatural and man-made barrier of hard currency must be somehow broken, and manufacturers must be enabled to import their requirements of capital goods from whichever sources they deem best suited for their purpose.

145. For some time to come, if manufacturers made efforts to improve the quality of instruments with the assistance of Government, there will perhaps be no possibility of the industry suffering from lack of consumer demand. We are of the opinion that the demand for scientific and surgical instruments will continue to be large not only in this Province, but also in Sind, Madras, Central India, Central Provinces and in the Indian States falling within the territories of these Provinces. From the location point of view, Bombay city would be the best site for the industry. In addition, it is ideally situated for developing the export market to countries bordering the Indian ocean littoral. In point of fact, most of the manufacturers in the Province have informed us that they have actually received inquiries for their products from these countries and that they plan to start exporting their products in a small way to Burma, Ceylon, Africa, etc. once their post-war schemes fructify and normal trade with these countries is resumed. In this matter, also, if exports are controlled, Government should grant the industry not only a sufficient export quota but all facilities for exports in order to establish a foreign market for the instruments. It is, however, necessary for Government to control the quality of goods which are exported in order that the industry may not acquire a bad trade reputation in the export markets. But for all intents and purposes, the export market will not loom very large, for some time to come, in the calculation of marketing possibilities. As regards the home market, it is evident that with the general increase in industrial activity, with the establishment of a number of laboratories and technical institutes and with the general improvement in public health, the demand for scientific and surgical instruments is bound to increase substantially. From these points of view we feel that Bombay Province alone would be in a position to absorb, within the next five years, even three times the present total Provincial production of surgical and scientific instruments. Further, if the present production could be increased five-fold, the output will have a ready and assured market throughout the country leaving enough for exports.

146. To achieve this, however, there is an absolute necessity of increasing immediately the range and quantity of the manufacture of surgical and scientific instruments and in this matter, the State will be required to play a vital role rendering all the paternal care necessary for development. In this connection we feel that adequate tariff protection to the industry is really a very important matter. The industry satisfies practically all the requirements of the Triple Formula and there is perhaps no reason why tariff protection should not be granted at least in the manufacture of those products, in which a little inferiority in quality could be tolerated by both the scientific and medical professions. We realise that to shut off imports entirely would be to jeopardise scientific and medical activities, as some of the instruments produced in this country either lack precision or are totally unsuitable for the requirements of these professions. We, therefore, recommend that Government should examine the case for the grant of substantial protective duties on the imports of those scientific and surgical instruments, which are or could be manufactured in this country in sufficient numbers and are or would be comparable in quality and precision with imported products.

147. We have already stressed the necessity of the adequate training of labour, the provision of a Government Test House capable of giving technical guidance and the grant of facilities for the imports of plant and machinery. We now recommend that those manufacturers who wish to send abroad for training their own technicians, should be given not only transport priorities, but should be considered for the grant of Government scholarships for foreign training and Government should exercise their influence in placing these technicians in suitable manufacturing establishments abroad. In addition to the above, we recommend that it is absolutely necessary for Government to depute for training abroad two technicians already familiar with the local conditions of manufacture in this industry, who on their return, should be attached to the Department of Industries to give the industry the benefit of their training and guidance in its future development and expansion. Unless this is done, existing industries should not be expected to make any appreciable progress.

#### Summary of Main Recommendations.

- (a) Government should grant import licences for raw materials required by the industry, even if these are to be purchased from non-sterling areas.
- (b) A small test house should be set up by Government without delay for the purpose of assisting manufacturers in turning out standardised quality products.
- (c) Government should appoint a well qualified expert as the head of the proposed test house to give technical guidance to the industry.
- (d) Government should grant all facilities for the imports of new plant and equipment.
- (e) Bombay city would be the best site for the development of the industry.



(f) Government should grant the industry all facilities for exports to establish a foreign market.

(g) Government should control the quality of goods which are exported to foreign markets.

(h) The case for the grant of protection to those products of the industry, which are or could be manufactured in the country, in sufficient numbers, and are or would be comparable in quality and precision with imported products, should be considered by Government.

(i) Government should grant scholarships, for training abroad, to technicians selected by the industry.

(j) Government should depute for training abroad two technicians familiar with the local conditions of manufacture in this country, who, on their return, should be attached to the Department of Industries.

## CHAPTER XIII.

## THE AGRICULTURAL IMPLEMENTS INDUSTRY.

148. The types of agricultural implements used in this country are the ploughs, harrows, seed drills, sugarcane mills, chaff-cutters, moat wheels, buckscrapers and tractors. Of these, the plough is by far the most important whilst the tractor is the least used and is very rare.

149. In India, right from the beginning, the Agricultural Implements industry has paid the greatest attention to the manufacture of the iron plough. Due to the excessive sub-division and fragmentation of land, principally due to the Indian laws of succession, the lands of Indian cultivators have been reduced to such small holdings that it is economically not feasible to use any implement other than an animal-drawn plough for the purpose of cultivation. Until these lands are consolidated to form large economic holdings or the benefits of collectivised farming are introduced, we do not visualise any economic possibility of the large-scale use of mechanically worked tractors, harvesters, etc. Therefore, for a long time to come the bullock-drawn ploughs will continue to be the mainstay of Indian agriculture. The Indian agricultural implements manufacturing industry, which started about a quarter of a century ago, has judged rightly and today 90 per cent. of the agricultural implements produced in India are ploughs of all shapes and types to suit different Indian agricultural conditions. In this Report we have given our detailed attention to the possibilities of increasing the production of improved iron ploughs in India and putting them on the land for extensive use.

150. Since the commencement of this century, scattered attempts have been made in India to manufacture various types of agricultural implements, but due to some reason or the other, except for a few manufacturing concerns, these attempts have fizzled out. Today for all practical purposes, there are only two concerns in Bombay Province, viz. Messrs. Kirloskar Bros., Ltd., of Kirloskarwadi, and Messrs. Copper Engineering Ltd., of Satara, which manufacture agricultural implements, particularly the improved form of the iron plough, on a large organised scale.

The history of plough manufacture dates from the year 1905. Before this year, the ploughs in use in India were mainly wooden ploughs which were highly inefficient. In that year, a few iron ploughs were exhibited at the Agricultural Exhibition held at Bombay. The iron ploughs caught the imagination of the cultivators and by 1910 large numbers of these ploughs were produced and marketed by Kirloskars, who were the pioneers in this line. In 1922, Coopers entered this line and began the manufacture of ploughs on an extensive scale. The result is that today these are the only two organised concerns in the Province and even in India manufacturing ploughs and small quantities of other agricultural implements on a factory basis. In addition to these two Provincial concerns, there are a few other concerns in India manufacturing the improved form of the iron plough on a scientific small-scale basis. Further, there are some small unorganised units working in different parts of India undertaking this manufacture but the activity individually is not on an organised scientific basis. The industry is particularly extensive in the Punjab which supplies most of the requirements of that Province.

151. Although the manufacture of a plough is not a very difficult problem, it requires detailed study in a country like India. To begin with, the plough must be of such a nature that it can completely break and pulverise the soil burying weeds and manure, and thus prepare the land ready for cultivation. On account of the multiplicity of Indian soil conditions and differences in the physical bearing of the cultivators and cattle, the ploughs must be so designed and produced that they would be suitable for use in every different area. It is useless to market a plough which is either too heavy for the pulling power of cattle used and the directing force of the man behind it or is too light for the soil. Unless the problem is thoroughly studied, a plough suitable for use in one area may be altogether unsuitable for use in any other area where these conditions differ.

152. At the present moment, the two Provincial concerns are manufacturing a variety of ploughs ranging from the lightest to the heaviest. These ploughs are all bullock-drawn, and the tractor plough has not yet been taken in hand. We are given to understand that Kirloskars and Coopers are producing nearly 15 different types of iron ploughs to suit different soils and other agricultural conditions. In the very limited market in India for iron ploughs, the reasons for which are stated later on, we are given to understand that Kirloskars and Coopers supply about 80 per cent. of the requirements of the country, except in the Punjab, which, as stated above, obtains most of its requirements of iron ploughs locally. In addition to this supply, there is quite a large demand in the country for different types of unscientific iron ploughs which are manufactured in various parts of the country in small iron foundries by blacksmiths for the replacement of the indigenous wooden ploughs made by the village carpenters.

153. There are very few technical difficulties encountered by the plough manufacturers. The materials used are pure cast iron, mild and chrome steel rounds and flats, nuts bolts, rivets and wood. All these are readily available in the country at fair prices. Further, the industry does not require any foreign technical help as the principles and processes of manufacture are well known. At a later date, however, when tractor ploughs, harvesters and other types of heavy and complicated mechanical agricultural implements are manufactured, it may become necessary for some time to avail of foreign technical help.

154. Considering the future of this industry in the Province, we observe that there is an immediate necessity of widely extending the manufacture of iron ploughs. Today, it is estimated that the total number of ploughs in use in India is about 25,000,000 of which barely 1,000,000 are iron ploughs of various types. These figures show in bold relief the extremely uneconomic and inefficient nature of our agricultural economy. The position is made still worse when it is realised that 90 per cent. of the ploughs in use are mainly wooden ploughs and can hardly cut into a few inches of the ground as a consequence of which ploughing and tilling of the soil as they should be done, are practically non-existent. For all practical purposes, therefore, the major portion of our agricultural activity lacks even a good iron plough which is the basis of agricultural prosperity. Therefore, as a primary step, before the use of mechanised agricultural equipment, there is an absolute necessity of replacing wooden ploughs by improved iron ploughs. In the face of this, how to increase our food supply and work our agriculture economically becomes a stupendous problem. The need of the moment, therefore, is

ploughs, more ploughs and still more ploughs to be used widely and intensively to increase our food and commercial crops. To carry out this scheme, there are four important conditions which must be satisfied.

(a) The primary requisite for the widespread use of good iron ploughs is that they should be sold at reasonable prices within the economic means of the average farmer. If the makers of improved iron ploughs are not able to sell ploughs at prices which farmers are able to pay, we recommend that Government should formulate a scheme for assisting farmers in making these purchases. In our opinion such assistance would not be a radical departure from orthodox practice as Government are already subsidising the sales of manure and good quality seeds. The plough enjoys as much importance as these farm products, and there is no reason why Government should not adopt the same policy.

(b) Propaganda by the State is another important factor. In the present backward state of the farmers, no amount of persuasion and help freely given will make them concentrate on the use of good iron ploughs in preference to outdated wooden ploughs. The prejudice is so deep rooted that instances are to hand where even a good iron plough, after being used, has been discarded for the wooden plough. This is really a serious situation. Unless Government take an active interest in the matter by undertaking an extensive propaganda campaign by means of leaflets, lectures, practical demonstrations, etc., the Indian farmer will not change, for many years to come, his old method of using the inefficient wooden plough. The Agricultural Department of Government has carried on in the past a great deal of propaganda to popularise the use of iron ploughs. There is, however, a lot to be done still, particularly at the present moment. It is in the interest of the State to intensify this propaganda campaign. Therefore, in the interests of the national agricultural economy, we strongly recommend to Government to publicise the use of the improved iron plough as extensively as possible, and then follow up this campaign with repeat publicity to keep the advantages of this implement constantly in front of the eyes of farmers.

(c) Then there is the technical necessity of offering the most suitable plough for a particular set of agricultural conditions. We have already seen the conditions governing the design, weight and types of ploughs used in the country. It is necessary to ascertain the resistance of the different types of soils and the drawing capacity of the various types of cattle used. The manufacturer must bear in mind that the utility of the plough to a farmer will depend upon the way the soil, the climate and cattle respond to it. Therefore, all specifications and designs must give considerable importance to these three essentials.

(d) Lastly, there is the absolute necessity of reducing railway freight rates on the movement of iron ploughs in particular and on other agricultural implements. Speaking about this subject the Royal Commission on Agriculture remarked that "In order to overcome the difficulties of transporting such manufactures over the vast distances which one finds in India, we would suggest for the favourable consideration of railway authorities a re-examination of railway freight rates on agricultural implements and

machinery and the grant wherever possible of concessions." We strongly recommend that not only should railway freight rates be reduced particularly on the iron ploughs but, in the case of all agricultural implements and machinery transported to backward agricultural areas, the rate should be very nominal. At the same time, we recommend to Government the timely movement of agricultural implements so that they reach the farmers when most needed during particular seasons. At the present moment, agricultural implements do not enjoy any priority for railway movement. The result is that on account of congestion in railway booking, some of the implements reach farmers after the season for making use of the implements is over. This difficulty must be remedied immediately.

155. If these basic principles are put into force, there will open up a really worthwhile field for the extensive manufacture and sale of iron ploughs in the Province. We are unable to estimate the demand correctly, but we are sure that, in the beginning, it will be a number of times more than the present demand. We are of the opinion that there is a need for the establishment in the Province, of one or more factories specialised in the manufacture of improved iron ploughs. The proposed units should be on an upto-date modern basis. If this suggestion is adopted, there is bound to be a substantial reduction in prices of ploughs.

In this industry also, we do not advocate any Government participation. In regard to the organisation of the industry, we are strongly of the opinion that the manufacturing operations should be on a large-scale basis. It is the only way that costs of production will be low and it will be possible to sell ploughs at reasonable prices. In this connection, we recommend the installation of mechanised foundries which will be most economical to work due to lesser moulding time and lower handling charges.

156. Considering the development of the other categories of agricultural implements, we observe that for some time to come, the consumption of such implements as sugarcane mills, oil mills, chaff cutters, moat wheels, harrows, etc. will continue to be inconsiderable. In our opinion the manufacture, in the near future, of a variety of other implements should not be lost sight of. In this connection, we cannot adequately stress the particular importance of the tractor plough. A heavy and costly implement and difficult to operate, it is bound to be used in India on an extensive scale in the future. Where there are large compact areas of land, its use is really most economical and desirable. The probability of the manufacture of this equipment, in the Province, at no distant date, must be kept in mind. As this is, however, not a problem of immediate importance, we have thought it fit not to discuss it in detail here.

### Summary of Main Recommendations.

(a) There is an absolute necessity of replacing wooden ploughs by improved iron ploughs.

(b) Government should formulate a scheme for assisting farmers in purchasing improved iron ploughs if the industry is unable to sell them at low prices.

(c) We recommend to Government to publicise the advantages of improved iron ploughs as extensively as possible.

(d) All specifications and designs of ploughs must give considerable importance to the resistance of the different types of soils, the drawing capacity of the various types of cattle and the climate in which agricultural operations are to be carried on.

(e) We recommend that not only should railway freight rates on improved iron ploughs be reduced but that in the case of all agricultural implements and machinery transported to backward agricultural areas freight rates should be nominal.

(f) Government must ensure a timely movement of agricultural implements so that they reach farmers when most needed during particular seasons.

(g) There is a need for the establishment in the Province, of one or more factories, specialised in the manufacture of improved iron ploughs. The proposed units should be on an upto-date modern basis.

(h) Manufacturing operations should be on a large-scale basis and foundries should be mechanised to secure economies of production.

(i) The manufacture in the near future of a varieties of other agricultural implements, particularly the tractor plough, should be considered.

## CHAPTER XIV.

## THE WAGON BUILDING INDUSTRY.

157. India possesses over 40,000 miles of railroads. It is a peculiar feature of the Indian railroad system that except for some wagons, steel rails, fishplates, sleepers and a few other items which are manufactured in India, all the other requirements are imported. The most important amongst the imports are locomotives and in part wagons. In this note, we propose to consider only the wagon building industry.

158. Wagon building is a specialised process if it is to be undertaken for quality production. It involves both structural and mechanical processes but cannot be efficiently undertaken by a workshop containing facilities for either of these processes. It is a separate industry by itself and requires a special lay-out for quality manufacture. In a small way the Indian wagon building industry has been established in India for quite a long time. Practically all the larger railways possess, in their workshops, facilities for effecting minor repairs and for re-conditioning wagons, but they do not possess facilities for building wagons.

159. For all practical purposes there is only one firm in India specialising in the manufacture of wagons. This is the Indian Standard Wagon Co. Ltd., of Burnpore, which possesses facilities for the manufacture of all parts of wagons except wheels, axles, and some other important components. In addition to this firm, there are three other concerns, viz., Messrs. Jessop & Co. Ltd., Messrs. Bird & Co. Ltd., and Messrs. Braithwaite & Co. Ltd., which manufacture wagons. All these four concerns are situated in the Bengal area. Before the War, although the combined manufacturing capacity of these four firms amounted to about 6,000 wagons a year, production was half this figure on account of lack of orders which were generally placed outside the country.

As long as imports were possible there was no difficulty in importing from the U. K. such component parts as wheels, axles, journal boxes, buffer ends, etc., which were not manufactured in the country. The situation, however, deteriorated when in 1942 the industry was unable to import these parts from the U. K. Many attempts were made to manufacture these parts in India of which the efforts made to manufacture wheels and axles have been the most successful. The demands made by war requirements and the cessation of imports put on an increasing strain on the industry. We are given to understand that in 1942 an order for 10,000 wagons was placed on the entire industry for completion before the middle of 1944. It is estimated that by the due date the industry was able to supply only about 2,000 wagons. This was mainly due to the shortage in the supplies of important component parts particularly wheels and axles.

160. The following are the important materials, required in the construction of wagons:

Steel sections like structurals, bars, billets, rivets, spring steels, plates etc.

Wheels and axles,

Steel castings and forgings.

The supply of steel was controlled during the War. The industry was however, given a high priority for the purchase of all the steel items, most of which were manufactured in India, except rivets of the right quality. As imports of rivets were cut off the industry was put to great strain. Messrs. Guest, Keen, Williams Ltd., of Calcutta, undertook the manufacture of rivets, but the quantity required was large and the supply was insufficient. Now that the War is over the supply position has eased.

In 1942 Tatas laid down a wheel and axle plant next to their steel work for the manufacture of high quality wheels, tyres and axles, all of which were imported items. By 1944 the plant was in operation and was supplying to this industry a part of its requirements of wheels and axles. Tatas production is not large, and consequently a large quantity of wheels and axles has to be imported. In point of fact it appears that the principal bottleneck in the increased production of wagons in India is the inadequate supplies of wheels and axles. We are of the opinion that determined steps must be taken to increase the production of wheels and axles in this plant, not only with a view to lessening our reliance on imports but also making it possible to increase the production of wagons which are needed very badly in the country today.

The manufacture of steel castings and the undertaking of forging work have been already discussed by us. Steel castings are required for axle boxes, buffers, etc. Forgings are required for drawbar hooks, screw couplings, break gear, etc.

161. The need of the moment is increased production to supply the large demand for wagons in the country. In 1944 it was estimated that the industry manufactured about 5,000 wagons as against the then defence demand for 10,000 wagons. Since then, there has been quite a large increase in the demand for wagons in India. During the War the Indian railways' rolling stock was put to considerable strain with the transfer of large numbers of wagons to other theatres of war and due to increased service. Replacements and adequate repairs were hardly done. The post-war railroad reconstruction programme envisages the purchase of hundreds of new wagons. Unless something definite is done soon to increase the Indian production capacity, large numbers of wagons will be imported.

162. For quite a long time increasing attention is being paid by manufacturers, to the possibility of manufacturing wagons in such a large engineering and manufacturing centre like Bombay Province. A definite scheme, however, has not yet fructified. Considering all factors we are agreed that the building of wagons should be immediately undertaken in the Province. Practically all the materials excepting a few component parts are available in India thanks to the manufacturing facilities developed in the country under the stress of War.

163. In regard to the organisation of this industry we cannot think of anything but large-scale production for lower costs. The industry should either be worked by an entirely specialised factory or should be taken up by one of the large-scale general and structural engineering firms. The latter course would be the quicker and easily practical method of expansion particularly in these days of acute scarcity of new plant and equipment and other manufacturing facilities which would be required in a new factory. A new factory will be, on the other hand, the most efficient and will have its own advantages in production. These suggestions would obviously take quite a long time before they are worked out. That being the case, we consider that the quickest and



the best method of building wagons in the Province would be to organise the manufacture of various components and structural-parts in the existing general and structural engineering factories which should then be assembled in an entirely separate unit. This unit should either be owned by private enterprise if that is forthcoming, or by Government. We recommend Manmad Junction as the best suitable location for such an assembly unit served as it is by the broad gauge and meter gauge railway systems.

164. A major industry of this nature would evidently require a large measure of Government assistance. Until the supply position is normal, Government would be required if this industry is established in the Province, to make sure that the industry obtains all the raw materials at competitive prices. The vital nature of the industry will even require a lowering of the freight rates on materials railed from Calcutta to Bombay and also a substantial reduction in custom duties on imported materials and component parts. The acquisition of land on easy terms will be another factor in which Government help will be needed. The most important question will be Government guarantee to purchase all railway requirements of wagons from this industry without which the industry will be left with no market.

#### Summary of Main Recommendations.

(a) The building of wagons should immediately be undertaken in the Province.

(b) The manufacturing organisation should be on a large-scale basis for lower costs.

(c) The industry should either be worked by a specialised factory or should be taken up by one of the large-scale general and structural engineering firms with considerable alterations in lay-out to suit manufacturing requirements.

(d) We recommend that the quickest and the best method of building wagons would be to organise the manufacture of various components and structural engineering parts in the existing general and structural engineering factories which should then be assembled in an entirely separate unit. This unit should either be owned by private enterprise or by Government. We recommend Manmad Junction as the best suitable location for this assembling unit.

(e) If the industry is established in the Province, Government must make sure that it obtains all raw materials at competitive prices.

(f) Government guarantee to purchase all railway requirements of wagons from the industry will be necessary.

(g) The vital nature of the industry will require reduction in freight rates on materials railed from Calcutta to Bombay and in custom duties on imported materials and component parts.

## CHAPTER XV.

**THE STRUCTURAL ENGINEERING INDUSTRY.**

165. The Indian Structural Engineering Industry is very heavily concentrated in the Calcutta area with fairly large-scale activity in the Bombay area and medium-scale activity in the Karachi, Madras and the South Indian areas. The reason for the heavy concentration in the Calcutta area is the easy availability of the basic materials steel, coal, etc. There are altogether about 30 large-scale and medium-scale concerns in India undertaking various types of structural engineering work of which nearly 18 are located in Calcutta. The most important amongst these Calcutta concerns are,

Messrs. Braithwaite & Co., (India) Ltd.,  
 Messrs. Burn & Co., Ltd.,  
 Messrs. Arthur Butler & Co., (Muzzaferpore), Ltd.  
 Messrs. Jessop & Co., Ltd.,  
 Messrs. Martin & Co., (Structural),  
 Messrs. The Howrah Engineering Co.

The Karachi, Madras and South Indian areas have 4, 3 and 2 concerns respectively. In the Bombay area there are altogether five organised concerns all of which are located in Bombay city and which either specialise in or undertake structural engineering work as a side-line. These concerns are,

Messrs. Richardson & Cruddas,  
 Messrs. Alcock Ashdown & Co., Ltd.,  
 Messrs. Garlick & Co.,  
 The Structural Engineering Works Ltd.,  
 Hind Tank Manufacturing Co., Ltd.

The structural engineering activity of the Province is quite important as each of the first four firms carry on quite a good amount of structural engineering work, although collectively their work is less than that of the firms in the Calcutta area.

166. The Indian industry produces a great variety of structural products. These are,

Railway and road bridges,  
 Aeroplane hangers,  
 Steel frame structures,  
 Transmission towers,  
 Oil well derricks and tripods.  
 Welded steelwork.

Of the above, one of the most important activities taken up during the War was the construction of aeroplane hangers of a standardised design. It is estimated that, in 1944, 22,000 tons of hangars were built in India at a cost of nearly Rs. 60,00,000. Another war-time activity was the standardised fabrication of what are called the "unit construction huts" required for residential and storage purposes for the Defence forces, large numbers of which were supplied, and the construction of floating docks. During the War, a number of such docks were built in India of which five were constructed in the Bombay harbour by Messrs. Braithwaite, Burn, Jessop & Co., Ltd., of Calcutta, and by Messrs. Alcock Ashdown & Co., Ltd. Of these docks, two are supposed to be amongst the largest in the world.

All the remaining structural items are essentially the normal peace-time work of the industry. These items acquired considerable importance during

the War when large numbers were supplied for defence requirements. In peace-time, however, railway and road bridges, steel frame structures, transmission towers, steel cisterns and welded steel work were the most important items of manufacture. In this peace-time work, the industry consumed, before the War, annually about 60,000 tons of mild and high tensile steel, rivets, bolts, nuts, etc. The consumption during the War period must have been much larger as it is estimated that the construction of bridges alone required about 22,000 tons of steel valued at about Rs. 1,18,00,000.

167. Amongst the Provincial concerns, Messrs. Alcock Ashdown & Co., Ltd., Messrs. Richardson & Cruddas, Messrs. Garlick & Co. and the Structural Engineering Works, Ltd., are the largest works. We have been unable to estimate the quantity of total structural work undertaken by the Provincial industry in the pre-war and the war-periods as all concerns have not given us the necessary information. However, from the returns submitted by Messrs. Alcock Ashdown & Co., Ltd., Messrs. Richardson & Cruddas, and Messrs. Garlick & Co., it is observed that these three concerns produced annually about 13,000 tons of structural engineering work of all types in the pre-war period which increased to 20,000 tons per year during the War. If statistical data regarding the work undertaken by the other firms is available, this figure would be much higher. The main types of work undertaken are steel frames for construction purposes, oil and water tanks, bridges and flat bottom steel boats and pontoons.

168. All the big Provincial structural engineering works possess special structural fabricating machines like punch and croppers, splitting guillotine sheers, angle and joint straighteners, high speed radial drills, pneumatic and hydraulic rivetting machines, hydraulic presses, electric arc-welding machines, etc. The principal raw materials required by the industry are mild and high tensile steel sections, iron and steel castings, bolts, nuts and rivets, electrodes, paints, galvanised sheets, etc. All these are available in India. There are, however, certain wider steel sections and plates which are imported as they are not manufactured in the country. During the War, the supplies of some of the steel sections and of bolts nuts and rivets were rather restricted due to defence requirements unless required for war jobs, but now the position has eased.

169. There is no doubt that in the post-war period the Provincial industry will be called upon to play an important role in reconstruction and rehabilitation work. For the building of new roads alone in India, the Government of India propose to spend Rs. 400 crores out of which it is estimated that Rs. 50 crores will be spent on bridge construction. In addition to this, the Government of Bombay propose to spend Rs. 44 crores in 15 years on construction of new roads in the Province which will obviously include a large number of bridges. Then there are the innumerable civil and Government requirements which will all keep the industry pretty busy.

To achieve this, extensive Government patronage is necessary. Before the War, the industry mainly thrived on Government orders, and worked at about 50 per cent. of its capacity, principally due to lack of sufficient demand. In the War period, the capacity of the Indian industry was estimated to be about 120,000 tons per year, but the industry was again working at less than the capacity. This was principally due not to a lack of demand, which was abundant, but was due to the inadequate supplies of materials, transport, skilled labour, etc. Now that the War is over, these shortages will be remedied and

the industry will soon be in a position to work to a greater capacity. Therefore, unless something immediate is done to extend patronage to the industry, there will be a considerable redundancy of fabricating capacity. We are of the opinion that to get the maximum output from the industry, Government must see that imports of structural engineering materials are strictly controlled, that the price of steel is kept low for meeting foreign competition, that all Government orders are placed with the Indian industry, and that war disposals of structural fabrications like "unit construction huts", etc., are strictly controlled. All these steps require to be taken without undue delay lest irreparable damage is done to the industry.

170. While recommending this step, we should like to invite the attention of Government to the nature of the constitution of these fabricating concerns. While the recent tendency is for Indian managed and financed concern to enter the field, it is no doubt true that the predominant control of the industry rests primarily in British hands as most of the important structural engineering concerns are British. This is particularly marked in the Calcutta area. Speaking of the Province, we observe that two of the largest fabricators are British controlled, one of them being managed by a British agency with large Indian capital, whilst the other is exclusively a British proprietary concern. These concerns are carrying on work of considerable importance and are playing quite an important part in the Provincial industry. We are of the opinion that, in tune with the policy of management that is being strongly recommended throughout this Report, these concerns should increasingly associate Indian finance and Indian control in their management. We recommend that Government should take some positive steps in the matter of Indianising these concerns with really effective Indian control in future policy.

171. In concluding this note, we should like to draw attention to the continued difficulty experienced by fabricators in the railing of finished materials. On account of booking shortages, we are given to understand that fabricated materials lie in stockyards at times for months on end before despatch. Government must of necessity take some strong action to relieve this situation which has been adversely affecting all industries. Further, most of the fabricators are planning the purchase of new plant and equipment from countries outside the sterling area. We recommend that Government must facilitate these imports and grant the necessary exchange facilities.

#### Summary of Main Recommendations.

(a) To get the maximum output from the industry, Government must see that imports of structural engineering materials are restricted, that the price of steel is kept low, that all Government orders are placed locally and that war disposals of structural fabrications are controlled.

(b) The British structural engineering firms in the Province should increasingly associate Indian finance and Indian control in their management. Government should take some positive steps in this matter.

(c) Government must facilitate the imports of plant and equipment required by the industry from countries outside the sterling area.

## CHAPTER XVI.

## THE GENERAL ENGINEERING INDUSTRY.

172. In this Chapter the following types of general engineering work are considered:—

- (i) Iron Castings,
- (ii) Steel castings,
- (iii) Forging and drop stamping,
- (iv) Welding,
- (v) General repair machining and maintenance work.

*Iron Castings.*—Good quality iron castings are of great importance in the engineering and manufacturing industries. There is quite a good amount of simple cast iron work carried on in the Province. The most important centre for this activity is Bombay city. Ahmedabad comes next and in the other districts towns and centres the activity is on a very small scale. It has not been possible for us to assess the number of foundries undertaking this type of work in the Province. Generally the foundries are very small, manufacturing simple textile parts and undertaking general repair and small scale machining work. Most of these possess a few machine tools of old vintage which enables them to machine the cast iron parts which are then sold as finished products. Most of these shops undertake a considerable amount of jobbing work for textile mills. Many prominent engineering concerns, who carry on the textile stores supply business as a side line, obtain their requirements from these shops. Amongst these shops is the group known as Kumbharwada which is a motley collection of small shops located in Bombay city which undertakes simple cast iron and machining work with little precision.

There are also a good number of other medium scale and large scale workshops which undertake general cast iron work also. Of these only a few produce good quality reliable castings. These firms are Messrs. Richardson & Cruddas, Messrs. Alcock, Ashdown & Co., Ltd., Messrs. Cooper Engineering Ltd., Investa Machine Tools & Engineering Co. Ltd., the Indian Hume Pipe Co. Ltd., Messrs. Garlick & Co., the Malleable Iron & Steel Co. Ltd., the Hindustan Foundry Ltd., Messrs. Ripon Iron Foundry Ltd., the Practical Engineering Works, the Standard Engineering Works and a few others. These shops turn out medium scale cast iron jobs of good quality although there is not much of metallurgical control and prevention of sand contamination. Some of these shops cast bodies for their own manufacturing lines like machine tools, etc., and also undertake a considerable amount of heavy and complicated casting work for electrical companies, railways, etc.

173. Although the larger workshops turn out better quality castings, we are of the opinion that the general standard of cast iron work undertaken in the Province is poor and crude. This is mainly due to the absence of adequate facilities for testing. In our opinion there is very little of metallurgical control and there is complete lack of modern foundry equipment in these establishments. The result is that it is not possible to produce castings of required quality for various engineering and manufacturing requirements. The present practice is to work generally by empirical processes and follow set formulae and mixtures which have given good results in the past. It is obvious that such assumptions are not conducive to the production of quality

castings of uniform nature containing the right type of iron contents for various engineering and manufacturing requirements. Thus, there are very few foundries who are on the Railway list because the railways adhere to certain specifications and test all castings before accepting them. Consequently very few foundries are able to conform to these requirements. In the absence of such test facilities, the general tendency is to supply castings without test certificates. It is only when particular customers require such certificates that these castings are sent to the Railways, for testing, which is undertaken on payment of a small fee. This method is not desirable as it takes a number of days before the result is known and it is not possible to keep a check on the quality during the casting process. We admit that it will not be economical for each foundry to set up a test house for its own requirements. We are of the opinion that the best way out would be the establishment of a Provincial Test House and we, therefore, recommend that Government should immediately establish a Test House in Bombay city for undertaking tests on all types of iron and steel castings produced in the Province.

174. As regards such matters as some form of elementary research, adequate metallurgical control and control over sand contamination, we are of the opinion that each foundry must be equipped with necessary facilities to carry out these requirements for the production of quality castings. As it would not be possible for each foundry to give effect to this recommendation economically, we recommend a high degree of specialisation by which only a few concerns would undertake foundry practice and specialise in this work as is done in the U. S., U. K., and other industrial countries. It is only by means of specialisation that a considerable degree of uniformity in quality will be achieved. We further recommend a considerable degree of mechanisation of these specialised foundries to reduce moulding charges, handling time, etc. If mechanised specialised foundries are established, we visualise a considerable reduction in costs and an improvement in the quality of castings.

175. Considering the high duty cast irons, we observe that these are now playing a very important part in the manufacture of all classes of heavy and light machinery throughout the world. However, in India the importance of these irons is not yet realised. In 1939, Messrs. Cooper Engineering Ltd., of Satara, introduced high duty cast irons in India by entering into an agreement with the Mechanite Metal Corporation of America & England under which they become the sole licencees for the manufacture of Mechanite Metal in India, Burma and Ceylon. Mechanite which is a high duty cast iron is cast in 20 different standard grades, each grade possessing chemical and physical properties to meet particular service conditions. These different grades consist of six grades for General Engineering purposes, four for Wear Resisting purposes, five for Heat Resisting purposes and five for Corrosion Resisting purposes. As compared to ordinary cast irons, Mechanite Metal is considered to be superior. Although it is possible, under very favourable circumstances, to obtain a grey iron casting, according to composition, of up to 20 tons per sq. inch tensile, consistent result of such tensile strength grey iron castings cannot be definitely obtained. Generally, the ordinary grey cast iron has a tensile strength averaging up to 10 tons per sq. inch. On the other hand Mechanite High Duty Iron can be cast to give 25 tons

per sq. inch tensile and is further capable of being heat treated to give 35 tons per sq. inch tensile. The entire process of casting Mechanite Metal is scientific and is carried out under closed metallurgical supervision. The actual metallurgical structure of Mechanite castings is pre-determined in the molten metal and there is strict control and regulation of the structure to produce exact physical properties required for particular service conditions. As a result of this, consistent result can be definitely obtained in producing mechanite castings of 25 tons per sq. inch tensile. A number of important engineering firms in India have realised the importance of high duty cast irons. The manufacturing firms are Messrs. Cooper Engineering Ltd., of Satara, who are the sole licencees, the Indian Hume Pipe Co. Ltd., of Bombay, Messrs. Jessop & Co., Ltd., of Calcutta, Messrs. Jay Engineering Works Ltd., of Calcutta and Messrs. Binny & Co., (Madras), Ltd., of Madras. Mechanite castings are very important for machining and spare parts manufacture.

176. There are some other important points that need to be considered. During the War, the industry found it difficult to obtain adequate supplies of coke and pig iron. Now the position has to some extent improved, but great attention should be paid to supplying good quality pig iron for better castings. We understand that there is some difficulty in procuring good quality pig iron and Government must ease the position. Another serious drawback is the absence of well trained metallurgists and foundry experts. In this matter some of the Indian Universities are performing a very useful service in turning out academically qualified experts. We are of the opinion that a suitable metallurgical degree course should also be inaugurated by the Bombay University as Bombay's needs for this type of experts is second to none. This is an important matter and we recommend to Government the payment of a grant for these studies. Allied with the shortage of trained experts is the dearth of literate intelligent foundry workers, particularly moulders. Foundry work does not attract intelligent workmen with the result that most of the foundries are staffed by the labouring class who, by long experience, have acquired the necessary dexterity to do certain stereotyped jobs, but who are incapable of contributing anything towards the progress of foundry practice. This is not surprising when it is considered that a foundry man draws generally a little less than an average machinist. In this question, we cannot recommend anything particularly except that foundry occupation should be made progressively attractive by paying better wages and providing better conditions of service, conditions which as they exist at present are not conducive to good health.

177. *Steel Castings.*—Steel founding in India is generally speaking far below the requirements of the country. We have already examined this subject in brief in the Chapter on the Iron & Steel Industry. The manufacture of steel castings is a highly technical proposition and very few Indian firms have undertaken this work. The most important amongst these firms are the three primary producers of steel, viz., The Tata Iron and Steel Co., Ltd., The Steel Corporation of Bengal Ltd., and The Mysore Iron and Steel Works. The Kumardhubi Engineering Works Ltd. of Assansol, the Bharatia Electric Steel Co., Ltd., of Calcutta, and some of the ordnance factories and railway workshops are also producing good quality steel castings. Amongst the ordnance establishments, high grade steel castings are made at the Ishapur, Cawnpore and Muradnagar Ordnance Factories. In the Province, there are

only two firms, viz. The Mukund Iron & Steel Co., Ltd., and the Indian Hume Pipe Co., Ltd., which manufacture a small quantity of steel castings. In our opinion the production is quite inconsiderable for any large scale industrial activity and there is an immediate necessity for increasing it.

178. *Forging and Drop Stamping.*—In the manufacturing and general engineering industries the forging industry plays a very important part particularly where higher stresses or accurate dimensions are involved. Machinery manufacture, particularly of the heavy type, requires a number of highly stressed parts which must be forged. In India scientific forging work is little developed. Practically all workshops carrying on general repair and maintenance work have a forging section which is usually manned by a blacksmith and coolie who wields the heavy hammer. Bigger shops usually possess pneumatic power operated hammers. The best equipped civilian concern which undertakes heavy forging work is the Indian Standard Wagon Co., Ltd., of Burnpore. The Ishapur, Cawnpore and Jubbulpore Ordnance Factories are also very well equipped for undertaking light and heavy forging work, though these facilities are not available for civilian requirements. In the Province, forging is done in the Provincial workshops of Messrs. Alcock Ashdown & Co., Ltd., Mazagaon Docks Ltd., Messrs. Richardson & Cruddas, the Hind Cycles Ltd., etc. The work carried out by Messrs. Alcock Ashdown & Co., Ltd., and Messrs. Richardson & Cruddas is important. Hind Cycles Ltd. is equipped with drop stamp for producing forged articles on a very large scale. In addition to this some of the engineering and manufacturing workshops, like the Structural Engineering Co., Ltd., Messrs. Godrej & Boyce Mfg. Co., etc., also possess automatic drop forging machines for the manufacture of various items.

Considering all the factors, Bombay Province cannot by any means be considered to be well equipped for undertaking large-scale forging work. There is no doubt that there is more than a necessity for increasing the capacity of forging work in the Province to meet the demands that will be set up with the increasing industrialisation of the country.

179. *Welding.*—Compared to rivetting, welding saves 70 per cent. of time and labour as it eliminates the work of drilling or punching of holes and of heading the rivets. Welding can either be done by oxy-acetylene flame or by electric current. Gas welding is practised more or less in all the workshops as it involves little capital outlay. The only requirement is a gas torch and gas and oxygen cylinders which are obtained from the Indian Oxygen & Acetylene Co., Ltd. On the other hand electric welding requires costly equipment and is generally practised by ship repairers and by ship building, structural engineering and general engineering firms. Amongst the Provincial concerns, Messrs. Alcock, Ashdown & Co., Ltd., Messrs. Richardson & Cruddas, the Shaparia Dock & Steel Co., Ltd., Messrs. Godrej & Boyce Mfg. Co., the Mazagaon Docks Ltd., the Structural Engineering Co., Ltd., the Hind Tank Mfg. Co., the Mapara Parikh Co., Ltd., Messrs. Garlick & Co., are the well known welding contractors.

The main difficulty in welding is the shortage of the right type of welding electrodes. During the War when the supply of foreign electrodes was drastically curtailed, the industry made increasing use of electrodes made in India. Indian made electrodes are generally of unsuitable quality for good welding work. In the first place the right type of wire is not available.



When the wire is processed for turning into welding electrodes, the adherence of fluxes is defective. The general complaint is that the flux flakes off while in use and sometimes even in storage. This is due to low adhesive power in the flux to hold on to the electrode. The net result of this is that the wire is incapable of giving a continuous arc and emits a considerable amount of smoke in the process of welding. We are given to understand that the Indian Steel & Wire Products, Ltd., is shortly going to manufacture the right type of electrode wire.

Pressure welding with the help of flash butt welders or intermittent spot welders is not so prominent in this country. During the War, the Electric Fan & Motor Mfg. Co., was the largest Provincial manufacturer of this type of welding machines. With the use of spot welding machines, the necessity of rivetting thin gauge sheets is eliminated as spot welding requires only a small portion to be heated which eliminates warping.

180. *General Repair Machining and Maintenance work.*—In the Province, Bombay city is comparatively well served with establishments which undertake, mostly as a side line, general repairs and maintenance of industrial machinery and machinery spares. To carry out this work successfully, no special machinery is required as the work generally involves simple machining. This work is usually allied to foundry practice and most of the Provincial firms undertaking this work possess facilities for undertaking casting as well as machining work. The general standard of machining undertaken is quite good. The main defect however lies in the quality of cast iron parts produced. Except for some firms producing quality cast iron products, the cast iron parts produced by the rank and file of the industry leaves much to be desired. Generally there are too many blowholes, which in some spares like cylinder heads, liners, etc., cannot be tolerated. These blowholes lead to considerable plugging and welding which undoubtedly affects the quality of the parts produced.

All the large workshops are well equipped for machining work and as the quality of cast iron parts turned out by these concerns is good, the machining work does not suffer. The result is that these concerns are capable of manufacturing various items of spares of a good quality. During the War, some of the most important activities of these large firms was the manufacture of piston rings, cylinder heads, liners, engine parts, high quality iron grills, cast iron pots, sulphitation tanks and textile spare parts. In all this work the manufacture of textile spare parts achieved great importance during the War. As imports were cut off, lacs of rupees worth of textile machinery spare parts were ordered from these general engineering firms. This branch of work not only provided a very lucrative business to large engineering shops but was a profitable line of business to the innumerable small and medium-scale foundries and machining shops, which not only secured orders on their own initiative, but carried on a large jobbing trade supplying textile machinery spares to the large engineering firms which in turn supplied them to the mills. Now that the War is over, large-scale imports of textile machinery spare parts will commence. Unless some positive steps are taken by Government to restrict these imports, there will be a falling off in orders for such spare parts manufactured locally. We therefore, recommend that Government must restrict the imports of such simple textile machinery spare parts as are being manufactured locally of an approved quality.

181. Beyond what has been recommended above, we have no other special recommendations to make in regard to the General Engineering Industry. We are of the opinion that when all our recommendations contained in the other parts of this Report are carried out, there is bound to be a rapid development and improvement in this industry.

#### Summary of M in Recommendations.

(a) We recommend to Government the establishment of a Test House in Bombay city for undertaking tests on all types of iron and steel castings produced in the Province.

(b) Each foundry must be equipped with necessary facilities to undertake some form of elementary research, metallurgical control and control over sand contamination.

(c) We recommend a high degree of specialisation by which only a few concerns would undertake foundry practice and specialise in this work.

(d) We recommend a considerable degree of mechanization of specialised foundries to reduce moulding charges, handling time, etc.

(e) Government must take positive steps to procure good quality pig iron for the Provincial foundries.

(f) We recommend to Government the payment of a grant for the establishment of a suitable metallurgical degree course by the Bombay University.

(g) Foundry occupation should be made progressively attractive by paying proper wages and providing better conditions of service.

(h) The production of steel castings in the Province should be increased to meet the demand likely to be set up by large-scale industrial development.

(i) The capacity of forging work undertaken in the Province should also be increased.

(j) We recommend that Government should restrict the imports of such simple textile machinery spare parts as are being manufactured locally of an improved quality.

## CHAPTER XVII.

## THE MISCELLANEOUS PRODUCTS MANUFACTURING INDUSTRY.

182. In this Chapter we have considered only a few of the miscellaneous metal products manufactured by the metals and engineering industries. The metal products considered are—

- (i) Metal Cans and Drums,
- (ii) Metal Cutting Tools,
- (iii) Clocks,
- (iv) Paper Clips and Panel Pins,
- (v) Metal Toys.

## SECTION A.

## METAL CANS AND DRUMS.

183. The manufacture of metal cans and drums is essentially a pressing operation. Light and medium scale metal pressing work was quite well established in the Province even before the War. Heavy pressing work, however, such as is employed in turning out automobile bodies, is relatively absent in the country. The principal classification of the tinware industry is—

- (a) Cans and containers for petrol, oil, kerosene, paints, varnishes, vegetable oils, etc.
- (b) Cans for food, etc.

In the Cans and Containers group, petrol cans, oil drums and kerosene oil tins are the most important. Petrol and oil containers are generally manufactured in the country by the important foreign petrol and oil distributing companies, such as the Burma Shell Co. Ltd., the Standard Vacuum Oil Co. Ltd., etc., and to a lesser degree by foreign producing concerns exploiting Indian resources like the Attock Oil Co., Ltd., and the Assam Oil Co. Ltd. Burma Shell at their installations at Calcutta, Bombay, Marmagoa, Madras, Karachi, Coconada, Ernakulum, and Chittagong manufacture a large number of four gallon tins and a lesser quantity of one gallon tins. In addition to one and four gallon tins, their Bombay installation is the principal agency for the production of two gallon tins. The Standard Vacuum Oil Co., also manufactures a large quantity of four gallon tins at their installations at Bombay, Calcutta, Karachi, Ernakulum, Marmagoa and Coconada. In addition, their Bombay unit turns out a smaller quantity of one gallon tins. Considering the Indian companies, we are given to understand that the Assam Oil Co., Ltd., at Digboi, manufactures a large quantity of four gallon tins, whilst the Attock Oil Co., Ltd., at Rawalpindi, produces a much smaller quantity of one, two and four gallon tins. In addition to these oil companies there are two more Indian concerns undertaking the manufacture of tins and containers. These are Messrs. A. K. Sarkar Ltd., of Calcutta, and the General Supply Corporation, of Lahore. Messrs. A. K. Sarkar Ltd., was one of the two concerns in India producing during the War the special type of two gallon tins known as the "Mid East" type. As far as we are aware there are no other organised manufacturers of oil and petrol cans and containers.

184. Considering the manufacture of drums and barrels, it is observed that before the War there were very few firms undertaking this work in India. Those firms were the Indian Galvanising (1926), Ltd., of Howrah, Messrs. Berry & Co. of Naihati, the Shalimar Paint Colour and Varnish Co., of Calcutta, Messrs. Hadfields (Indian) Ltd., and the Burma Oil Co., Ltd. During the War, a number of new concerns undertook the manufacture of barrels and drums to meet the large demand. Today there are more than 20 concerns in the Drum group, of which the major portion is located in Calcutta and two only are located in Bombay. These local concerns are Messrs. Hassambhoy Jetha, and Messrs. Mapara Parikh & Co. In the Barrels group there are only three concerns of which one viz., that local branch of the Standard Vacuum Oil Co., is situated in Bombay. The principal raw materials used in the Can and Containers group are different types of Birmingham gauge and B. G. tin plates which are principally obtained from the Tin Plate Co., of India Ltd., and galvanised and other types of steel sheets.

We were unable to formulate a post-war scheme of expansion for the manufacture of drums and barrels in the Province as we could not gather sufficient data to form any conclusions.

185. Cans for food are principally manufactured in India by the Metal Box Co. of India, Ltd., which operates three factories—two general line factories—one each at Calcutta and Bombay and one open top factory at Okara near Lahore. The factories are very well equipped and the Company is able to avail of the latest developments in this line on account of its association with the Metal Box Co., Ltd., of England. The latter concern has not only connection with other prominent can manufacturers in the dominion countries but has an agreement with the Continental Can Co., of America, the largest can makers in the U. S. A., for the mutual exchange of technical improvements. During the War more than three-quarters of the manufacturing capacity of the Company was devoted to War work and a number of new jobs was undertaken. Millions of tin plate and black plate containers were produced during the War, for packing of various food products, paints oils and other stores for the defence services. In addition to this Company, there are two more well organised medium scale concerns located in Bombay city. These are the Zenith Tin Co. and the Bombay Containers Mfg. Co. The former manufactures large size tins for the storage of milk powder, oil, vegetable ghee, etc. The latter company concentrates on the manufacture of drums. The principal raw materials used are tin plate, galvanised and black mild steel sheets and mild steel wire, of which tin plate is the most important.

186. During the War, the industry experienced a shortage of tin plate andterne plate. With the cessation of hostilities, the position is expected to improve. There is, however, the important question of plant and equipment to which attention must be drawn. Speaking of the Province, while the oil Companies and the Metal Box Co. are well equipped to produce cans, containers, etc., the other workshops are generally poorly equipped to undertake mass production. Orders for these products run into tens of thousands of units and nothing but mass production is economical. It is, therefore, absolutely necessary for all the Provincial can and container producers, excepting the Metal Box Co., and the oil companies, to purchase new automatic plant and equipment suitable for mass production.

187. During the War, the principal oil distributing companies manufactured a very large quantity of various types of containers, drums, barrels, etc., for the packing of mineral oils. With the end of the War, the demand for mineral oils other than kerosene oil, will not be as large as the demand during the War. The question, however, is whether these oil distributing companies should be allowed to continue the manufacture of these containers in India. From the national point of view, the development of this industry in India is necessary and, therefore, it should be desirable if the principal foreign oil distributing companies operating in India ceased to manufacture in India their requirements of cans and containers and instead bought them from civilian indigenous manufacturers. If this suggestion is taken up, it will create a very profitable industry, which will stand the country in good stead in peace and war. We are given to understand that already one of the principal oil distributing companies has intimated the Government of India their intention to discontinue the manufacture of these containers in India, now that the War is over.

188. In regard to the manufacture of food cans we are of the opinion that as long as the Metal Box Co, is in the Indian market, it will hold undisputed sway for a long time to come. This company with its unrivalled manufacturing capacity and production technique will be in a position to supply any future moderate increase in demand for these products. So long as this company is in the Indian market, we do not see any possibility of Indian firms competing with it on the same terms. We recommend that Government should take positive steps to prevail upon this concern to associate Indian finance and control in its management, which at the moment is exclusively British in its constitution and direction. Until such time as the people of India increasingly take to canned food, we do not visualise any profitable expansion in this industry beyond the output turned out by the existing concerns. However, we recommend that when there is a worth-while demand, the question of regionalising the production of cans and containers for food and encouraging other manufacturers to enter this line should closely engage the attention of Government.

## SECTION B.

### METAL CUTTING TOOLS.

189. The metal cutting tool industry is essential for the large-scale industrial development of the country. Large quantities of cutting tools are required by ammunition factories, railway and general engineering workshops and by a number of repair, maintenance and manufacturing establishments. Before the War, practically the entire demands of the country were supplied by imports and there was very little quality production in the country. During the War, with the cessation of imports, a few concerns in the Province took up the quality production of metal cutting tools. The only item today extensively manufactured in the Province is the twist drill, the production of which is sufficient to meet a large proportion of the requirements of the country. In regard to the other metal cutting tools such as reamers, milling cutters, taps, chasers, dies, etc., our production is small and generally our requirements are met with by means of imports.

190. Good facilities exist in the Province for the quality manufacture of some of the tools particularly twist drills. There are some specialised concerns engaged in small tools' production in the Province. These are Messrs. Bolinjar Metal Works, the Bharat Tool Manufacturing Co., Ltd., and the Indian Tool Manufacturing Co., Ltd., all of which are located in Bombay city and the suburbs. Messrs. Bolinjar Metal Works, which is the least equipped of these concerns manufactures various types of dies. The Bharat Tool Manufacturing Co. Ltd. specialises in the manufacture of taps, reamers, dies and cutters for slotting and milling work. The Indian Tool Manufacturers Ltd., which is the best equipped of the three concerns specialises in the manufacture of twist drills.

191. The manufacture of metal cutting tools requires a very high degree of quality work. The first imperative necessity is to possess up-to-date precision machine tools. Practically all these machine tools are required to be imported and as such Government should render all necessary aid to prospective manufacturers to facilitate the imports of machinery. Then there is the question of raw materials. The manufacture of cutting tools requires high quality alloy and carbon steels. Whilst some of these steels are manufactured in India, they were available with considerable difficulty during the War, but now the position has to some extent improved. The steels required must be of the right uniform quality as the extent of heat treatment to be given to the tools to bring out the required hardness depends very largely upon the composition of the steel. A very important factor in the quality manufacture of metal cutting tools is the nature of heat treatment given. The general complaint of the consumers of Indian made cutting tools is that since correct heat treatment is not given, the tools have little reliability. For the future success of the industry we recommend that manufacturers of cutting tools should possess grinding and heat treatment plant of the latest designs and precision testing and measuring instruments. Without the required plant and instruments the production of these tools will lack quality.

192. The production of metal cutting tools, except twist drills, cannot be considered sufficient for the requirements of such a large manufacturing and engineering Province like Bombay. We are of the opinion that there is an urgent necessity of increasing the manufacture of all the cutting tools except twist drills. We consider that there is need in the Province for a specialised plant which should undertake on a large scale the manufacture of all types of cutting tools and particularly cutters, drills and reamers. The plant should be equipped with the latest machinery and great importance should be given to the heat treatment aspect of the production. In this connection we invite the attention of prospective Provincial manufacturers of metal cutting tools to the recent establishment of the Praga Tools Co. in Hyderabad (Deccan), for the quality manufacture of metal and hand tools. The plant of this Company is superbly equipped for undertaking large scale quality manufacture of metal cutting and hand tools. We are not aware of the targets of production set for the plant, but we are given to understand that shortly the Company will go into large scale manufacture. It is likely that when all-out production is reached, this Company will be in a position to supply a major proportion of the Indian requirements of metal cutting tools. As such, we are of the opinion that prospective Provincial manufacturers should consider the production capacity of this firm before formulating their plans. If our recommendation in another part of this Report for the establishment of a Government Test House in the Province is carried out, and if a definite

standard of quality is laid down, that should go a long way in encouraging the makers of small tools to manufacture to a standard and induce the Indian users of these small tools to place reliance on them in preference to the imported tools. If the Indian buyer is assured that he is investing his money wisely in Indian made small tools, private enterprise is bound to come forward to develop this industry to the fullest extent possible.

Lastly, once quality metal cutting tools are manufactured, we recommend that Government should put into force some form of licensing scheme to restrict the imports of such metal cutting tools as are manufactured in India.

### SECTION C.

#### CLOCKS.

193. The manufacture of good quality watches, clocks and alarm pieces is a highly specialised work requiring special types of precision plant and equipment. Before the War, the major proportion of the watches marketed in India were exported by Switzerland, which even today holds the pride of place, while in clocks and time pieces Germany and Japan were the principal exporters. Although there were a large number of mechanically minded proficient Indian watch and clock repairers who were even able to construct clocks and watches with assorted parts no attempts were made to undertake the manufacture of clocks, watches, etc., on an organised scale. This was largely due to the low prices of imported products, the lack of suitable plant and equipment and lack of experience of mass production methods of manufacture.

194. In 1924 the Swadeshi Electric Clock Mfg. Co., was established in Bombay city to undertake the manufacture of clocks on a cottage industry basis. With a handful of workmen and generally old machinery the Company commenced the manufacture of clocks. At first only electric wall clocks were manufactured, as this manufacture was much simpler than that of spring-wound clocks. In technical equipment the company was singularly deficient. Excepting a few hand presses, most of the other plant and machinery was either converted to suit the purpose or was entirely made in the company's own workshop. The technology of manufacture was crude and obsolete and there was little possibility of changing it as the War broke out and it was not possible to obtain the required plant and equipment. In spite of these handicaps, the firm continued the manufacture and concentrated on the manufacture of electric and weight operated mechanical Tower clocks. In the manufacture of Tower clocks particularly, the Company has attained a high degree of efficiency. We are given to understand that the firm has supplied Tower clocks to various parts of India. The most notable amongst these clocks is the Rajabai Clock Tower in Bombay city which has a diameter of 13½ feet. The Company also manufactures the Pulsynetic type of master clocks which control a chain of other electric clocks, by sending out electric impulses, thus ensuring a uniform time. We are given to understand that one such clock installed in a Cawnpore mill controls nearly 42 other secondary electric clocks. As these types of electric synchronous clocks are suitable for A.C. current only, the Company has further developed another clock working on D.C. current which has a pendulum and an escapement wheel. These

clocks are more difficult to manufacture and costly. The Company manufactures one more variety known as the seven-day clocks, which are reported to be giving satisfactory service.

195. During the War, the industry suffered from a serious disadvantage in that the raw materials required for the manufacture were not available in the right quality. The main raw materials required are brass sheets and wire. Indian made brass sheets were unsuitable for this industry as they were not of uniform fineness, the gauge being uneven over the whole of the surface. This necessitated considerable cold rolling work before use. Another disadvantage is the heavy rate of duties which this industry has to pay for the import of steel springs which are required for the manufacture of clocks and parts of clocks. We are given to understand that there is a substantially higher rate of duties applicable to imports of steel springs used for clocks than for other purposes. Considering the nascent nature of the industry and the fact that this is a pioneering effort, we are of the opinion that Government must closely examine this question of imports of raw materials and the import duties levied on them with a view to rendering some valuable aid to the industry by reducing custom duties and making available to the industry the right type of raw materials.

196. The industry's future plans are not yet definite. The Swadeshi Electric Clock Mfg. Co. however intends to purchase special plant and equipment from the U. K. for establishing a modern factory somewhere near Bombay city. They plan to manufacture nearly 200 clocks per day which would be sold at about Rs. 20 per piece. We are given to understand that the price would be lower still if import facilities as required by them are available. This industry, therefore, is ripe for immediate assistance from Government on the lines indicated earlier. Considering the vast increase in post-war demands, in the wake of higher standards of living and purchasing power, we are of the opinion that there is definitely a room for further expansion in this manufacturing line in the Province.

#### SECTION D.

##### PAPER CLIPS AND PANEL PINS.

197. The manufacture of paper clips and panel pins is carried on in Bombay city on a cottage industry basis. Paper clips are manufactured by about four individuals who operate altogether about six machines. The raw materials required are good quality mild steel wire and a small quantity of carbon steel for tool making. The machines take 18 SWG wire and have a capacity of 40,000 clips per day of 8 hours. The industry suffers from a disadvantage in that good quality raw materials are not available. For quality manufacture it is necessary that the wire utilised should be perfectly round and of an uniform gauge. Generally Indian made wire is not of the right quality and consequently there is a certain amount of wastage and loss in production.

198. We are given to understand that the industry is not very profitable. It is stated that the ex-factory price of locally manufactured clips is Rs. 1-2-0 per 1,000 with the retail price being about Rs. 1-6-0 to Rs. 1-8-0 per 1,000.



On the other hand imported clips are sold at Rs. 1-8-0 per 1,000 thus offering stiff competition to Indian made pins. We are given to understand that a representation was made to the Government of India by the industry to stop the import of foreign clips and an assurance was given that Indian firms would be able to satisfy the country's needs, but the appeal has had no effect. There is no doubt that the present quality of the Indian made clips is inferior to the British made clips. Unless some positive steps are taken by Government to get the Indian makers of mild steel wires to improve the quality of the wires and reduce the price further, the industry will continue to suffer. We recommend that this question should be immediately looked into by Government for the purpose of taking suitable action.

199. In regard to the manufacture of panel pins, there are only three machines in the Province turning out these pins. The production of each machine comes to about 6 cwts. per month. In view of the very large demand for these pins in an important centre like Bombay Province we recommend a considerable expansion in production capacity. This can be done by Government by encouraging the importation of the requisite machines from abroad or encouraging their manufacture locally. In conclusion, we state that there is considerable room for the development of these two minor industries on a cottage-scale basis and Government would be well advised to give special attention to the development of these two industries immediately.

## SECTION E.

### METAL TOYS.

200. We propose considering here the manufacture of such metal toys only as could be manufactured with very simple equipment and which do not require high-skilled technique. The type of metal toys dealt with here are classified into three categories:—

(a) Hand-cast metal toys such as lead soldiers, guns, animals, etc. The manufacture of hand-cast lead toys requires lead, permanent steel moulds and paints. Since lead has a very low melting point, there is no particular type of furnace required. The only skill that is needed is some knowledge of melting, pouring and separating from the steel moulds. For die-cast lead toys, the materials required are the same as above in addition to a small hand-operated die-casting machine.

(b) Toys fabricated from tin plates such as plain and working models of toy cars, engines, trains, ships, aeroplanes, animals, etc. In the manufacture of toys fabricated from tin plates, the materials required are tin plate scrape wire, spiral or clock springs and paint. The plant required consists of punching dies and a screw type hand press.

(c) Special toys such as scale model of locomotives, ships, aeroplanes, etc., and building outfit such as meccano and constructo. We do not propose to consider this complicated subject of mechanically made special vehicular toys until such time as our village artisans have perfected the technique of simpler types of metal toys classified in the (a) and (b) groups stated above.

201. - Our investigations reveal that practically all the raw materials required by the Metal Toys Industry are easily available in the country. The plant and the machinery required are of the simpler type and are capable of being easily manufactured in India. There are a few Provincial concerns engaged in this industry. Mostly these concerns operate on a very small-scale basis with hand-operated machines. The products manufactured are of a fair quality although there is much room for improvement. What the industry practically lacks is organisation which, at its present stage, when manufacturing units are scattered, is not yet possible without a co-ordinating agency. We recommend that Government should organise this toy making industry in the Province on a cottage-scale co-operative basis. If the principle of co-operation is availed of in the purchasing of raw materials and the marketing of the finished products, it would be an excellent industry for the betterment of the village population. We recommend to Government the immediate appointment of a well-qualified special officer to organise this industry, look after its welfare and plan its production and marketing to achieve the maximum economy of production. In this matter, we feel that Government would be well advised to consider the desirability of paying a subsidy to the Bombay Society of Model Engineers for the training of artisans in the manufacture of toys requiring skill.

### Summary of Main Recommendations.

#### METAL CANS AND CONTAINERS.

- (a) All the Provincial cans and containers manufacturers, excepting the Metal Box Company and the oil companies are recommended the purchase of new automatic plant and equipment suitable for mass production.
- (b) The development of Metal Cans and Drums Industry in India is necessary. As such it should be desirable if the principal foreign oil distributing companies operating in India ceased to manufacture in India their requirements of cans and containers and instead purchased these products from Indian civilian manufacturers.
- (c) We recommend that Government should take positive steps to prevail upon the Metal Box Co. (India), Ltd., to associate Indian finance and control in its management.
- (d) For the present we do not visualise any profitable expansion in the industry manufacturing cans and containers for foods beyond the output turned out by the existing firms. We, however, recommend that when there is a worth-while demand the question of recognising the production of these products and encouraging other manufacturers to enter this manufacturing line should closely engage the attention of Government

#### METAL CUTTING TOOLS.

- (e) We recommend that manufacturers of metal cutting tools should possess grinding and heat treatment plant of the latest design and precision testing and measuring instruments.
- (f) We consider that there is need in the Province for a specialised plant which should undertake on a large-scale the manufacture of all types of metal

cutting tools and particularly such tools as cutters, drills and reamers. The plant should be equipped with the latest machinery and detailed attention should be given to the heat treatment aspect of the production.

(g) Once quality metal cutting tools are manufactured, we recommend that Government should put into force some form of licensing scheme to restrict the imports of such metal cutting tools as are manufactured in India.

#### CLOCKS.

(h) Government should closely examine the question of imports of raw materials required by this industry and the import duty levied on them with a view to rendering some valuable aid to the industry by reducing custom duties on such imports and making available to the industry the right type of raw materials.

(i) There is definitely a room for further expansion in this manufacturing line in the Province.

#### PAPER CLIPS AND PANEL PINS.

(j) Government should look into the question of supplying to this industry an improved quality of wire at a fair price.

(k) We recommend a considerable expansion in the production of panel pins in the Province. Government should encourage the imports of the requisite machinery from abroad or encourage its manufacture locally.

(l) Government should give special attention to the development of these two minor industries in the Province on a cottage-scale basis.

#### METAL TOYS.

(m) We recommend that Government should organise the Metal Toys Industry in the Province on a cottage-scale co-operative basis.

(n) To carry out this recommendation effectively we recommend that Government should immediately appoint a well qualified special officer to organise this industry, look after its welfare and plan its production and marketing with a view to achieving the maximum economies of production.

(o) Government should consider the desirability of paying a subsidy to the Bombay Society of Model Engineers for the training of artisans in the manufacture of toys requiring skill.

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## CHAPTER XVIII.

## DECENTRALISATION OF INDUSTRIES.

202. In India, industrialisation has taken deep roots in certain localised areas resulting in widespread evils usually associated with large-scale concentration of human beings in congested towns and cities. It is estimated that, in 1939, nearly 52 per cent. of the factory workers of India were employed in the Provinces of Bombay and Bengal. It is true that, during the War, a number of industries were started in different parts of India but, even then, the cities and suburbs of Bombay and Calcutta are yet the biggest centres of industrial activity. Such large-scale concentrations have promoted an unbalanced industrial development of the country with large areas having no industry worth the name and subsisting mainly on uneconomic agriculture.

203. Speaking about the Province of Bombay, in the past, large-scale industrial development was mainly concentrated in Bombay city. This was but natural in view of the extremely favourable location of the city for the development of industries. In course of time, when the city of Bombay was filled to the neck by industries, industrialists were forced to find new centres for locating industries. A small-scale migration took place and industries were established in such centres as Ahmedabad, Broach, Surat, Sholapur, Jalgaon, Poona, etc. and in the suburbs of Bombay city. The first five towns owe their growth largely to their location as important centres of the cotton textile industry. They do, however, possess a sprinkling of metals and engineering industries, a large proportion of which are general engineering firms, producing castings of textile parts and executing all types of general engineering work. Poona is another town where medium-scale engineering businesses are located. The most notable migration has, however, been to the suburbs and the surrounding areas of Bombay city extending up to Ambernath. Together with Bombay city this area is the focal point of industrial development of the whole Province of Bombay. The area contains a large proportion of the large-scale and medium-scale metals and engineering industries established in the Province. It is further served by a number of small-scale manufacturing and repair establishments. This does not, however, mean that beyond these towns and the Bombay area, there is no industrial activity. There are a large number of establishments distributed throughout the Province which carry on industrial activity on a small-scale and cottage-scale basis.

204. In our opinion the ideal principle to be achieved when planning the large-scale industrialisation of the Province is to disperse industries in such a manner that industrial occupations and exploitation of resources are not concentrated in any one area. This step would not only equalise sources of wealth over different areas, by developing backward regions, but will also provide a much needed strategic advantage in times of war. We are, therefore, of the opinion that immediate steps should be taken by Government to make suitable sites located in the Province attractive for the location of industries. Once this is done we recommend Government to intervene in the question of locating new industries which are to be established in the Province, with a view to achieving an ideal dispersal of industrial activity throughout the

Province for uniform industrial development. In recommending this step, we are not suggesting that Government should not allow any more industries to be located in Bombay city and suburbs, but that, as far as possible, efforts should be made to disperse industries in industrially backward districts of Province like Kaira, Panchmahals, Sholapur, Satara, Kanara, Kolaba, Ratnagiri, etc., once sites in these districts are made suitable for location. In the dispersal of industries, we also recommend that Government should pay detailed attention to the question of developing rural areas. Further, attempts should be made to concentrate industrial capital and enterprise on economically backward regions with a view to promoting an ordered development of industries in the Province. We may point out that an outstanding characteristic of Russian economic life, before the War, was the establishment of vast industrial centres in agricultural areas which contained, prior to this development only small industries engaged in the manufacture of agricultural necessities. This was of course made possible by making these areas as attractive as possible for the purpose of location. We, therefore, stress the necessity of a wise dispersal as we are sure that if the present tendency of concentrating industries in Bombay city and in the suburbs is allowed to be continued without ordered direction, it will create a vast conglomeration of industries and workers in a small area with injurious effects on the well-being of the population.

205. In this Report, we have not made many recommendations of suitable sites for the location of new industries recommended by us. We have left this part of our terms of reference to the Special Sub-Committee, appointed by Government, which would be paying detailed attention to this subject. There are, however, certain instances where suitable sites have been suggested. It will be observed that the sites preferred are more or less located in close proximity to Bombay city. This recommendation may appear odd in view of our strong belief, as stated earlier, that industries should be suitably dispersed in the Province. We are of the opinion, that, although we strongly believe in the wise dispersal of industries, the present state of development of town, municipal, transport and power facilities in the Province precludes any economical consideration of location outside Bombay city and suburbs and some of the well developed towns like Poona and Ahmedabad. It is our duty to recommend the best location possible with a view to affording all possible advantages to newly established industries. As such, we are unable to recommend any other sites at the present moment, beyond the vicinity of these areas.

206. However, to break this concentration, which is so badly needed, we strongly recommend that there should be vast improvement in the following facilities, in as short a time as possible, without which extensive dispersal would be economically not feasible :—

- (a) The provision of cheap and abundant electricity,
- (b) The improvement of road and rail facilities,
- (c) The easy acquisition of land for industrial and housing purposes,
- (d) The undertaking of industrial housing programmes wherever necessary,
- (e) The improvement of public health and sanitation,

- (f) The grant of special railway rates in backward areas,
- (g) The provision of extensive medical facilities,
- (h) The provision of educational institutions of a high order.

Unless backward areas are made attractive for industrial location by developing the above facilities, we do not expect any considerable deglomeration tendency away from Bombay city, Poona and Ahmedabad. In conclusion, we emphatically caution Government against the taking of any hasty steps to compel new industries to operate in these backward areas before they are developed, as development will be decidedly uneconomic in the absence of these facilities.

#### Summary of Main Recommendations.

- (a) The ideal principle to be achieved when planning the large-scale industrialisation of the Province is to disperse industries in such a manner that industrial occupations and exploitation of resources are not concentrated in any one area.
- (b) Government should take immediate steps to make suitable sites located in the Province attractive for the location of industries. Once this is done, Government should intervene in the question of locating new industries with a view to achieving an ideal dispersal of industrial activity.
- (c) In the dispersal of industries, Government should pay attention to the question of developing rural areas.
- (d) We recommend a vast improvement, in backward areas, of such facilities as public health, sanitation, transport, education, power resources, easy availability of land, etc., to attract industries.

Government are advised against the taking of any hasty steps to compel new industries to operate in backward areas before they are developed.

## CHAPTER XIX.

## MINERAL RESOURCES.

207. There is a widespread belief that India is naturally deficient in important mineral resources. This belief has gained ground in the absence of facts revealed by an upto-date scientific geological survey. In the present state of the geological mapping of India, we are unable to express any definite opinion on the existence of the country's mineral resources. As far as is known, there are large deposits in India of important ores of iron, coal, bauxite, manganese and mica. In regard to the other deposits of non-ferrous ores like those of copper, zinc, antimony, molybdenum, tungsten, etc., we are of the opinion that India cannot, by any means, be regarded as naturally deficient in these ores, unless a comprehensive geological survey has been undertaken and the deficiency observed. The Indian Industrial Commission, as early as 1916-17, when the geological problem had barely been touched, declared that "The mineral deposits of the country are sufficient to maintain most of the so-called 'Key' industries except those that require vanadium, nickel and possibly molybdenum\*". The experience of western countries has conclusively proved that it is frequently possible to locate newer and workable reserves if there are concentrated efforts to find them. As long as such investigations are not completed, it would, therefore, be correct to regard India's deposits of these ores as not deficient. In point of fact, all indications up to the present moment point to the existence of workable deposits of these ores in India.

208. However, considering the present known mined mineral resources of the country, we observe that the position cannot be regarded as favourable. We cannot deny that the present known deposits of most of the ores of important non-ferrous metals like lead, zinc, tin, copper, etc., are insufficient to sustain any large-scale industrial development. India's present deficiency in some of these ores could, however, be made up by imports from our neighbours Burma and Malaya. Further, modern processes of refining have created a situation, whereby even deficiency of ores can be, to some extent, ignored in the consideration of industrial development. This is, however, not a very happy position, although it may relieve the situation to some extent. Then, there is the excessive concentration in one area in India of some of the basic ores required for large scale industrialisation. Thus, coal and iron, which form the very basis of industrial activity in any country and are the hall-mark of advanced civilisation, are concentrated in the east of India. Whilst reserves of iron are plentiful in quantity and quality, the reserves of coal are not so. As if this is not enough, India's resources of coking coal, which are small, as compared even to her present requirements for metallurgical purposes, are being wasted for non-essential requirements.

209. We will here consider the extent and availability of the two most important minerals, viz., coal and iron, on which is founded the modern industrial state. The availability in India of ores of such important non-ferrous metals like copper, lead, zinc, tin, aluminium, manganese, etc. is considered in detail in the Chapter on the non-Ferrous Metals Industry. As far as the Provincial deposits of all these ores are concerned, except for manganese and bauxite, there are no other known workable deposits located

\* Report of the Indian Industrial Commission, page 88.



in the Province. We have made this brief survey, as the existence of these basic ores have a vital bearing on the future industrial development of this Province.

210. *Coal*.—Coal is the most important mineral product of India. In total annual production, India ranks second in the Empire and ninth in the world, claiming a 2 per cent. share in the world's production. Practically all the coal mined in India is located in the Bengal and Bihar coalfields which account for nearly 9/10ths of India's output. Next in importance to these coalfields are the Panch Valley coalfields of the Central Provinces, the coalfields of Talchir State in the Eastern States Agency and of Tendum in Hyderabad State, all of which claim a very small share. Coal is very unevenly mined in India being located principally in one area. It is obvious that this concentration is a source of great danger to the successful development of industries in the country. Speaking about Bombay Province, the excessive dependence on one principal coalfield has, during the War, seriously jeopardised the continued industrial activity of the Province. Failure of coal deliveries on account of wagon shortages and lower raisings, created a precarious situation and at one time, some of our important industries like cotton textile and iron foundries were even compelled to stop work. A very large number of Provincial metals and engineering concerns have demonstrated to us the dangers of this situation particularly in times of stress, as during a war, when there are bound to be transport bottlenecks. Most of these concerns informed us that they are in a position to increase their production if adequate supplies of coal are available. The experiences of other countries serve to show what can be done to relieve such shortages by conscious efforts made to locate new resources. Intensive prospecting and survey work, undertaken before the War, enabled Russia to mitigate her excessive dependence on the Donetz coalfields. There is no reason why the same progress cannot be made in India. In our opinion, successful survey and exploration work will not only disperse the coal resources of the country but, will also augment them, for which there is a dire need as the present production amounting to about 28 million tons per year is woefully deficient for any large scale industrialisation of the country. We are, therefore, strongly of the opinion that an industrial Province like Bombay, if it is to make any industrial progress in the future, must locate new sources of supply of coal within its borders or in areas adjacent to it.

The Jharia field is the main source of coking coal of good metallurgical quality. India's resources of coking coal are insufficient for any large-scale industrial development of the country. Further, the high percentage of ash and low calorific value minimise considerably the percentage of economic use of the coking coal available. The situation is made worse by the improper use of the small quantities of coking coal available. Considerable quantities of coking coal, which should ordinarily and sensibly be reserved for metallurgical purposes, are consumed in locomotives for steam raising. We condemn this exhaustion of valuable supplies of coking coals resulting in the starvation of metallurgical industries and affirm that it is positively detrimental to the country's industrial development. We are of the opinion that immediate action should be taken by the Railway Board to equip all locomotives with suitable equipment to burn coal of low quality, which they can

do with as good results, and thus preserve the reserves of coking coal which are bound to prove useful with the gradual industrialisation of the country.

211. *Iron Ores.*—India's resources of high grade iron ore are one of the largest in the world. The most valuable ores are located in what is called the "Iron Belt" in the Singbhum district of Orissa Province and contain ore reserves estimated to be between 2,800 to 3,000 million tons, with an iron content of about 60 per cent. In addition to these abundant high grade ores, there are good quantities known to be located in Mysore, Central Provinces and Kumaon, but these are yet to be investigated extensively. The very rich content of the ores has made it possible for pig iron to be produced in India at a low cost with an advantageous effect on the cost of production of steel. It is, however, unfortunate that such immense resources are located in one region. Although, the question does not fall within the scope of our inquiry, we are led to say, on account of its great importance, that it would be worth while to investigate the ores available in Central Provinces and Mysore in order to make the peninsula of India as far independent of eastern sources of supplies as possible and also to diversify the location of iron ore reserves from the strategic point of view. So far as the needs of the Province are concerned, and they are very important, we strongly recommend that Government should carefully investigate the iron ore deposits known to be located in the Province at Redi, near Vengurla, in South Ratnagiri district and at Banda in Sawantwadi State (we have referred to this subject, in detail, in the Chapter on the Iron and Steel Industry). In addition to this, Government should also undertake jointly, with the Central Provinces Government, a survey of the iron ore areas of the Central Provinces with a view to finding new sources of ore supplies which could be profitably exploited by an iron and steel industry established in this Province or in the Central Provinces.

212. In our opinion, the need of the moment is a revolution in the basic concept and application of the Geological Survey of India. Since the awakening of industrial consciousness in India, Indian economists and industrialists have been constantly emphasising the necessity of equipping the country with an up-to-date geological survey. But it is an unfortunate fact that in no industrially advanced country in the world the problem of an up-to-date geological survey has been so wantonly neglected as in India. How much the geological survey of the country falls short of our actual requirements is illustrated by the Central Provinces and Berar Provincial Industries Committee, which mentions that "The number of geologists employed in Russia is variously estimated at 2,500 or more. On the other hand the strength of the Geological Survey of India was only 64 including the officers of the 'Utilisation Branch\*.'" They have recommended the geological mapping of the Central Provinces and Berar by a staff of geologists each working on about 250 sq. miles or so every year.

It is well known that the major portion of the Indian territory remains to be surveyed and geologically mapped. We record with regret that the policy hitherto adopted by the Government of India has not been in the best

\* Report of the Central Province and Berar Provincial Industries Committee, page 23.

interest of the country. It is only very lately, in 1945, that the Government of India recognised the need for expansion of the Geological Survey as the *sine qua non* of the development of basic industries and accordingly we understand that Government have made a start by the appointment of geologists.

218. We are strongly of the opinion that the entire outlook of the Geological Survey of India requires to be changed with increasing attention being paid to ascertaining the economic utilisation and industrial possibilities of mineral deposits. Further, although this is a central subject, it is absolutely essential that the Provincial Government should immediately undertake a comprehensive Geological Survey of the Province to supplement the efforts of the Central Government. To carry out this proposal, we recommend the immediate engagement by Government of experienced geologists who should be permanently attached to Government.

The main function of this organisation should be to undertake scientific geological investigations and advise Government and people, interested in developing mining, on the mineral resources of the Province.

We consider that the future fate of industrialisation in the Province, which will form a fair proportion of industrialisation in India, is very largely dependent upon such a geological survey being undertaken in as short a time as possible.

#### Summary of Main Recommendations.

(a) If Bombay Province is to make any industrial progress in the future, new sources of supply of coal must be located within its borders or in areas adjacent to it.

(b) Reserves of coking coal should be preserved for metallurgical requirements and the Railway Board should equip all locomotives with suitable equipment to burn coal of low quality.

(c) Government should carefully investigate the iron ore deposits known to be located in the Province at Redi, near Vengurla, in South Ratnagiri district and at Banda in Sawantwadi State.

(d) Government should undertake jointly, with the Central Provinces Government, a survey of the iron ore areas of the Central Provinces, with a view to finding new sources of ore supplies which could be profitably exploited by an iron and steel industry established in Bombay Province or in the Central Provinces.

(e) The Provincial Government should immediately undertake a comprehensive Geological Survey of the Province to supplement the efforts of the Central Government. To carry out this scheme, Government should engage experienced geologists, who should be permanently attached to Government.

## CHAPTER XX.

## ELECTRIC POWER DEVELOPMENT.

214. The quantity of electric energy at the disposal of a nation determines to a large extent the command its peoples enjoy over natural resources. It is the best single indication of the field for industrialisation, natural resources being available. In the final analysis, the higher the generation of electric energy, the better the technical equipment of a nation.

In his address to the Institute of Engineers delivered on 1st February 1945, the Electrical Commissioner with the Government of India declared that "The total electric energy generated in India in 1943, was approximately 3.578 million kw. hours, about the same as the weekly production of energy in the United States. In the United States about 180 times as much energy is used per head of population as in India, while in the United Kingdom the figure is about 100 times as much".\* In India, at the present moment, electric power is fairly well developed in the Bombay, Mysore, Madras and Punjab areas. In the other areas, electric power is either not developed at all or the development is inadequate for any large-scale industrialisation.

215. As far as Bombay Province is concerned, it has not been possible for us to calculate the exact figure of the generation of electric energy. We observe that the generation of electric power is non-existent in the majority of the rural areas and is absolutely inadequate for even medium-scale industrial requirements in towns and industrial centres except Bombay city and suburbs, Poona and Ahmedabad. Even in these cities, the power generated has proved insufficient to sustain any further large-scale industrial activity, as was observed during the War.

There are three hydro-electric companies located in the Province, viz., the Tata Hydro-Electric Power Supply Co. Ltd., the Tata Power Co. Ltd., and the Andhra Valley Power Supply Co. Ltd., which have a total capacity of 246,000 H.P., generating 1,003 million units. These Companies serve a very limited area in and around the cities of Bombay and Poona. A fair proportion of the electric energy generated by them is further taken up by the B. B. & C. I. and the G. I. P. railways for running electric trains. In addition to this Tata system, there are operating in the Province about 6 steam stations and 55 diesel stations which mainly serve the important towns and commercial centres. The most important amongst these is the Ahmedabad Electricity Co. Ltd., which has an installed capacity of 37,500 kws. Barring the Tata system and the Ahmedabad thermal station, all the other existing power stations are generally too small to supply electric power economically for large industrial use.

216. Before we consider the hydro-electric possibilities of development in the Province, we examine the electric development proposed under the Electric Grid scheme of the Government of Bombay. The scheme consists of the following:—

- (i) The North Gujarat Grid scheme, under which steam turbo sets of 30,000 kws. will be set up at Ahmedabad to augment the present installed capacity to 67,500 kws. The general plan is to transmit power to Baroda in the south and to Kalol in the north with a few main sub-stations on the

\* Quoted by the Central Provinces and Berar Provincial Industries Committee Report, P. 16.

way. According to the present programme, grid power will be available early in 1948 at Barajadi, Mehamadabad, Kaira, Mattar, Nadiad, Umreth, Anand and Borsad. Extensions around these centres will then be undertaken as and when required;

(ii) The South Gujarat Grid scheme, under which it has been decided to establish a steam station near Surat comprising initially of two numbers of 7,500 kw. turbo sets. It is proposed to construct a E.H.T. line from Surat to Bulsar with main sub-stations at Navsari, Billimora and Bulsar. From each of these sub-stations power will be supplied within a radius of 20 miles. It is expected that grid power will be available in this region by the end of 1948. Extensions around these centres will then be undertaken as and when required;

(iii) The Bhandardara-Randha Hydro-Electric scheme, under which it is proposed to develop the Bhandardara-Randha Hydro-Electric project and connect it with transmission lines right up to Bhusawal through the existing diesel stations at Sinnar, Manmad, Malegaon, Dhulia, Amalner, Jalgaon. It is also proposed to take lines to Nasik, Kopergaon, Yaval, Chopda and Parola. The area to be served will be the north-western part of the Province and includes parts of Nasik, Ahmednagar, East and West Khandesh districts, aggregating approximately 10,000 sq. miles;

(iv) As per terms of the agreement with the Mysore Government, the Bombay Government are entitled to purchase electric power from the Jog hydro-electric station which they propose to do for use in the Kanara district for development of the district's mineral and forest resources. Electric power amounting to about 3,800 kws. will thus be obtained sometime next year;

(v) The rural electrification and small town schemes, under which it is proposed to install small diesel stations to supply power to small towns and villages communities for village industries and irrigation. This scheme when executed will supply power to the towns of Ratnagiri, Malvan, Vengurla, Chiplun and Khed and to certain villages of the Satara and Bulsar talukas.

Altogether it is proposed to install in the near future as many as 37 diesel stations in some of the Provincial towns and commercial centres which are not served by electricity. All these schemes will supply a long felt need for power in these areas but for large scale and even medium-scale industrial use the installed capacity would prove insufficient. It is, however, expected that when the Bhandardara-Randha scheme is linked up with the Surat station, there will be some scope for supplying power for industrial use in the particular area but not to a large extent.

217. The need of the moment, however, is the development of vast hydro-electric projects which alone would be in position to supply the enormous quantity of electric energy required for medium scale and large scale industrial development. In this scheme, the harnessing of the immense possibilities of the water power resources of the Western Ghats will afford a vast field for hydro-electric development. The Indian Industrial Commission estimated the generation of about half a million horse power from the water resources of the Western Ghats. Since then nearly 246,000 H.P. have been developed leaving room for another 100 per cent. improvement. However, the Western Ghats alone do not afford all the possibilities of hydro-electric development. We are of the opinion that if intensive hydrographic surveys are undertaken, additional water power resources are likely to be unearthed specially in

Bombay Province, the geographical features of which are largely rugged and mountainous. We admit that the intermittent supply of rain water and the seasonal flow of rivers, which usually dry up in the hot season, will leave only a few sources which could be grainfully tapped. However, even these will prove very useful and, therefore, we recommend that Government should undertake without delay a Provincial Hydrographic Survey. If new water power resources are located, capable of being successfully harnessed, we recommend that Government should consider the question of undertaking the establishment of hydro-electric works, particularly in those areas in which natural resources are available. In this connection we invite the attention of Government to the preliminary survey undertaken in 1921 by the Hydro-Electric Survey of India, which gave particulars of four important sites in Bombay Province, which showed definite promise of development into combined power and irrigation projects, with storage as the essential feature of all the projects. Of these, we understand that Government are actively considering the development of two projects as important hydro-electric works. The sites investigated were:—

(i) The Kalinadi River Hydro-Electric Project in North Kanara at the junction of the Kalinadi and the Pandri Rivers,

(ii) The Karjan River Hydro-Electric Project in Rajpipla State located close to the junction of the Tera Nala and the Karjan River,

(iii) The Koyna River Hydro-Electric Project in the Western Ghats situated at about 80 miles south of Poona,

(iv) The Panam River Hydro-Electric Project located at about nine miles from Lunawada town between the States of Lunawada and South Rampur.

218. We are given to understand that Government are considering the development of the Koyna River Hydro-Electric Project, (situated at about 15 miles south-east of Chiplun harbour and 35 miles west of Karad railway station on the M. S. M. line) as a vast hydro-electric scheme to be operated in conjunction with the proposed Electric Grid system to which reference has already been made above. This scheme when fully developed is capable of meeting a maximum demand of about 220,000 kw. which would be greater than the capacity of the entire Tata Hydro-Electric system. Initially, however, only 36,000 kw. will be developed for supply to the Deccan including Sholapur, Satara and Poona districts. It is also intended to develop the Kalinadi River Hydro-Electric Project, situated at about 45 miles south-west of Dharwar railway station and about 25 miles north-east of Karwar port. This scheme when fully developed, is capable of meeting 80,000 kw. although initially 20,000 kw. could be developed economically if load is available. Lastly, under the same scheme it is intended to develop the Bhatgar Hydro-Electric Project situated at about 30 miles south of Poona near the Bhatgar Reservoir. This project can meet a demand of 10,000 kw. provided the power station is linked up with the Koyna River Hydro-Electric station, when developed, or with the Tata system at Poona. Power will then be supplied to the industrial areas of Poona, Sholapur and Satara districts.

219. This in short is the proposed future hydro-electric development in the Province to be undertaken in conjunction with the Electric Grid system. Of these three schemes, the Koyna River Hydro-Electric scheme is the most

promising from the point of view of the Province's immediate industrial requirements. We are of the opinion that Government should give active consideration to the development of the Koyna scheme in as short a time as possible. The scheme will be really vast and when fully developed will be capable of sustaining large electro-chemical and metallurgical industries. Further, we, particularly stress the importance of the other hydro-electric schemes and trust that Government will place their development in the forefront of their post-war schemes. When fully developed, these works will open up new vistas of industrial development and will solve our most pressing problem of the supply of adequate motive power for our vastly increasing industries. There is every likelihood that new industries like the nitrogenous industries, the electric smelting of indigenous iron ores, electric welding, reduction of aluminium, manufacture of calcium carbide, electrolytic production of chlorine gas and a host of other key industries would be established in the Province if cheap electric power is available in large quantities and at a low rate.

220. In concluding this note, we stress the urgent necessity of increasing the generation of electricity, by some means or the other, in Bombay city and suburbs. In the major proportion of the answers received by us from representative metals and engineering concerns located in the city and the suburbs, our attention has been drawn to the inadequate supply of electric power not only for the future expansion of production capacity but also for present operations. The scope of manufacturing activity of these factories has been considerably increased on account of War demands, and there are signs that this tempo of activity will continue in the post-war period. If the Provincial industrial structure is to naturally expand in the wake of increasing demand, the shortage of power and particularly electric power must be solved. This question has become all the more urgent when we consider that a number of new industries are to be located in areas contiguous to the city and the suburbs which will require electric power in large quantities, in the absence of easy availability of coal, in which Bombay Province is singularly deficient and for which there is such an acute shortage in the country that it would be disadvantageous to rely upon it as a source of power. We therefore strongly recommend that Government should take steps to supply additional electric power to industries located in Bombay city and suburbs to promote industrial development. In this connection we draw the attention of Government to a persistent belief amongst Provincial industrialists that there is quite a good amount of additional electric power available but which is still reserved for essential defence requirements. If this is true, we are strongly of the opinion that there is no justification now that the War is over for withholding this quantity of power which should be released for industrial requirements immediately.

Government must realise that the development of Bombay Province as a vast engineering and manufacturing centre, for which it is really well suited, is indissolubly bound up with the availability of large quantities of electric power at a low rate.

**Summary of Main Recommendations.**

(a) Government should undertake without delay a Provincial Hydrographic Survey.

(b) If new water power resources are located, capable of being successfully harnessed, Government should consider the question of undertaking the establishment of hydro-electric works, particularly in those areas in which natural resources are available.

(c) Government should give active consideration to the development of the Koyna River Hydro-Electric Scheme in as short a time as possible.

(d) Government should place the development of other hydro-electric schemes in the forefront of their post-war development plans.

(e) Government should take steps to supply additional electric power to industries located in Bombay city and suburbs.

(f) If additional electric power is still reserved for essential defence purposes, we strongly recommend that Government should release immediately the quantity of electric power so reserved for industrial requirements.



## CHAPTER XXI.

## ROAD AND RAIL TRANSPORT.

221. Our attention has been drawn to the recent statement of policy by the Government of Bombay in which they declare that " Since it is clear that no kind of improvement can be fully or successfully introduced until there is proper access to all parts of the Province, particularly the outlying villages, the Government will put the development of good communications in the forefront of its scheme. " \* We observe that the Government of Bombay plan to spend about Rs. 14½ crores in the first five-year period and a total of Rs. 44 crores in 15 years. It is expected that this comprehensive scheme of building and improving roads will, when completed, provide 2,700 miles of national highways, 5,600 miles of provincial highways, 6,000 miles of major district roads, 10,000 miles of minor district roads and 14,400 miles of village roads. The following table shows the extent of the existing roads and the proposed new roads in the Province of Bombay :—

	Existing Roads.	New Roads.	Total Anticipated mileage.
National Highways	... 2,700	.....	2,700
Provincial highways	... 2,500	3,100	5,600
Major district roads	... 3,000	3,000	6,000
Minor district roads	... 2,250	7,750	10,000
Village roads	... ..	14,400	14,400

222. On the other hand the Road Plan drawn up by the Government of India proposes the construction of new roads throughout India at a capital cost of about Rs. 450 crores, bringing the total to 400,000 miles as against the existing mileage of 242,000. It envisages the construction within 10 years of national highways going through Provinces and States with a network of provincial, district and village roads and it also aims at connecting villages with one another.

223. Considering these plans we feel that there is little left for us to recommend in regard to the development of road communications in the Province. We would, however, be failing in our duty if we did not recommend to Government, the urgent necessity of executing these plans without delay.

It is well known that the state of all types of provincial roads is far from satisfactory. At present, there are practically no roads worth the name except a few highways running through the Province. Most of these are unmetalled and in need of urgent repairs. As far as the other roads are concerned, they are in a miserable condition with the village roads being nothing more than a mere tracks cut by carts which are generally obliterated in the monsoons. That this state of affairs needs vast improvements, none will deny. The formulation of the Provincial Road Plan is, therefore, very timely, but its execution requires considerable dispatch.

224. We are of the opinion that a widespread use of motor transport will provide a much faster and efficient system of transport, preserving at the same time the surface of the roads. In our opinion the Provincial Government should, therefore, give every encouragement to the extensive development of

\* Planning for the Future of Bombay's Countryside - a pamphlet issued by the Government of Bombay, P. 4.

motor services throughout the Province. Even the Indian Railways Enquiry Committee (Wedgewood) declared that "In India, no less than in other countries, the omnibus can do much to transform life in the villages by bringing them into direct contact with the neighbouring towns and the railways".\*

225. In regard to the Provincial railway system, we understand that the Government of India have drawn up a Railway Plan under which is proposed to construct 5,000 miles of new lines in India at a cost of Rs. 100 crores spread over 10 years which will include a vast programme of relaying of tracks. This War has revealed the serious defects in our railway system which proved thoroughly incompetent to meet the sudden large demands for the movement of traffic thus causing severe losses to a number of Provincial industries. We are of the opinion that the time has come to effect improvements in the transport system by undertaking on a large scale the building of passenger cars, freight cars, locomotives and other railway equipment. In regard to improvements in goods traffic, we recommend that, in addition to putting into service more freight cars, the speed of goods train services should be accelerated to secure speedy despatch of goods and also have a large turnover of goods carried by wagons.

226. Lastly, in our opinion, the systematisation of transport, under the road-rail co-ordination scheme, would be beneficial to Provincial industries.

#### Summary of Main Recommendations.

- (a) Government must execute the Provincial Road Plan without delay.
- (b) A widespread use of motor transport will provide a faster and efficient system of transport preserving the surface of the roads.
- (c) Government should give every encouragement to the extensive development of motor services throughout the Province.
- (d) In addition to putting into service more freight cars, we recommend that the speed of goods train services should be accelerated to secure speedy despatch of goods.
- (e) The systematisation of transport under the road-rail co-ordination scheme would be beneficial to Provincial industries.

\* Report of the Indian Railway Enquiry Committee, P. 89.

## CHAPTER XXII.

## RAILWAY RATES POLICY.

227. The industrial structure of any country is vitally dependent upon a favourable railway rates policy. Well-advanced industrial nations of the world owe not a little of their industrial prosperity to advantageous railway rates framed by their Governments. Seen in this context, it is dismal to record that the railway rates policy of the Indian railways in relation to the industries of the country is far from sympathetic.

228. It is but natural to expect in a country of the size of India where the products of the land, whether raw materials or manufactures, have to travel over vast distances, before they are converted into manufactures or are sold, that railway rates should be framed to the advantage of industries. That this has not been so, much to the detriment of the industrial development of the country, is well known. The Indian railway rates policy has been so based in the past that at every stage it has discouraged the development of industries, encouraged the exports of raw materials and imports of manufactures. Even the Indian Industrial Commission, when considering the various types of railway rates charged in India, remarked that "They have accentuated inequalities and have, on the whole, tended to operate to the disadvantage of internal traffic and, therefore, of Indian industries".\* To give an instance of the crippling effects of railway rates in India we quote the remarks made by the Chairman of the Tata Iron & Steel Co., Ltd., on the effects of changes in freight rates imposed by the Bengal-Nagpur and the East-Indian Railway, at the Annual General Meeting of the Company held on 28th September 1934. He said that "But for this increase in freights, we should have been content with a lower scale of protection" and that "these increased freight charges amount to over Rs. 40 lakhs per year. Without wishing in this place to challenge the equity or otherwise of these revised rates, I wish to point out that they raise issues which are of great importance to industries in general throughout India."

229. The problem of the revision of this highly unsatisfactory system of railway rating has engaged our attention very closely and much as we would have liked to consider it in detail, we are unable to do so for want of time. We should, however, like to direct attention to the following features on which some action is badly called for:—

(a) Railways in India possessing as they do the power to alter minimum and maximum rates have a potent instrument by which they can either obstruct or foster industrialisation. The history of railway rates in India proves that this power has been predominantly used in a negative manner with deleterious effects on industrial development. We are of the opinion that this matter requires a close examination by Government without delay.

(b) It is too well known that the Indian railway rate structure is fixed in such a manner that traffic to and fro ports is encouraged with resultant disadvantages to industries located in areas away from ports. As rates at ports are generally lower than internal rates the result is that an industry internally located cannot take full advantage of its favourable

\* Report of the Indian Industrial Commission, P. 206.

geographical location, and falls a prey to the temptation of locating itself in a port town to avail of the freight advantage, inspite of other geographical factors of location being unfavourable. This system has acted detrimentally to the interest of industries located in the interior of India, and has promoted a lop-sided development. We are fully aware of the comparatively favourable railway rates the industries of Bombay city enjoy on account of the present anomalous railway rating system in India. We admit that this has attracted industries to Bombay city and its outlying areas. We also admit that a fair proportion of the success of the industries located in Bombay city is due to this favourable rating. The question, however, is whether this unfair rating system, which is positively beneficial to the industries in the city, should be allowed to continue in the national interests. After detailed consideration from the national point of view, we are convinced that in the larger national industrial interests, although it would be a definite loss of advantage to industries located in Bombay city and outlying areas, internal traffic should be rated on the same basis as the rating of traffic of the same class travelling to and fro ports.

(c) Although the cost of transporting goods in the interior of the country is unduly high on account of the peculiar railway rating system, it is made prohibitive, in a number of cases, by the charging of different railway rates by different railway systems most of which have separate rating schedules. These railway systems consider themselves as entirely separate units for through booking with the result that one definite rate or telescopic rate is not quoted for the entire distance. We, therefore, recommend the introduction of the system of uniform and telescopic rates with one rate being charged, for the entire distance, for a consignment travelling over more than one railway system. We should like to go a step further and recommend that the consignment should even be made to pay lesser freight charges per mile as the distance increases, as otherwise the cost of transport over vast distances would be unduly prohibitive, stifling the industries concerned.

(d) We are also of the opinion that, as far as possible, special rates should be granted to basic and key industries. In addition, new industries which are recommended for establishment in the Province should be quoted special rates especially in the initial stages of development. All such grants of special rates should be based on definite principles and, wherever concessions are made, Government should take great care to see that they are not initiated under the force of political intrigues or partisan motives but mainly dictated by the interests of the country as a whole and its future industrial development.

230. We are of the opinion that these revisions in the railway rate schedules brook no delay and that the Government of India should immediately appoint an expert committee to examine the entire problem of railway rates and recommend the most suitable manner by which the railway rate structure could

be revised so as to foster the development of industries in the country. This committee should also examine the question of framing railway rates in such manner that new traffic would be created. We recommend that there should be some representation of Provincial industrialists on this committee.

231. The handling of freight is another important subject in which some urgent improvement is necessary. None will deny that under the present supervision, there is improper and careless handling of freight by the railway staff which results in considerable damage to goods, which adversely affect insurance claims, etc. The situation worsened during the War and there is no improvement even now. We recommend that there should be a complete overhaul of the system of handling freight which should be mechanised as far as possible and should be under the care of responsible supervisors, who should be made responsible for the proper handling and safety of goods.

232. In conclusion we repeat that in the post-war period, when there are so many concrete schemes of industrialisation on the anvil, there is perhaps no problem affecting industrialisation in India which needs so urgent a solution as the railway rates policy, which will largely determine the development and expansion of industries in the country.

#### Summary of main recommendations.

(a) The power possessed by Indian railway systems to alter minimum and maximum rates requires a close examination by Government without delay.

(b) Internal traffic should be rated on the same basis as the rating of traffic of the same class travelling to and fro ports.

(c) We recommend the introduction of the system of uniform and telescopic rates with one rate being charged for the entire distance.

(d) We recommend that consignment should be made to pay lesser freight charges per mile as the distance increases.

(e) As far as possible special rates should be granted to basic and key industries. New industries which are recommended for establishment in the Province should be also quoted special rates especially in the initial stages of development.

(f) Government should immediately appoint an expert committee to examine the entire problem of railway rates and to recommend the most suitable manner by which the railway rates structure could be revised so as to foster the development of Indian industries in the future. There should be some representation of Provincial industrialists on the committee.

## CHAPTER XXIII.

## INDUSTRIAL RESEARCH.

233. "Present research activity in India does not represent even the bare minimum whether judged by international standards or the actual requirements of the country in her present stage of industrial development." Except for the establishment of a Council of Scientific and Industrial Research, a Board of Scientific and Industrial Research, the Industrial Research Utilisation Committee and a few other laboratories and test houses, no further steps have been taken by either the Central or Provincial Governments on the subject of expanding the scope and utility of technical research and testing in this country. It is true that there are working in India some Technological Institutes carrying on research on particular industries like sugar, textile, etc., and that there are also a few institutes for the improvement of agricultural products and animal husbandry. Yet no concerted attempts have been made to set up a well integrated research and test organisation.

234. In Europe and America, commercial corporations annually spend vast sums of money developing products with a view to providing wider varieties, cheaper sales prices and higher quality. Industrialists in India have unfortunately not yet realised the value of research as a factor promoting the growth of industries. In the absence of Government initiative, Indian industrialists have not been alert to the need for researches and tests and whatever has been done has been undertaken mainly by large organisations like the Tata Iron & Steel Co., Ltd., and others whose findings are private property. In the present circumstances when small scale businesses abound in the Province and in India, it will not be possible for the large proportion of industrial establishments, for a long time to come, to undertake extensive industrial research on a scientific basis. In the absence of such facilities, practically all the metals and engineering products produced in the country are not subject to any form of tests and very little of research work is done on them. If this state of affairs was to continue without improvement, we do not visualise any improvement in the quality of the products turned out, which is so badly needed.

235. The recent decision to set up laboratories in India dealing with various phases of industrial development is welcome. The Government of India have planned to set up a National Chemical Laboratory, a Central Glass Research Institute, a National Metallurgical Laboratory, a Fuel Research Laboratory and a National Physical Laboratory. The Government of India have also under consideration the establishment of a National Standards Institution for the quality control and standardisation of products manufactured in India. We have carefully studied this organisation and whilst we have little to comment on its structure and objects we state that the establishment of such an institute is much too belated and the sooner it is set up the better it would be. In our opinion industrialisation in India would be considerably helped by standardisation and quality control of products enforced by centrally managed Government organisation.

236. In the Province, research and test facilities are conspicuous by their total absence. Except for a few organisations, researches and tests are virtually unknown. For the future development of the Province, we cannot

adequately stress the need for research and test houses on many important metals and engineering subjects. In the absence of a Provincial research and test organisation, there is a serious gap in the Provincial industrial structure which must be filled up soon, otherwise the quality of products turned out by organised industries will continue to deteriorate and much-needed standardisation will never be attained. In these circumstances, until such time as research and testing could be undertaken by private business houses, we recommend that Government should take positive steps for the establishment in Bombay Province of some research institutes, laboratories and test houses, which would undertake extensive research work on industrial raw materials, products and processes of manufacture. In addition to this, Government should also favourably consider all schemes coming from business houses, proposing the establishment of research and test houses, and should give them not only facilities but also provide them with capital whenever required. We particularly welcome the proposed scheme of the Provincial Government under which they plan to set up in Poona, at a cost of Rs. 15,00,000, a Test House for testing engineering materials, structures and machines for the benefit of the public and manufacturers. We understand that this Test House will be fully equipped for carrying out metallurgical, chemical and physical tests on engineering materials and machines and will also lay down certain minimum standards and specifications of materials and machines used in the Province. We recommend that this Test House should be a central agency for the whole Province co-ordinating the work of Provincial pilot plant and subsidiary test and research houses.

237. We now refer to the urgent necessity of establishing pilot plants in the Province. In well advanced industrial nations of the world, there is a professional body of industrial engineers and consultants whose main business is to supply promoters with valuable information on the industrial value of raw materials, their economic utilisation and the most efficient plant and structure that would be required. Their speciality is to supply rich practical industrial experience to entrepreneurs with a view to reducing their preliminary expenses to the minimum. On the other hand, the risk to which private enterprise is exposed in India is very great. The country's lack of industrial organisation and the absence of a body of consultants to supply industrial experience is a grave anomaly in its industrial structure. The development of industries in India presents to the entrepreneurs a number of problems connected with efficient production. Many a times he is placed in grave doubts about the economic utilisation of raw materials or the economic possibilities of certain processes of manufacture. The result is that as a rule the Indian entrepreneur is proverbially shy of investing money in industries which have not yet been established in the country. To make the situation worse he has no facilities worth the name to do even a little bit of "pioneering" work, and if at all he undertakes it, he usually spends quite a good part of his capital to gain valuable practical information which in other countries can be obtained by paying nominal fees to special industrial consultants. In our opinion the time is now to help him. We, therefore, recommend

to Government the establishment in Bombay Province, on a small commercial scale, of a number of pilot plants working on various untried manufacturing fields, which would undertake commercial tests and pass on the industrial experience acquired to industrialists planning to establish industries.

238. Before we conclude, we should like to refer to the main recommendations of the Industrial Research Planning Committee, appointed by the Government of India, under the chairmanship of Sir Shanmukhan Chetty, which has just concluded its deliberations. Pointing out the dearth of research workers in the country, the Committee recommended the establishment in India of a National Research Council, which should give, among its other functions grants-in-aid to Indian universities for the training of scientific assistants. Further they have recommended that the Council should organise and maintain national laboratories and specialised research institutes, stimulate pure and applied research and set up a Board of Standards and Specifications. This scheme could not be considered by us, in detail, but we commend it for the serious consideration of the Government of India as it is the first time, to our knowledge, that such a comprehensive well-integrated plan for industrial research in India has been drawn up.

#### Summary of main recommendations.

(a) Until such time as research and testing are undertaken by private business houses, Government should take positive steps for the establishment in Bombay Province of some research institutes, laboratories and test houses, which would undertake extensive research work on industrial raw materials, products and processes of manufacture.

(b) Government should favourably consider all schemes coming from business houses proposing the establishment of research and test houses and should give them not only facilities but also provide them with capital whenever required.

(c) We recommend that the Provincial Test House proposed to be established at Poona by Government should be a central organisation for the Province co-ordinating the work of Provincial pilot plants and subsidiary test and research houses.

(d) We recommend to Government the establishment in the Province, on a small commercial scale, of a number of pilot plants working on various untried manufacturing fields which would undertake commercial tests and pass on the industrial experience acquired to industrialists planning to establish industries.



## CHAPTER XXIV.

## STATISTICS.

239. There is perhaps no aspect of Government activity in India which is so utterly neglected as the maintenance of up-to-date vital and industrial statistics. Beyond the holding of a decadal census of population, the scope of which even was drastically curtailed during the War resulting in the omission of valuable information, the Government of India does not undertake any comprehensive collection and dissemination of information pertaining to the trade, industry and commerce of the nation. There are of course certain publications prepared by the Government of India and the Provincial Governments but these are either issued after the value of the information contained in them is lost or are printed in such limited numbers that they are unavailable to the rank and file of the business community.

240. The general importance of industrial statistics cannot be adequately stressed. It is universally recognised that unless there is some statistical base, industrial planning cannot have any foundation. The pre-requisites of planning are of such a nature that the planning body, if they are not to go awry, must base their conclusions on solid facts and not on empirical generalisations. "The nation which studies the drift of events, as it is revealed by the statistical analysis, will be infinitely better equipped to take advantage of its opportunities than another which perhaps trusts only to the methods of empiricism".\* In addition to the fact that an up-to-date system of industrial statistics provides data pertaining to the industrial progress of a country, it is also useful in focussing attention on deficiencies and redundancies in the industrial structure so that they could be solved.

241. We are of the opinion that if planning in the country is to have any success, it must be materially assisted at every stage of its formulation by statistical data covering all the aspects of the industrial economy of the country, particularly showing clearly, the trend of the trade markets and prices, the state and equipment of industries, the reserves of industrial raw materials, the scales of wages, the income in the hands of the people, the distribution of income over various heads of expenditure, the geographical distribution of population and lastly detailed classification of existing industries, their capacities and their production. To collect and analyse the above data would require a huge organisation and there is no reason why one should not be established by the Central Government which will work in co-operation with the Provincial Governments.

242. - Many major Provinces have organised statistical work and have established Commercial and Industrial Statistical Sections. It is generally felt that the work of the Provinces is, in the main unco-ordinated, as the consequence of which the results of statistical researches undertaken by them are not capable of being woven into one close pattern which would serve the needs of the country as a whole. The need of the moment, therefore, is a central statistical organisation controlled by the Government of India. We admit that this is a subject which is beyond our terms of inquiry. But it is of such supreme importance for the national industrial development that we

\* The *London Times* referring to the Empire Statistics Conference of January-February 1921, quoted by the Central Provinces and Berar Provincial Industries Committee Report, Page 85.

have thought fit to refer to it. Making a very cursory recommendation, which merits further consideration before formulation, we feel that the immediate need in the country is for the establishment of a Central Statistical Office, by the Government of India, on the lines of the U.S. Bureau of Census.

243. The Central Statistical office must prepare vital statistics of national importance on the following subjects,—

- (a) Census of population,
- (b) Census of agricultural and industrial production,
- (c) Census of per capita income,
- (d) Census of national income,
- (e) Census of large-scale establishments in India,
- (f) Index of price movements both agricultural and industrial,
- (g) Index of cost of living,
- (h) Review of the sea-borne trade of India,
- (i) Review of the inland trade of India,
- (j) Review of the movements of goods and passenger traffic on Indian railways,
- (k) Figures relating to the quantity and value of the coastal traffic of India.

Statistics on some of these subjects are already being prepared but their scope should be further extended to render more useful information. This subject of statistics is of such national importance that a separate department of the Government of India needs to be constituted with a Member in charge. To give effect to the proposals and carry out the statistical analysis in a comprehensive form, the department should be staffed by a large well-trained permanent secretariat which should preferably be divided into separate sections under Directors or Research Officers dealing with each of the above subjects. The above classification is by no means exhaustive and the Government of India should elaborate it according to the needs of the country.

244. In regard to the statistical set-up in the Provinces we recommend the immediate establishment of a comprehensive statistical organisation, very well staffed and under a separate Director, which should carry out statistical analysis of facts in which the Province is vitally interested such as the following :—

- (a) Census of wages of different classes of industrial and agricultural workers,
- (b) Classification of expenditure of wages on various heads of consumption,
- (c) Statistics relating to cottage industries,
- (d) Census of public health and detailed inquiry into the causes of deaths and their relative percentages,
- (e) Census of agricultural population,

(f) Census of labour employed in industrial establishments coming under the Factories Act,

(g) Census of hours lost on account of strikes and industrial disputes with their relative causes,

(h) Census of housing conditions of industrial labour.

Statistics on some of the above subjects are already being prepared but their scope should be further extended to render more useful information. In addition to the above, the Department should actively assist the Central Statistical Office in the preparation of vital national statistical information.

#### Summary of main recommendations.

(a) We feel that the immediate need in the country is for the establishment of a Central Statistical Office by the Government of India.

(b) We recommend the immediate establishment in the Province of a comprehensive statistical organisation very well staffed and under a separate Director, which should carry out statistical analysis of facts in which the Province is vitally interested.

## CONCLUSION.

This Report is but a rapid survey of the existing Provincial industrial structure, as the number of subjects that we had to consider and the limited time at our disposal prevented us from undertaking a detailed inquiry. The recommendations made in the Report, in regard to the lines on which our future industrial development should be based, should engage the detailed attention of the Provincial Industries Committee. We are of the opinion that when considering the recommendations, the Committee should bear in mind the general suitability of large-scale and medium-scale methods of approach, particularly necessary in metals and engineering industries, and not be led away by the small-scale method of industrial organisation which appears, much to our discomfiture, to be gaining ground in many quarters where the complexities of industrial economics and the benefits of large-scale production are not readily realised. This does not, however, imply our lack of faith in the small-scale basis of organisation which admittedly is a virtue in a number of cases. What we wish to point out is that without heavy industries our industrialisation will never be self-sufficient and will always lack a solid foundation. We are also of the opinion that in planning the future industrial state of the Province, there should be a large degree of co-ordination between the industrial development plans of the various Indian Provinces and States on the one hand and between the Provinces and States and the Central Government on the other hand.

There is no doubt that there is a great need for further industrialisation in the Province. We have outlined the scheme of expansion for metals and engineering industries in the post-war Provincial industrial plan. In our opinion, Government must place the greatest importance on the development of the Iron and Steel, the Non-Ferrous Metals, the Prime Movers, the Electrical Machinery and the Machine Tool Industry. Whilst the Non-Ferrous Metals Industry, excepting refining of virgin metals, is developed to some extent in the Province, the Province does not possess a basic Iron & Steel Industry. Further, there are very few modern steel re-rolling units operating in the Province and the production of such associated industries like screws, bolts, nuts, rivets, etc., which are so important in the manufacturing and engineering industries, is next to nothing. These two industries should engage very closely the attention of Government for on their development will hinge our future industrial progress. In the Prime Movers Industry we are really backward as compared to Western standards. This is not so in the quality of products turned out, but in the range of production which is admittedly very narrow. The manufacture of light electrical machinery and other types of electrical accessories is quite well established. The need of the moment in this section is the development of heavy electrical machinery and switchgear. The Machine Tool Industry is also comparatively well developed in the Province although manufacturing operations are controlled by a few firms. In this industry, there is more than a need to continue the present concentration on quality and gradually turn out heavier and special purpose machine tools. In General Engineering there is an urgent necessity of turning out good quality castings, both steel and cast iron, and increasing the capacity of the forging and welding work done. All these industries, involving as they do a vast outlay of capital and manufacturing technique, would require a great deal of Government help and encouragement. The remaining industries considered in the Report are dependent for their success on the development of these basic industries.

For the further future development of these industries in the Province, the question of supplying facilities for the purchase of adequate raw materials and new plant and equipment would be a matter of considerable importance. In the case of raw materials, whereas most of these are available in India, industries are unable to obtain their requirements in the right quantity and quality. We admit that the question of quantity is a transient one and will be solved once normal conditions are restored. However, with the inevitable quickening of the pace of industrialisation in the post-war period, the normal requirements for industrial raw materials would increase and facilities should be made for supplying these in India. In the case of all industrial raw materials which are required to be imported, Government must either remove the import duties or reduce them substantially as the circumstances of each case require. In general, the question of raw materials has assumed such serious proportions in respect of the requirements of all industries, that it is incumbent upon Government to see that before their planning programmes are completed, existing industries do not die for want of raw materials. As regards plant and machinery, we observe that except for some types of quality machine tools, there is no quality manufacture undertaken in India, of the various types of specialised plant and equipment such as special purpose machine tools and general machinery required for a number of manufacturing activities. Until such time as the quality manufacture of these types of plant and machinery is developed in India, we would have to rely on imports for our requirements. In these days of exchange restrictions and transport congestions, Government must somehow facilitate these imports from whatever foreign countries they could be purchased. These imports should be allowed only where such plant and equipment as required are not available in the country. In addition to raw materials and plant and machinery, there are a number of specialised component parts and semi-finished products required in various manufacturing fields which are not manufactured in the country. In this also, Government should not only grant all facilities for imports but should also, at least in the initial period, either substantially reduce or entirely remove import duties, as circumstances require, until such time as these component parts are manufactured in the country.

Another pressing necessity is the grant of adequate facilities for the easy acquisition of land required by industries for expansion purposes. A number of new industries are likely to be established in close proximity to Provincial industrial centres. Without Government help in providing them facilities for acquiring sites, new industries would be considerably handicapped at the time of their establishment. We, therefore, recommend Government to take all possible steps to facilitate the easy acquisition of land by industries. In this matter we draw the attention of Government to the acquisition by the Punjab Government of nearly 800 acres of land in Lahore for industrial development. It is a step worth taking by the Provincial Government. In regard to the improvement in the transport system, there is more than a need for a larger allocation of wagons and for the acceleration in the speed of goods train services. We also hope that the Provincial Road Plan would be executed before long.

When the War broke out many ordnance factories operating in India were equipped with up-to-date manufacturing facilities. First class light and heavy machine tools, presses, general purpose plant and equipment and other up-to-date manufacturing and repair facilities were brought out to India under

the most urgent priorities to enhance the manufacturing capacity of war material. There is no doubt that the ordinance establishments are relatively better equipped than civilian engineering firms to undertake most of the ordinary and specialised metals and engineering work. It would be, however, inadvisable to place reliance on the production facilities available in these establishments. We are of the opinion that the future state of our industrial organisation should be entirely self-sufficient in respect of all types of industrial facilities and should not in any way rely on some of the production and manufacturing facilities available in these establishments. The reason for this line of policy is that, the moment another War starts or is even likely to start, these ordinance establishments will be required to stop completely their ordinary peace time working and revert to the production of materials for the Defence Services leaving our industrial structure high and dry without facilities for some of the important manufacturing and repair activities.

It is perhaps not too readily realised that crippling losses inevitably follow from industrial inefficiency. These losses creep into the very industrial and social structure with disastrous results. Inefficiency is such a steady process that its effects are hardly noticeable until realisation is brought by constant cut-throat competition and loss in production. Considering the industrial organisation of the Provincial factories we are of the opinion that it needs further improvements. The general impression gathered by us from our visits to some of the representative metals and engineering concerns located in Bombay city convinced us that most of the establishments would be well served with improved plant and equipment, well designed lay-outs, better production planning and better labour relationships. We are glad to record that there is a perceptible tendency on the part of at least some of our prominent manufacturers to pay detailed attention to these problems. In the interests of the national industrial structure, we strongly advise Provincial manufacturers to undertake the technical reorganisation of their manufacturing units and thus bring about a high degree of technical efficiency. The time is particularly opportune as a number of our industrial units are likely to expand their manufacturing capacity by the installation of new plant and equipment. If, at the moment of such expansion, detailed attention is not paid to the entire rearrangement of men, machines and manufacturing processes, with a view to promoting the maximum utilisation of manpower, materials and machines, our industrial structure will acquire a lasting legacy of inefficient industrial organisation.

## A NOTE ON THE AVAILABILITY AND UTILISATION OF ALL TYPES OF METALS SCRAP.

This inquiry was undertaken by us in the closing stages of our work. It was our intention, when we decided to consider this subject, to make a thorough statistical analysis of the availability and utilisation in the Province of all types of ferrous and non-ferrous metals scrap. With that purpose in view, we addressed a few questions to all the important Provincial concerns which carried on an extensive trade in these types of metals scrap and also to some Government departments directly connected with this subject. We regret to say that the response from these parties was very unencouraging. Even the Collector of Customs, Bombay, was unable to give us details of the exports and imports of the various types of ferrous and non-ferrous metals scrap and supplied us with information which was easily available in the Annual Statement of the Sea-Borne Trade of British India but which was absolutely inadequate for our purpose. In view of this, we had to abandon our original project of making a census which would have proved really useful in estimating the demands and consumption in the Province of all types of metals scrap.

In all advanced industrial nations of the world, secondary production of metals from scrap is an important part of the industrial economy. We have already referred briefly to this aspect of the metals and engineering trade in the Chapter on the Non-Ferrous Metals Industry. Suffice it to say that even where natural resources of ores of various ferrous and non-ferrous metals are available for reduction purposes, refining from scrap is extensively undertaken to supplement the supplies of metals with a view to preserving the reserves of ores. To illustrate this statement we give below a table showing the secondary consumption of non-ferrous metals from scrap as compared to the virgin consumption of such metals in the U.K. during the period from 1942-44 :—

Metals.	Total Consumption.	Consumption		Percentage of Secondary Consumption to Total Consumption.
		Virgin	Secondary	
	Tons.	Tons.	Tons.	Per cent.
Copper ...	2,238,519	1,287,542	950,977	42.48
Zinc ...	1,080,837	665,590	415,247	38.42
Lead ...	885,609	631,900	253,709	28.64
Tin ...	89,648	59,544	30,099	33.57
<b>Total ...</b>	<b>4,294,608</b>	<b>2,644,576</b>	<b>1,650,032</b>	<b>38.42</b>

The above table strikingly reveals that between 1942-44, the secondary consumption of non-ferrous metals in the U.K. was as much as 1,650,032 tons giving a percentage of 38.42 of the total consumption. What this quantity must have done to aid the British economy by supplying vital requirements of non-ferrous metals can best be left to imagine. The statistics of the recovery of non-ferrous metals from scrap in the U.S., in the year 1944, are still more striking. Out of 1,000,000 short tons of non-ferrous metals scrap collected, secondary recovery of tin from scrap totalled 32,589 short tons valued at about \$34,000,000 while a new U.S. record was established with the secondary recovery of 325,645 short tons of aluminium. In respect of secondary production of steel from scrap Japan offers perhaps the most outstanding example. Before the War, the major portion of the Japanese

iron and steel industry subsisted mainly on the refining from scrap which was undertaken on a really vast scale. Japan purchased huge quantities of scrap from foreign countries and particularly America. As we will see later, India also supplied a good quantity as compared to her production capacity. Comparative statistics for India are not available. If they were available, they would undoubtedly underline the importance of secondary metals in the metal economy of this country.

The collection and recovery of scrap is not a very easy process. Modern and upto-date methods of grouping, extraction and refining are absolutely essential. In the first place, the scrap collected must be graded and segregated so that the metal is easily recoverable. Alloys of one name may contain varying properties of alloying elements and, therefore, they require careful analysis before melting. Even in countries where the science of secondary production has reached a far advanced stage, the collection of scrap and its proper segregation presents many problems. In India, however, no special attention has been paid to these questions by the dealers engaged in this trade and also by the manufacturers. Not only is there a lack of uniformity in collection, grading, segregation, etc., but consistent attempts have even been made to keep the scrap free from such impurities as dust, oil, pieces of metals, etc. In this question, the primary responsibility is that of the dealers of scrap. It is absolutely necessary that the scrap dealers must exercise the greatest amount of care and supervision in the collection, grading and segregation of scrap and employ the most up-to-date modern methods to carry out this work effectively. Cleanliness is a prime factor in the segregation of scrap. Contamination by means of dust and oil necessitates additional processing which adds to the cost. In this matter, enough clean storage space properly enclosed and compartmentalised for different types of scrap is very important. Further, it would considerably facilitate the work of scrap dealers, if producers of scrap i.e., factories, segregate the scrap at its very source which is then sold to dealers of scrap in separate lots each containing a particular type of scrap. Thus, if all manufacturing establishments and general machine shops were to provide separate containers for each type of scrap, not only would the work of segregation of the scrap be facilitated but also a better price would be obtained for sales. In his present ignorant state the methods employed by the scrap dealer are not such as would produce successful results. We are of the opinion that scrap dealers must organise themselves into an association to carry out this work effectively. This association should then be instructed by the secondary producers in the methods of collection, grading and segregation of all types of metal scrap.

With these general remarks, we now consider the ferrous and non-ferrous metals scrap industries. For the purpose of consideration this note is divided into two sections, one dealing with Ferrous Metals Scrap and the other with Non-Ferrous Metals Scrap.

**Ferrous Metals Scrap.**—Ferrous metals scrap are the scraps of iron and steel. Before the War, the re-rolling of ferrous metals from scrap was undertaken on a small scale in India. Whatever was done was mostly carried out by the primary producers of steel and there was some re-rolling work outside these primary producers. Before the War, as Indian production of iron and steel was generally sufficient to meet the Indian demand, little attention was paid to the recovery of steel from scrap. As a consequence of this, large quantities of ferrous scrap were exported to Japan. For five years



ending with 1940, the total Indian exports of iron and steel scrap\* aggregated 829,158 tons valued at Rs. 98,26,128. In the same period our total re-exports of iron and steel scrap aggregated 237,032 tons valued at Rs. 71,72,401. The total of exports and re-exports amounted to 566,190 tons valued at Rs. 1,82,93,529 giving an annual average of 113,238 tons valued at Rs. 36,59,706. Of this total, exports to Japan totalled 549,530 tons valued at Rs. 1,77,76,527. After Japan entered the War, exports of ferrous metals scrap to Japan completely ceased. The scrap rendered surplus on account of this was easily absorbed by the Indian re-rolling mills. In point of fact, the War set up such vast demands for iron and steel, that every available ton of ferrous metals scrap was usefully employed. The principal use of the quantity of steel scrap available was by the various Indian re-rolling mills. These mills were compelled to roll billets from steel melted from scrap as the primary producers were unable to supply these mills with their requirements of steel billets. We have already made a reference to this subject in the Chapter on the Iron & Steel Industry. Today the situation has worsened to such an extent that there is an acute shortage of usable ferrous scrap.

With a view to tiding over the present shortage, we have, in other parts of this Report, stressed on the urgent necessity of prohibiting the exports of ferrous metals scrap and encouraging its import free of duty. We once again affirm our belief in this line of policy which, if undertaken, would considerably minimise the present acute shortage of steel in India. In our opinion, urgent Government action is called for as, with the cessation of hostilities, large-scale exports of such scrap may once again commence. We realise that if the present plans of the Government of India to double steel production materialise there would be enough of steel for Indian requirements for some time to come. These plans, even if they were to be energetically implemented, would take anything between 7 to 10 years before they are successfully executed. Until that time, the question of increasing the supplies of available steel becomes most important. We have already recommended a detailed investigation into the economics of the establishment of a steel plant at Kalyan with a capacity of 400,000 tons of steel per annum of which 100,000 tons are to be recovered from scrap. Considering this question, we are strongly of the opinion that the time is more than ripe for Government to undertake a detailed inquiry into the availability of ferrous metals scrap in India and in the Province as this inquiry is not capable of being successfully undertaken by any private agency. Once such an inquiry is concluded, it will enable Government to formulate a concrete plan for the economic utilisation of the available scrap with a view to augmenting our short supplies of steel and particularly ensuring adequate supplies for Bombay Province.

*Non-Ferrous Metals Scrap.*—The sources of non-ferrous metals scrap accruing in the Province are as following:—

- (a) Railway workshops,
- (b) Ordnance factories,
- (c) P. W. D. and Government workshops,
- (d) Engineering and manufacturing establishments,
- (e) Utensils manufacturing factories,
- (f) Cottage factories manufacturing utensils,
- (g) Non-ferrous foundries.

\* The nomenclature used in the Annual Statement of the Sea-Borne Trade of British India is "Iron or Steel, Old for Re-manufacture."

The types of scraps available from these sources are likely to be those of alloys of copper, brass, bronze, ball-metal, gun-metals, aluminium, white metal, lead and zinc.

Non-Ferrous metals scrap is usually divided into 5 sections-according to the basic metal in the scrap. The industry generally employs what are known as "spot tests" for rapid identification which are absolutely essential in order to reduce the labour involved in purifying the metal. The following are the five sections—

(a) *Copper Bearing Scrap.*—This consists of discarded gun-metal; brass and bronze machine part fittings; radiator scrap; copper wire and cable scrap; domestic copper and brass utensils; copper bearing oxides; foundry ashes and dross.

(b) *Tin Bearing Scrap.*—Consists of bearing metal and white metal scrap; discarded type metals and dross; tin solder ashes; tin solder sweated from soldered joints and radiators; tin foil; tin collapsible tubes and caps; Britannia metal and pewter; etc.

(c) *Lead Scrap.*—Consists of storage batteries scrap and dust cable sheathing; water and drainage lead pipes; lead sheet scrap; chemical lead scrap and hard lead scrap from chemical factories; tea chests lead, etc.

(d) *Zinc Scrap.*—Consists of zinc from Iron free galvanising zinc dross; zinc roofing sheets, etc.

(e) *Light Alloy Scrap.*—Consists of aircraft scrap, iron-free aluminium and alloy scrap.

The processes used in the recovery of metals from the above types of scraps are similar to those employed in the manufacture of alloys from primary metals. Properly graded lots of different types of non-ferrous metals scrap are melted into homogeneous lots, usually with a mixture of fluxes, to remove impurities. The purified metal batches are then analysed and then blended with the addition of virgin metals to obtain alloys of required standard specifications. The manufacture of these alloys is the most important part of the functions of the secondary metals industry.

At times it becomes necessary to re-process the metal if it is entrapped in drosses or is oxidised or if impurities cannot be removed easily or if the ratio of metal contents does not permit the manufacture of standard alloys directly from scrap. The reduction operations employed in the re-processing of secondary metals are practically the same as those employed when reducing metals from ores or concentrates. This serves to illustrate that for an economical and efficient working of this industry, expert knowledge in metallurgy is absolutely essential.

No detailed statistics are available about the availability and utilisation in the Province of the various types of non-ferrous metals scrap. In view of the present acute shortage of non-ferrous metals, there is a very good scope for the reclamation, in their pure form, of such secondary basic metals as copper, zinc, tin and lead by electric process. We are of the opinion that there is an urgent necessity for the establishment of an electric refinery to process drosses, concentrates and ashes which are either partly utilised or not used at all at the present moment.

Considering the scope for new industries in the Province based on the recovery of non-ferrous metals from scrap, we are of the opinion that there

is a good field for the manufacture of aluminium alloy castings of such items as window frames hinges, household fittings, furniture fittings and other utilities which are capable of being successfully manufactured from various types of aluminium scrap. Large quantities of such aluminium scrap are being offered today in the market in various percentages of aluminium, zinc, copper and other minor metals. The modern process is to use pressure casting machines in the manufacture of such alloy castings. We are of the opinion that there is room in the Province for about three to four die-casting machines of this type. In the same way, brass castings of much better quality can also be manufactured.

As the supplies of non-ferrous metals scrap available in India are insufficient for recovery purposes, Government should not only prohibit entirely exports of all types of non-ferrous metals scrap but should also allow imports of such scrap free of custom duties.

In the near future, in the industrial economy of India, the secondary metals industry is bound to play an important part. As long as our present deficiency in vital supplies of ores of ferrous and non-ferrous metals, continues, we will have to resort to this industry for a solution of the metals shortage in India. No country in the world can claim to be industrialised if it lacked the metals industry or possessed it in a negligible form. We, therefore, consider that the development of the secondary metals industry, both ferrous and non-ferrous, should be kept by Government in the forefront of their post-war development plans. All aid should be given by Government to develop this industry on right lines. In particular Government should facilitate the imports of foreign plant and machinery and make available to the secondary producers cheap and abundant electric power. A considerable reduction of freight rates on the internal movement of metals scrap for indigenous smelting and refining purposes only should also be favourably considered by Government. If these measures are taken and if exports are prohibited and imports allowed free of duties, the development of the secondary metals industry would be considerably aided.