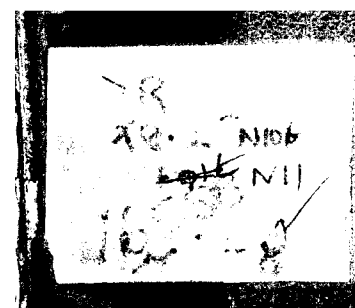




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REPORT
OF
THE SIXTH
INDIAN INDUSTRIAL
CONFERENCE

HELD AT ALLAHABAD

ON THE

30th December, 1910

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INTRODUCTION.

'The prosperity of the country should be our first thought and, I venture to think that the gratification of our political aspiration is of little avail, if this be lost sight of.' (*Presidential address of Mr. R. N. Mookerjee*, p. 13).

'This (foreign competition is a most serious question, gentlemen, and not only this Conference but every man of this country should continue to constitutionally agitate, until Government affords Protection, in some shape or other, to local manufactures. We all know that if the Government of India were left alone to do its duty towards India, there would be no hesitation in introducing some such measure, suitable to the special needs of India. But there are stronger influences at work, whose interests clash with our own, and without the combined efforts of the Government and the people, I am afraid, we shall never get a satisfactory solution.' (*Ibid* p. 12).

'A benevolent inactivity is not the attitude we have a right to expect from Government and indefinite promises of assistance are not of any practical value. Nothing short of definite, and fully authorised, assurances of support, confirmed, if necessary, by legislative enactment should satisfy us. Indefinite promises, in such matters, are subject to different interpretations by different people.' (*Ibid* p. 13).

'The end of all Government is the highest happiness of the people. This happiness is only possible, if the people have wealth, which can only be obtained by trade.' (*The Hon'ble Pandit Madan M. Malaviya*, p. 2).

'We, who think that we are educated and progressive, we, who attend Conferences and sit on legislative councils, who are rulers of states, or earn more princely incomes in courts of law, we ourselves have despised and hated everything Indian, and it is by that hatred that we have destroyed our industries and degraded the status of our artisans.' (*Dr. A. K. Coomaraswamy*, p. 270).

'The "Swadeshi movement" must extend into the Christian communities in such a way, that they will be left independent if all the missionaries were packed off to the countries, from which they originally came'. (*Revd H. Fairbank*, p. 262).

The Sixth Indian Industrial Conference was held at Allahabad on Friday the 30th December, 1910. The session met under exceptionally favourable auspices and has been pronounced on all hands to be a great success. The attendance was full and consisted of representatives from various Provinces

who take a lively and real interest in the economic and industrial problems, which are at present occupying the minds of all thoughtful men in the country. There were also many sympathisers with the movement, who honored the session with their presence. The Conference was also fortunate in securing as its President, a distinguished practical industrialist of the type of Mr. R. N. Mookerjee, C. I. E., the senior partner of the well-known firm of Messrs. Martin & Co. of Calcutta, who holds a high and recognised position in the commercial and industrial circles of Bengal. He is also the Sheriff of Calcutta, and is associated with various public institutions of the metropolis of India in different capacities. He is a member of the governing body of the Sibpur Civil Engineering College, a trustee of the Indian Museum, and a Fellow of the Calcutta University. It is no wonder that under the guidance of a distinguished man like Mr. R. N. Mookerjee the proceedings of the Conference were crowned with success. The several resolutions submitted to the Conference, were passed after being thoroughly discussed by persons qualified to deal with the questions handled by them. As usual a fairly large number of papers were contributed by various official and non-official gentlemen from different Provinces of whom many having expert knowledge, could speak with authority. The value of their contributions to the literature of the Conference must be gratefully acknowledged. The Presidential address, is replete with eminently practical suggestions, which deserve the most careful study.

In the opinion of some very sincere and well meaning friends who are intimately acquainted with the aims and objects of the organization and are in close touch with the movement, the time has now arrived when, the Conference ought to introduce a change in its methods of work. According to their view the reports of the last six or seven years' Conferences, furnish more than sufficient information of a general character on important industrial and economic questions. It is, therefore, high time, in their opinion, that the Conference should attempt to be more practical in its mode of work by selecting for discussion one or two principal industries like Sugar Manufacture or the extraction of oils from oil seeds, compiling

a symposium on each subject, containing the views and practical suggestions of well-known experts in each line. This, they hold, will lead to more tangible results, being achieved by the Conference. This suggestion coming from influential and well intentioned quarters deserves to be seriously considered. A mere reference to the summaries of proposal, and suggestions published at the beginning of all the previous reports will convince the most casual reader that many of these suggestions are eminently practical. It will be a matter for the next Conference to consider this subject in all its bearings and arrive at some conclusion.

The preliminary arrangements of the Allahabad Session were undertaken by the Honorable Pandit Madan Mohun Malaviya, the leading public man of the U. P. He was assisted by Mr. Purushotamdas Tandon, High Court Pleader, who acted as the Secretary of the Reception Committee.

The proceedings were opened by the Honorable Pandit who as Chairman of the Reception Committee delivered a short and interesting address. The rigour of famine, he said, had been felt only since the decline and downfall of Indian industries which, according to authentic information, were once in a flourishing condition and had now been replaced by the sole industry of agriculture, with its precarious prospects. This fact he further exemplified by referring to the great Exhibition across the road, which had many lessons, to teach to the educated and the illiterate alike. He rightly complained :—

"The Exhibition brings to our knowledge the great natural resources of our country and demonstrates at the same time how backward we are. It reminds us that our agricultural methods are still primitive and we have only to look at the Industrial and Engineering Courts of Germany to know where we stand to-day," (p. 2).

A very wide extension of primary and agricultural education alone can appreciably mend matters. With an appeal to Government to allot more funds for the diffusion of technical and scientific education, he expressed the hope that a central technological institute, would be established in a suitable place in India before long, to commemorate the visits of their Majesties the King Emperor and Queen Empress to the shores of this ancient land. The learned speaker also

advocated the imposition of protective tariffs and even bounties for the benefit of a few industries, such as sugar and gold thread manufactures, which were once in a very flourishing condition.

The Presidential address of Mr. R. N. Mookerjee, C. I. E., is as might be expected of a successful business-man, full of sound and practical advice and was rightly admired both by the Anglo-Indian and the Indian Press for its wide range, breadth of view and business and commercial insight.

Mr. Mookerjee points out at the very outset of his address why so many of our efforts to start small industries have failed. His remarks on this point are worth quoting :—

"In the present condition of our country we should recognize that to develop any industry successfully, we must have, first and foremost, expert knowledge as well as men of undoubted practical experience in the particular industry which we desire to establish. From Bengal students have been sent abroad to Europe and America, at public expense, to acquire scientific knowledge. Some of these students have returned, and doubtless, have acquired a fair knowledge of what they were sent to learn but they must necessarily lack that practical training and capacity for management, that comes only with long experience and is so necessary for men, who hope to become pioneers of new industries. None of these students, so far as I am aware, has shown any capacity for taking charge of, or efficiently managing, any large industrial concern. Nor do they get any opportunity, prior to being sent abroad, to acquire sufficient technical knowledge here, that they might ascertain for themselves, whether they have any liking for, or aptitude in the particular line in which they are to become experts." (pp. 7, 8).

"If we are," says Mr. Mookerjee, "really serious in our desire to give an impetus to the development of our industries, we should press for the establishment in some central part of India, of well equipped Technological College fitted with proper workshops and up-to-date laboratories, where students from the existing technical schools in the country as well as B. Sc. students from the universities can complete their training and acquire practical knowledge," and recommends that the Conference should draw up a draft scheme and approach the Government with a request for the establishment of such a College, thus, doing away with the necessity of sending a large number of young and untrained students to foreign countries, whose election is at present made in a more or less haphazard

fashion with the result that in most cases money spent on them has been merely wasted. His note of warning in this respect deserves very careful consideration.

In the present state of our country, Mr. Mookerjee suggests that we should not hesitate to employ foreign capital, engage foreign experts and form Joint Stock Companies to raise capital, as private enterprise in India is almost in its infancy owing largely to the want of industrial and commercial knowledge on the part of capitalists, coupled with their disinclination to depart from their antiquated methods of investing money. Mr. Mookerjee exhorts the possessors of wealth to part with at least a fractional part of it "to make India industrially equal to any other country in the world." The learned speaker also appeals to Government to grant bounties or levy preferential duties for the encouragement of a few industries as "in a country industrially new as India is, a certain amount of dry nursing has to be done."

Says Mr. Mookerjee :—

"I would suggest that the Government should be approached and asked to appoint a Joint Commission of officials and commercial men to discuss and decide in what particular form Protection would be most beneficial to India. This point should be definitely decided before we actually apply for any protective legislation. I think it is imperative on our leaders to give this question their first consideration and, if we are successful in securing a wise form of Protection, I am sure the country's industrial development will receive a great impetus." (p. 12).

He then proceeds to enumerate a few important points which should be steadily kept in view, when forming Joint Stock Companies and advocates the desirability of securing the co-operation of a few commercial European gentlemen on the Boards of Directors to ensure the success of the concerns.

With regard to the quick disposal of articles manufactured in the country Mr. Mookerjee acknowledges that there are very serious difficulties owing to the formidable competition of foreign manufacturers who at once lower the prices of their commodities to such a pitch as would throttle the infant industries and the only remedy for this evil is that "every man in this country should constitutionally agitate until Government affords protection in some shape or other to local manufacturers."

The speaker next alluded to the necessity of revising the Patent laws to suit the requirements of the country as it will materially assist the establishment of factories for manufacturing the articles protected by the Patents.

In connection with the policy of Government in purchasing stores or articles of indigenous manufacture, Mr. Mookerjee pleads for a change in the present attitude of Government and has some very trenchant remarks to make which may be given in his own forcible style.

"A benevolent inactivity is not the attitude we have a right to expect from Government and indefinite promises of assistance are not of any practical value. Nothing short of definite, and fully authorised assurances of support, confirmed, if necessary, by legislative enactment, should satisfy us. Indefinite promises, in such matters, are subject to different interpretations by different people." (p. 13)

In support of his view he has cited specific instances to emphasise the discouraging treatment received by Indian industrial concerns at the hands of Government and advocates the abolition or at least reduction of the gigantic Store Department of the India Office in England.

In regard to foreign capital, Mr. Mookerjee is in favor of its utilization to the fullest possible extent, on two grounds. (1) It will create in the foreign capitalists a personal interest in our concerns and (2) through their influence, we may secure a measure of protection, where needed.

The importance of elementary education of "the artisan and craftsmen classes" has not escaped the attention, of the President, and he thinks that without this education, these classes cannot be made to appreciate the advantages of introducing machinery designed to save their labour and cheapen the cost of productions.

The President of the Conference deals next with the problem of the building of new Railways and extensions to existing ones and draws attention to the vast opening, which exists for light feeder railways, and complains that the new branch line terms though much more liberal than the old ones "do not go far enough" and he holds that more lines of the light narrow gauge type would be constructed, were the District Boards encouraged to promote such within their districts, and suggests the revival of the proposals for an enactment once contempla-

ted, which authorised the District Boards to levy a special cess for the purpose of guaranteeing such lines. In connection with Railway construction, Mr. Mookerjee recommends the appointment of a Commercial or Financial expert as one of the members of the Railway Board, as the present constitution of the Board is more or less technical in its character. In support of his contention, he cites the instances of the Manganese industry of the C. P. which has suffered in consequence of this want of knowledge of local requirements on the part of the members constituting the Board.

Speaking about the recent efforts of Government for imparting agricultural education and diffusing a knowledge of Scientific methods, he takes rather a very despondent view and expresses his misgivings as to the amount of direct good these schemes will achieve in proportion to the amount of money spent by Government, as it is questionable, he says, how far the students have succeeded in utilizing in practical cultivation the knowledge acquired at an enormous cost.

The Presidential address was followed by the presentation of the Annual Report of the Conference by the General Secretary. The Report was adopted on the motion of Sir Vithaldas D. Thackersey who made a neat little speech in support of it.

The number of papers submitted to the Conference was twenty-nine. Some of the papers were contributed by high Government officials having special knowledge. The others were by non-official gentlemen, a considerable number of whom are persons who could speak with some authority on the subjects dealt with by them.

"History of cotton improvement in India with special reference to the C. P. and Berar," is the title of a paper contributed by Mr. D. Clouston, Deputy Director of Agriculture, C. P. and Berar,—a paper to which the place of honor ought to be assigned owing both to the position of the writer and the ability and expert knowledge with which he has handled the subject. The paper reveals much historical research and contains valuable information on the cotton industry. Mr. Clouston takes us to the earliest periods of human civilization when man-

kind first learnt the art of utilizing various fibres to clothe itself. The author has proved that cotton fibre has been used by the Hindus at least for the last 4,000 years, as the word *karpas* (Kapas) or cotton appears in very ancient Hindu Literature, like the institutes of Manu and that from 1,500 B. C. till the 16th century, India was a recognized centre of cotton industry and its fabrics were for ages supplied to the European countries, and even to Royal families. The first cultivation of this plant in Egypt and Japan is recorded to have taken place in the 13th century. Till the 15th century, dyed and printed calicos and muslins of India were carried to Venice, Constantinople and other places by Phœnician and Arab traders. This trade successively passed through the hands of the Portuguese, Dutch and lastly the English traders. The inventions, however, of men like Wyatt, Pane, Arkwright and others, ushered in quite a new era in the arts of cotton spinning and weaving which was destined to revolutionize the whole industry. To quote Mr. Clouston:—

'India which hitherto had been supplying the western world with her matchless fabrics was to be beaten out of even her home market by the gigantic cotton manufactures of England and the long established handloom industry of India, has terribly suffered during the last century and is well nigh on the border of total extinction unless vigorous attempts are made to resuscitate it.' (Papers p. 3)

The growing demand for the staple commodity emphasizes the need of removing the drawbacks and defects in the supply of this material as far as possible. The chief defects pointed out are the following:—

- (1) Most of our Indian cotton is too short in staple to satisfy the requirements of English Mills.
- (2) Indian cotton is not properly assorted or cleaned and contains more dirt and waste than the American.
- (3) The bulk of the present Indian cotton is of inferior staple.
- (4) A comparatively small quantity of superior staple is adulterated with inferior qualities.

Mr. Clouston next points out that the cultivator does not always get the full market value for his cotton owing to the following causes: (He confines his remarks to C. P. and Berar.)

(1) The middleman pays for a small quantity of superior cotton the same price as he pays for short staple.

(2) The cultivator sometimes takes his long stapled cotton to a market where low grades are only sold.

(3) Cotton is not of uniform staple being a mixture of different types and varieties, which causes deterioration of his crop.

(4) Long stapled cottons fail to realise full value as they contain larger percentage of dirt.

The author then proceeds to prove that owing to the limited area available for cotton cultivation in the Southern States of America, India is the only country which is in a position to extend the cultivation of this fibre to any extent in the near future, and there is thus a promising future for the cotton grower, in the C. P., Berar and other provinces if improvements in this direction are based on the following principles:—

(1) The selection and propagation of pure and selected strains of different races of Indian cotton through the agency of seed farms.

(2) Introduction of such exotic varieties as may prove more profitable than the existing ones.

(3) Improved methods of tillage and a more extensive use of manures.

The paper contributed by Mr. G. S. Henderson, Deputy Director of Agriculture in Sind on "Long stapled cottons in Sind" comes next. The information given in the paper is of great interest to cotton growers or mill managers, who have been closely watching with interest the experiments carried out in Sind for the cultivation of Egyptian cotton. The history of these experiments may be traced back to 1852, when Sir Bartle Frere appointed an American cotton planter to superintend the experiments. It was in 1904, that the work came to be entrusted to persons, who had actual experience of that work in Egypt. Some American varieties are also being tried and promise to acclimatize. During the last season American cotton was grown in about 13 places.

There is however some difficulty every year in the dis-

posal of cotton after it is produced and Mr. Henderson proposes the following plan :—

"After harvest the cotton should be gathered in a few conveniently selected sub-depots. Only clean cotton would be accepted and one uniform grade of Mit-Alihi would be produced. The British Cotton Growing Association might be asked to step in at this stage, and clean, gin and export and sell the cotton, or Government by means of the existing Agricultural Department might buy the crop outright, export and sell it for a few years to see if local firms will not then take it up. The first is by far the simpler and if a good area of say 10,000 acres Alihi could be guaranteed, it would be worth their trouble to send an experienced agent to take over the cotton at Mirpurkhas to clean, gin, bale and export it. Arrangements could be made to get half the value paid to the cultivators on delivery at the sub-depots, the remainder after selling at Liverpool." (p. 23).

"*Agriculture in Bengal*" is the subject of a paper written by Mr. Abinash Chandra Das of Bankura, who traces the history of agriculture right down from the Vedic times.

Once considered a noble and dignified occupation, with the vicissitudes of national ideals, there came a change in the popular sentiment with regard to agriculture, which in course of time came to be regarded as an unclean and low profession, unworthy of the higher classes.

Mr. Das discusses the subject with special reference to Bengal and strongly urges on the middle class youngmen the importance of this pursuit. He suggests the reclamation of waste lands as an occupation which will conduce to the immense benefit of the ryots as well as of the educated middle class. His appeal to young men deserves to be quoted.

"I would strongly urge our young men to turn their attention to the art of agriculture, and equip themselves with a suitable scientific training for successful agricultural work. Let them set up as gentlemen farmers, and make the land yield a wealth of crops, which is far superior to ordinary wealth consisting of gold and silver. Let them earn an honest livelihood, and lead a life of independence, comparative ease and happiness by tilling the soil for crops, by keeping and breeding cattle, by dairy farming, by rearing up forests for fuel and wood on the dry uplands, by gardening and fruit-farming, and by a variety of ways." (p. 42).

In his paper on "Agricultural improvements" Mr. M. B. Sant, Assistant Secretary to the Indian Industrial Conference offers a few practical suggestions, which deserve to be carefully considered by the authorities concerned. Mr. Sant

believes that the efforts of Government in founding the present agricultural colleges, Research Institutes, demonstration farms, &c., require to be supplemented by providing means for the education of the ryot and other practical agriculturists, and suggests that the agency of circle inspectors in the Bombay Presidency and officials entrusted with similar functions in other Provinces should be more extensively employed, for the purpose as these officials being constantly in touch with the farmers possess better facilities for imparting instructions in improved methods and correcting their mistakes. After laying down the duties of these circle inspectors and pointing out the necessity of forming seed depots at every taluq town to be in charge of the mamledar, or mahalkari, Mr. Sant proceeds to the consideration of forest products and other subsidiary agricultural industries, and strongly advocates the employment of foreign experts under agreement to train up a certain number of students within a specified period.

We next pass on to the paper of Rao Saheb G.K. Kelkar of the Agricultural College, Poona, who writes on the "Possibilities of improved methods of dairying in India", with special reference to the Bombay Presidency. The adulteration of milk everywhere is a patent fact and every house-holder would like to see this serious inconvenience removed by all possible means. Professional milkmen in this country are as a rule careless about the methods of feeding the milch cattle and are also ignorant about the proper and correct methods of tending, housing and breeding them. The principal adulterating medium is water, which decreases the nutritive value of the milk and also proves often times a source of a number of diseases injurious especially to children. Dairying has become a regular industry in Western countries and is conducted on scientific principles, with the aid of improved apparatus of the type of the centrifugal cream separator invented by Dr. De Laval rendering dairy operations speedier and simpler than before. Mr. Kelkar justly complains that our dairy industry has remained just where it was centuries ago. He gives the result in the form of a table of the analyses of different samples of milk supplied in cities like

Bombay or Poona to show that the quantity of water mixed with pure milk ranges on an average from 43 to 67 per cent. Children thus get only $\frac{1}{3}$ of the nourishment they ought to get and the result is the high mortality among them.

To remedy this evil, Mr. Kelkar indicates places or sites suitable for starting Dairies, with clear instructions regarding the feeding of cattle and selection of the proper breed.

Along with Mr. Kelkar's paper may be read "Cow-keeping in Bengal" by Mr. A. P. Ghosh of the Commercial Intelligence Department, Calcutta, wherein the author gives a few practical instructions regarding the housing, feeding and breeding of cows which will be found interesting.

Mr. Chotabhai Udairam Patel of Baroda, has contributed an equally interesting paper on the "Economic Entomology in India." Mr. Patel has divested the subject as far as possible of all technicalities which naturally perplex laymen.

He describes the ways in which insects of various types cause damage to crops all over India every year, and thus add to the rigour of famine which makes its appearance regularly in some part of the country or other. It is thus necessary that we must be in a position to control insect life and its activities and make it subservient to our own interests. To devise ways and means to obtain good results both in the reduction of damage done to crops and in the increase of commercially valuable products, is the primary aim of Economic Entomology. "This aim" says the author, "can be attained by a careful study of the subject and investigation of the conditions under which they thrive and the means by which they can be destroyed. After a proper appreciation of the work done by the Imperial Entomologist of Pusa and his staff, Mr. Patel suggests some practical ways of spreading the knowledge of this subject among the cultivators:—

1. Demonstration of the methods of dealing with crop pests, comparing the results with non-treated area.
2. Competition prizes for the best work done in fighting out a particular pest.
3. Encouragement to those who exert themselves in combating the pests according to directions.

4. Exhibition of magic lantern slides dealing with the life histories of insects in villages.

5. Wide distribution of leaflets in Vernacular among the cultivators and schoolboys.

The next paper on the list is on "Wood distillation," contributed by Mr. M. R. Bodas, High Court Pleader, at Bombay. Mr. Bodas points out that Indian forests remain still unexplored except for their timber and contain hidden wealth which awaits exploitation. Out of the numerous possible sources of Commercial profit, the author gives a few details about wood distillation, including manufacture on commercial scale of all the products obtained by dry distillation of wood and other similar vegetable substances. According to Mr. Bodas, the manufacture of wood charcoal, acetic acid, lime acetate, Methyl-alcohol, wood naphtha and other products of wood distillation, for which there is a considerable demand in the market, does not require much capital or a very elaborate or costly machinery. The industry can be started in the midst of a jungle and given the facilities for transport, it can be most profitably carried on under the very trees of the forest. The author proves with the aid of facts, and figures carefully worked out that the industry has a bright future before it and deserves to be taken up by our educated men.

Mr. D. N. Nagarkatti of the Alembic Chemical Works, Bombay, contributes a very ably written paper on "Essential Oils." The information given in the paper is of a highly technical character. After defining the essential or volatile oils and pointing out the distinction between these and the fixed oils, he tries to trace the antiquity of this industry and indicate the sources from which the oils are obtained and sets forth the three different theories about their formation. There are seven methods in vogue of separating the essential oils:—

- (1) Distillation.
- (2) Expression.
- (3) Infusion or maceration.
- (4) Enfleurage.
- (5) Extraction.

(6) Combined enfleurage and distillation.

(7) Extraction by air current.

The author then proceeds to describe in detail each process, with practical hints for persons, who would like to try them. The paper is in fact full of useful information, as it gives the commercial uses to which these oils are put, the principal centres of their manufacture in India, with the possibilities of development of this, as well as other subsidiary industries and concludes his paper with the following eloquent passage emphasizing the importance of the subject—

“To a chemist, the study of essential oils opens a book as yet unroad; for the industrial chemist, the whole of the vegetable kingdom from which he can hope to separate unknown oils; for the practical perfumer, an unexplored region of harmony of music of the odours. To the physicist, the study of essential oils will show that some hypothesis must yet be founded on which he can hope to build up the laws by which different odours act upon the human sensorium, in unison with its other faculties; but the botanist and the physiologist have the grandest task to perform, that of interpreting the language of flowers and know from them the way in which the perfumes are manufactured in the Laboratories of Nature by the higher wisdom (p. 103).

The next paper is written by Mr. C. C. Ghosh, Assistant to the Imperial Entomologist at Pusa, who discusses in detail “The commercial possibilities of Eri Silk.” Eri Silk like all other kinds of natural silk is the product of worms, and the silk produced by worms feeding on the leaves of the castor plants is called after the Vernacular names of that plant Eri, Arundi or Endi silk. It being largely produced in Assam, it is sometimes called Assam silk also.

For commercial purposes there are two classes of silk, (1) reeled or raw silk and (2) spun silk. The paper describes the processes of rearing the worms, the manufacture of silk from Cocoons and gives a historical sketch of the early attempts at producing Eri cocoons in Assam and other parts of India with special reference to the attempts that are now being made at Pusa. There are, in the opinion of the writer, excellent facilities for pushing on this industry to any extent in India and there is no necessity of our importing this article in such large quantities from Japan and other countries. What is wanted in India is a proper organization among

rearers, reelers and weavers, as well as a diffusion of knowledge of sericulture among the educated men who can command capital.

“Progress in Irrigation by pumping in Madras” is the title of the paper contributed by the Honorable Mr. Alfred Chatterton, late Director of Commerce and Industry, Madras Presidency, in which he gives with the aid of carefully compiled statistical tables, a clear idea of the progress made in the Presidency in matters of irrigation, the total number of Oil Engine pumping plants erected since 1902-3 being 246. The Honourable Mr. Chatterton had on two previous occasions brought the subject before the Industrial Conference and now traces in the present contribution the amount of progress made, suggesting the directions in which improvements in the engineering side of this question are likely to facilitate further extensions. The author concludes the paper with the following observation :—

“It will be obvious from these brief notes that in no direction does finality appear to have been reached. In the beginning, when the work was first started the prospects of attaining any marked decree of success were by no means assured. Now it is certain that the use mechanical methods of lifting water will year by year extend, and at no distant date, we shall have thousands of mechanically driven water lifts at work. In every direction, progress has been made. It is now possible to obtain much better appliances than was the case five years ago. Then, we were not certain that underground water could be obtained in sufficient volume in any great number of cases, now, we know that over large areas and in many places it is well worthwhile to instal mechanical arrangements to lift water. Progress has been much greater than was anticipated owing to the rise in value of agricultural products and the large profits that have consequently been made by the land-owning classes. This has, at the same time, increased the cost of cattle labour and compelled the intelligent land owners to turn to engines and pumps as a means of reducing the expense of lifting water and at the same time of bringing a larger area of dry land under wet cultivation. Each advance prepares the way for further improvements and indicates that the efforts now being made will in time be productive of great results.” (p. 131).

The next paper in the list is on “Paper and paper pulp industry in India” by Mr. William Raitt, the well-known Paper Fibre expert, attached to the U. P.

Exhibition held at Allahabad. "Few people" says Mr. Raitt, "realise the extent to which the use of papers has become one of the necessities of modern civilization." We use it in small quantities at a time, and its cheapness does not impress us with the idea of quantity or the cumulative result of its use and waste. As the late Mr. Gladstone once expressed, "the consumption of paper is the measure of a people's culture." Mr. Raitt puts the world's annual consumption of paper, at 8 million tons, with a normal rate of growth at 25% in ten years. United Kingdom consumes about 1 million ton a year whereas India with seven times the population requires only about 40,000 tons, which is another evidence of the illiteracy of its masses. India has to import annually more than half the quantity of her requirements, although she teems with the raw materials for manufacture of wood pulp as well as fuel, lime, water and cheap labour, requiring only a few chemicals to be imported—with such excellent facilities, it is a pity that no attempts are yet made in India to start wood pulp factories and the main object of Mr. Raitt in writing this paper is to prominently call the attention of the Indian capitalists and others to the vast field for enterprise and profit that exists in this industry. He further indicates that the Himalayan spruce and fur and other fibrous materials which can be had in abundance in Indian forests and waste lands, can yield wood pulp, which now is the main ingredient out of which cheap paper is being manufactured in Europe and America. Mr. Raitt observes :—

Let it be said at once that we need not trouble in the least about paper-making,—that is paper-making proper as distinct from pulp-making. The Indian paper trade has shown no want of enterprise in the past and the best proof of that is in the fact that it has now expanded up to the full economic limits of its present raw material supply. Provide new sources of *that*, and the paper-maker will do the rest. In suitable localities erect pulping mills to reduce the local raw material to half-stuff, eliminating on the spot the 60 per cent. of waste and reducing the freight and handling charges in the proportion of 2½ to 1. Briefly and simply, in *that* lies the future of the Indian paper industry. " (p. 136) .

Mr. Raitt's views on this question may be thus summarised in his own words :—

"I have thus briefly, and, I hope, plainly, outlined a possibility in

Industrial enterprise which even the most seasoned and preternaturally cautious capitalist must admit contains the chief elements of ultimate success. An assured local market of, say, 25,000 tons per annum, an equally assured export one of 10,000 tons, both of them continually expanding and the latter carrying with it what practically amounts to a bonus of Rs. 20 per ton. A country producing not only the raw material in abundance, but which also provides the important manufacturing, factors of fuel, lime and cheap labour, requiring no imports except a comparatively small amount of chemicals :—In these, I venture to say, you have the foundations and essentials of success to a degree paralleled by few, if by any other, industries. " (p. 137 and 138).

In his paper entitled "The Production and import of toys and games in India," Sirdar Madhao Rao V. Kibe of Indore, draws attention to the vast scope existing in that branch for development of certain small industries. Why should we not be able to manufacture our own toys instead of depending on Germany, Japan and other foreign countries for their supply? Our artisans do not lack dexterity and taste and have been producing for centuries a variety of toys and game requisites which are the delight of children and means of recreation for the grown up people. There is a large sale of toys at fairs, in bazars and in temples on holidays. Germany, it is estimated, produces over 75 million Rupees worth of toys per annum; the United States of America also have organised this like other industries on a sound commercial basis. The bulk of the foreign toys are so flimsy that they do not last even for a few hours and yet India imported Rs. 34 lakhs worth of toys in 1909-10. Is this not a waste of money? Why should we not place this branch of National industry on proper footing and save money? Sirdar Kibe Saheb suggests the establishments at suitable centres of Museums of Japanese and German toys along with samples of Tools and processes employed in them.

We now proceed to the paper of Professor Radhakumud Mukerjee in which he essays to handle the difficult problem of indicating the "Lines of Indian industrial advance and suggests a few openings for new industries." Mr. Mookerjee puts the problem thus :—

"Those who have devoted themselves to the study of Indian econo-

record shall be available for the inspection of the Examiner of Accounts or the supervising officer when required." When we read through the above order carefully, we note that it begins with the qualification, that when a *serious* inconvenience (the word *serious* is important) would be caused; and it goes on to say that when an *economy* can be effected by purchasing in India, and concludes by saying that when the value of the articles exceeds Rs. 50, the sanctioning officer should place on record the reasons which make the local purchase desirable.

I should like to refer briefly to one other important matter. We often see articles in Indian newspapers, or hear speeches from public platforms, condemning the use of foreign (English) capital for the development of Indian industries. But, I am afraid, those who hold such views do not seriously consider the question in all its aspects. Apart from the fact that foreign capital is only attracted by signs of peace and prosperity, and that we know that foreign capital is welcome in any other country for the development of her industries, an important consideration for us in India arises from the fact that, for our own good, it is wise to allow British capitalists to interest themselves in our industries, and thus take an active part in their development. That industrial enterprise can be successful in India is amply proved by the many large and thriving industries, representing millions of capital, which already exist and it is a reproach to us, as a people, that practically the whole of these, with the exception of a certain number on the Bombay side, have been financed and developed by English capital and energy. It is true that when these industries were first started, our countrymen had little interest in, or knowledge of, such enterprises, but that attitude is rapidly changing and it should be our aim and endeavour to emulate the example set us by our English fellow-subjects and to join with them in the industrial development of India. Our success in this direction lies in creating for them a personal interest in our concerns as, without their help, co-operation and guidance, it is doubtful if we should succeed, either in our industries or in securing such form of protection as will solidly establish such industries.

Most of my remarks, up to the present, apply to large concerns, requiring considerable capital. But we must not lose sight of the smaller industries, such as tanning, dyeing, soap and match making and sugar manufacturing concerns which only require a capital ranging from Rs. 50,000 to two lacs. These have, of late, got an impetus from the Swadeshi movement, inaugurated 3 or 4 years ago. But for want of practical support on the part of men of our middle classes, these concerns are not thriving as much as we could wish. There is no lack of so-called enthusiasm, but I may be pardoned, if I say it is only lip-enthusiasm on part of many of our countrymen. There are many who are loud in their praises of Swadeshism and the revival of Indian industries, but their patriotism is not equal to the practical test of assisting in the finance of such enterprises. Amongst the most prosperous of our middleclass men are those of the legal profession, and members of that profession, owing to their higher and better education, are the natural leaders of the middle classes. They represent us in councils, in Municipalities, in short, in all public bodies. If these gentlemen, who are so ready in offering suggestions for the encouragement of Indian industries, would each put down, say but one month's earnings out of a whole year, for investment in industrial concerns, there would be less difficulty in raising capital for the development of our industries. I count many personal and intimate friends amongst the members of the legal profession, and I hope they know me well enough not to take amiss the charge I have brought against them. I feel sure that they, themselves, will admit it is not unfounded.

As I have said before, a great stimulus has been given to the promotion, improvement, and expansion of small industries by the recent revival of Swadeshi feeling. In this land of ours, from time immemorial up to the middle of the last century, our artisans and craftsmen were justly celebrated, all over the world, for their skill, and the products of their craftsmanship were in great demand in foreign countries. But from the middle of the last century, that is, from the period when steam power was perfected and manufacturing science made such great strides, our manufactures have steadily

mic problems and to the advancement of the material welfare of the country, cannot fail to recognise that there has been a practical deadlock in the present industrial situation of India. Considering the present state of our labour, capital and enterprise, the three principal factors of production, we are greatly at odds in the keen industrial struggle into which we have been thrown, and to compete with Europe, or the west generally, seems almost a hopeless task," (pp.143, 144).

Our labour is most unskilled and inefficient, capital shy and insufficient and thirdly there is a remarkable lack of enterprise or business ability. In the midst of manifold disadvantages, the situation has to be faced and ways have to be found out. In the opinion of the writer, the main problem is to determine how a country of small productions like India, and as yet not fitted for huge combinations, can stand the ever increasing efficiency and competition of large production. "In the struggle for existence in the industrial world" says Mr. Mookerjee "fitness does not depend on size alone but is determined to a large extent by adaptability to environment and by the conjuncture of circumstances." In this way there will always remain a place for small industries in the course of industrial development. Abundance of raw material, proximity to market, cheap labour which are the characteristic features of India, are distinctly favorable to the growth of small industries. The hereditary craftsmen should be organised in small factories or workshops by the *entrepreneurs*, which can be produced only by a system of specialised education where manual training in the lower and applied sciences in the higher stages will be taught to overcome the traditional prejudice against manual labour. With a few suggestions regarding the utilization of our present resources in capital, the author proceeds to enumerate a number of small industries (handicrafts, mechanical and chemical) suited to the two types of organizations *viz*:

- (1) The small factory.
- (2) Home industry.

Indigenous sugar industry is in a most precarious condition to-day, as the imports of foreign sugar are increasing by leaps and bounds, imports being now valued at more than 10 crores of Rupees every year. The new attempts that are

being made to revive this industry have so far met with very indifferent success. Professor P. G. Shah of Lahore has in his paper on "Sugar industry" tried to indicate the defects in the organization of this industry in India, to which the failures are attributable.

The first official records relating to sugar, date from 1609 when the English ships were commissioned to bring a "few chestes of best Indian sugar for a trial." Till the beginning of 19th century, Indian sugar commanded a steady European market. In 1830, says the writer, an import duty of 38 per cent. which amounted to 120 per cent. on gross price and 200 per cent. on prime cost was levied. This step had at once a disastrous effect on the Indian sugar and to-day India cannot meet her own requirements but has to import large quantities from Mauritius and other places. After pointing out defects in the present methods of carrying on the industry, Mr. Shah concludes his ably written paper thus which will repay a careful perusal :—

"To sum up, the Sugar Industry of India has been a historical fact in the past, and though threatened in the present, is not impossible to be revived in the near future. But there are various difficulties; the relative prices of gul and sugar are not very favourable for sugar manufacture, unless he is a clever hand at finances and quick enough to take advantage of change in the prices; the methods of cane-growing are very backward, so also the methods of sugar refining are very wasteful and need to be considerably improved, so as to yield a maximum quantity of sugar and to utilise to the utmost all the waste products. The future of the Indian Sugar Industry does not depend on the farmers or the capitalists, but will be worked out only by a sincere co-operation between the expert agriculturist to take care of the quality and the quantity of the crop, the Chemist and the Engineer to help the most economical management of the Technical processes involved and the able financier to take advantage of the rise and fall in prices of raw and refined sugar. And the failure of the recent sugar factories can be best attributed in a nutshell to the absence of this co-operation. If this co-operation is secured, the wastages in sugar manufacture amounting to 30 or 40 per cent. will be saved, and by the use of modern methods and machinery, with extensive and intensive cultivation, the Sugar Industry of India will be put on a sound basis, and will surely be able to keep at bay the rapid inflow of foreign sugar." (p. 166).

Mr. M. B. Sant, Assistant Secretary to the Indian Industrial Conference, Amraoti, contributes a paper on "Functions

and Scope of a Modern polytechnic and Technical School." Mr. Sant justly complains that an important subject like Technical Education and the establishment of a fully equipped polytechnic institute on the models of similar institutions in foreign countries has not yet received the measure of public attention it deserves, and alludes to the efforts of the General Secretary of the Conference in this direction, who moved a resolution in the Viceregal Council advocating the establishment of one fully equipped Polytechnic College for all India on suitable scale and suggested on another occasion that the founding of such a College would be the most appropriate form possible in which to commemorate the coming visits of Their Imperial Majesties King Emperor and Queen Empress for the purpose of coronation in Delhi. In the opinion of Mr. Sant, this problem of Technical education, resolves into two Schemes ; (1) the establishment of a " fully equipped polytechnic Institute and (2) opening of separate Schools or Colleges for courses in different subjects." Mr. Sant gives a list of nearly 42 subjects for which Schools can be opened for the benefit of male as well as female students.

" Modern Co-operation " is the theme selected by Mr. C. Gopal Menon of Madras for his paper. According to Herbert Spencer, " the degree of co-operation measures the degree of Evolution " in man as well as in other living organisms. Writings of practical naturalists like Charles Darwin, Professor Huxley and others support the view that it is the diminution of competition and development of co-operation which are important factors in the progress of society.

Co-operation may be defined as a scheme " by which people throw into a common chest such capital as they can afford or can borrow and undertake to produce on their account and risk."

The author then tries to trace the history of this movement in foreign countries by citing the instances of the early efforts of the Rochdale Pioneers, and famous institutions like the Land Banks of Germany, Austria, &c. (2) The Monte de Piete of France, (3) The Popular Banks and Credit Unions of Germany, Italy, Ireland and other countries. We

are told by the writer that it was the indebtedness of the ryots owing to the usurious rate of interest charged by money-lenders and the exaction of the Jews in Germany, that led to the propounding of schemes for the relief of the peasant population.

According to Mr. Menon, the indebtedness of the Indian ryot dates back to the period of early British administration when revenue came to be demanded in coin instead of being paid in kind as was the custom in the pre-British period. The inquiries of Sir F. Nicholson, resulted in the enactment of the Co-operative Credit Societies Act of 1904. Under this Act, three classes of societies have come into existence Central, Rural and Urban. Says Mr. Menon :—

" What is necessary, therefore, to achieve success in the movement is for the Government to afford ample facilities for its working. Reports of the existing societies in the various districts in India show healthy signs with prospects of future development. But, for greater expansion, a plentiful working capital is essential and for this purpose Central financing agencies are being established in the various Provinces in India. In the Madras Presidency the work of financing the small societies is undertaken by two Central Banks established at Madras and Salem, respectively. In Burma, the Bank of Rangoon is doing this work. In the United Provinces loans have been raised from the Joint Stock Banks, while in Bengal a co-operative union of some 50 societies is formed. In Bombay, the scheme for the creation of a Central Bank with a Government guarantee is awaiting the sanction of the Secretary of State. These are, undoubtedly steps in the right direction, full of promise for the future. The movement is bound to play a considerable part in the economic development and well-being of agrarian India if in addition to the establishment of Central financing agencies, steps are taken to effectively organise and supervise these infant institutions." (pp. 198, 199).

The author tries to show that the movement is fast growing in all parts of India under the fostering care of Government, and it behoves educated and patriotic men to come forward to take an active part in pushing forward a cause which holds out such encouraging prospects for the ryot. Mr. Menon concludes his paper with the following stirring appeal to his countrymen which deserves to be reproduced:—

" Economic co-operation has supplied the modern world with its

marvels. If we find that our world is inert, hard, mechanical or soulless, it is only because we do not find active and energetic men behind the machine. There we have the motive power in the shape of millions of lives—lives of men, of women, and of children. Utilise this motive power in the form of co-operative ideal to this modern life of ours and it will no longer be a mere machine but a living force of which we will ever be proud. Co-operative ideal is great enough for a world created by economic co-operation. Discourage and elaborate private life—Simplicity in the home life leading to a rich, stately and noble public life, should be the basis of co-operative ideal, such was the dream of the wisest and best minds of ancient times." (p. 201).

In a highly informing and ably written paper on "Our Joint Stock Companies" Mr. R. R. Nabar of the Bombay Stock and share exchange, gives a clear idea of the principles which form the basis of all Joint Stock business and warns the well-meaning but inexperienced and unwary investor in India to be on his guard against the pitfalls with which his path is beset.

Mr. Nabar's paper deserves to be given a wider publicity and should be read at least by every would-be investor in the thousand and one spurious Joint Stock Companies which are the rage of the hour. He has attempted to place within easy reach of the average reader "a few useful hints, suggestions and warnings which if well understood and strictly followed in practice will not only save an investor but will show him how to invest his savings with the maximum of advantage and the minimum of risk."

The idea of a Joint Stock Company is new to the country, as it has followed in the wake of the British rule. Even in England and other advanced countries, the laws relating to these companies are not yet perfect, but have to be modified to meet new requirements. To quote Mr. Nabar :—

"The system of joint-stock has nothing in it to blame. It is the particular method followed in the working of it which is sometimes faulty and which is mainly responsible for the breakdown of many of our companies. Like the different wheels of a clock, the joint-stock system depends, for its smooth running, on the loyal co-operation of many different sets of men, such as shareholders, Directors, Agents, Auditors, and others, and if even one set be dishonest, self-seeking and unscrupulous and make their own interests separate from those of others the whole concern must come to a deadlock. But if they all be men of

honesty, intelligence and character and understand and fully exercise the ample powers that are bestowed upon them by law ; if shareholders, directors, agents and others thoroughly understand and insist upon their rights and perform their duties, then very few concerns will ever fail and spread so much havoc around us, as we see, they do now-a-days." (pp. 205, 206).

The author describes graphically the ways in which the promoters of a concern advertise their business by issuing a prospectus in which every blessed thing that is in favor is blazoned forth in big type while other points which are of a doubtful character are relegated to some remote corner that they may escape the attention of the general public ; how important it is for the shareholder to make careful inquiries regarding the reliability of the agents, directors, auditors and others, whose names are trumpeted through the prospectuses, &c. If the shareholders elect to remain indifferent and ignorant and take no interest in the management as well as the transactions of the concerns, in which they have put their hard earned money they must take the consequences of their apathy. Mr. Nabar concludes :—

"Investment is a science and not an empirical method depending upon mere chance. Unfortunately this is not realized by most of our investors. Success more or less depends upon close, constant and comprehensive survey of various facts and figures about trade, commerce and crops, the state of the money market, the scientific and technical methods daily coming into vogue, the physical features of the country, machinations of big operators, political condition of the country and so on. Owing to easy and improved means of communications, the world is drawing together more and more, and consequently, these investigations have, on many occasions, to be extended to other countries, in order that we may come to the right conclusion. Information of other similar matters has to be collected from every available quarter. Coming events cast their shadows before, and those who can appreciate their proper significance and act promptly, become every way successful in their investments." (p. 218).

Mr. Nabar is followed by Professor V. G. Kale of the Fergusson College, Poona, who contributes a valuable paper on "the Labour Problem in India," wherein he has attempted to indicate briefly the position of our industries so far as labour is concerned, to expose the drawbacks in its supply and suggest ways of improvement.

Mr. Kale points out that in the western nations, with the

advance of democracy the aggressive character of the labour movement has gone on increasing. Says Mr. Kale:—

“Modern economic developments summed up by the world ‘industrialism,’ or ‘commercialism’ have pushed into the forefront many serious social problems, which demand immediate attention. Whatever one may think of Socialism, it is a factor, that has to be counted with. Present social and economic conditions, the tendency of wealth to concentrate in few hands, the reduction of large masses of people to the condition of human machines, the degrading nature of the drudgery which numbers of workpeople have perforce to undergo, the problem of unemployment which is becoming more pressing every day, the prevailing high prices and the general discontent of the working classes with their lot—these have even furnished a justification for some of the proposals Socialism has been pressing. One of the unfortunate and disquieting tendencies of the times is the form the struggle between labour and capital has taken. The demand for a rise in wages, and for easier and more convenient conditions of work by organised bodies of workmen, begins instead of ending with a strike and threatens to throw society and the industrial world into immediate chaos.” (p. 218).

Almost every country in Europe and America has recently had occasions to face the fearful effect of labour strikes and realize the tremendous power of the concerted labour. India which has already entered on this new phase of industrial and economical evolution “in which the break up of the old system is sure to be followed by the introduction of western conditions”. From every quarter in India, comes the cry of the scarcity and dearness of labour whether for agricultural, factory or domestic purposes. The cry is especially loudest in provinces like Bombay, where the commercial and industrial expansion of cities absorbs an abnormally high number of skilled and unskilled labourers. High prices of food-stuff, depopulation owing to plague, expansion of the factory system, extension of Railway, canals and other public works, and the desire on the part of the labourers to migrate to centres, which offer tempting wages—all these causes have contributed to the present scarcity and high wages of even unskilled labour all over India. With rise of wages there is no commensurate improvement in the efficiency or skill of the labourers, and Mr. Kale exhorts his countrymen to devote serious attention to the subject for devising means to increase the skill of the labourers and to avoid the disastrous

consequences of labour strikes which threaten the industrial organization of foreign countries.

“A few thoughts on Economic India” is the title of the paper contributed by Mr. Kunj Behary Bullav, Munsiff of Bankura. The views on some important questions contained in the paper are not quite in accord with those advanced by other Indian Economists. Mr. Bullav attempts to prove that India is growing in prosperity by quoting figures of our imports of gold and silver, the increasing volume of the country’s trade, expansion of Railways, irrigation, its gold standard and so on. In the opinion of this writer, apart from its humanitarian interest the famine policy of Government “prevents much economic loss in India.” In the first place, the Irrigation works, eliminate the chance of monsoons from the field of production, secondly the Railways bring food to affected regions. Formerly according to Mr. Bullav there was famine for want of food as well as for want of money. Now food is brought by Railways and money or food supplied by Government by opening relief works.

The author then proceeds to describe the condition of the agriculturists and the middle classes in Bengal and suggests that manufacturing activity is the sole remedy for improving the prospects of the middle class and labourers of Bengal. Mr. Bullav holds that protection is unsuitable for India, which, however, is quite contrary to the view generally accepted by eminent Indian and Anglo Indian economists. His argument may be stated in his own words for what it is worth:—

“Protection is unsuitable for India. Protection is economically unsound, free trade being nothing but application of the principle of division of labour in international commerce. In European countries and America protection is based on Nationalism. But India is a continent with different races and peoples with mutually conflicting interests, and nationalist school of political economy can have no place here. Further to some extent, India is naturally protected on account of her distance from the manufacturing countries and the cheapness of her labour.” (p. 237).

Since the introduction of the Education Bill of the Hon’ble Mr. G. K. Gokhale in the Viceregal Council, the question of mass education free or compulsory or both has

come to the front and is being discussed all over India both in official and non-official circles. Those who are anxious to study this question in all its bearings will find the paper of Professor Jogindra Nath Samaddar, of Hazaribagh on Education in Indian Economics, highly instructive.

Mr. C. Gopal Menon of Madras gives in a short paper his views on "Practical salesmanship," which he defines as follows:—

Merely disposing of goods—even large volumes of them is not salesmanship. I consider that true salesmanship is the art of exhibiting a reasonable profit in the sale of the commodity one sells. Salesmanship may, therefore, be defined as the ability of the seller to persuade dealers to purchase goods to his profit, in other words, briefly defined, it is the sale of goods for profit. It is also the power which enables us to make others think as we think, believe as we believe, the power to create a desire for things where such desire did not previously exist. He must possess a combination of qualities, mental, moral, spiritual and physical—the influence of which will have to be brought to bear upon men whom he interviews with a view to making them purchase his goods at a profit. (p. 248).

The business of an order taker is somewhat different from that of the salesman, the latter ought to possess a power to persuade, which is not essential in the former.

Mr. Menon rightly observes that the industrial development of our country being in its infancy, we have to face a tremendous foreign competition. It is, therefore, quite essential to train up a class of capable salesmen, all over the country, who would induce merchants and others to purchase indigenous manufactures, even if they are somewhat dearer than those available in the market.

We now pass on to the excellent paper of Dr. Alfred Hay, of the Bangalore Science Institute, on "Modern Methods of Illumination." The progress from the primitive oil lamp and tallow candle to the highest types of modern artificial illuminants is certainly very remarkable both from a general or industrial standpoint, and Dr. Hay presents a brief review of the whole question, and indicates its present position with a forecast of its future developments.

In selecting the best system of illumination, cheapness is not the only consideration which has to be taken into account. Safety from fire risk, cleanliness, convenience of handling,

ease in lighting or extinguishing the illuminant, color of the light, possibility of using the light in confined spaces, or in any other positions, absence of noxious fumes physiological effects of the light and several other factors have all to be reckoned with.

The author concludes thus:—

"A consideration of the history of the two most important classes of illuminants—those depending on gas and electricity respectively—shows that enormous advances have taken place in their efficiency since the introduction of the earliest representatives of each class. It would be idle to suppose that finality in this respect has been reached, and that further improvements are unlikely to take place in the future, although it may be extremely difficult to attempt any forecast of the lines along which future developments are likely to proceed. One thing we are certain of—namely, that as regards efficiency, even the best of one modern illuminants fall far short of the ideal to aimed at, and that there is still plenty of room for improvement." (p. 259).

In the next paper Rev. H. Fairbank of the Petit Industrial School, Ahmednagar, gives a brief history of the "Industrial work in the American Marathi Mission, Ahmednagar, together with its growth, difficulties it had to surmount and the actual results it has attained. In the early days of Mission work in India, literary education only was imparted in Mission Institutions with the aim of producing teachers and preachers. In course of time, just when employment could not be found for boys in these two capacities, literary education had engendered among the students a thorough dislike for manual work. There were also boys who could not get on with their literary studies as well as the sudden increase in the number of orphans during the great famines of 1896 and 1900, when over 3,000 poor orphans were taken by the Mission. All these facts led to the introduction of industrial education.

At a time when there was the serious question as to how to provide for a living for so many boys and girls when they grew up, to teach them some handicrafts was thought to be the only method of preparing them for life.

The writer next enumerates the various difficulties with which the mission had to contend and the many ways in which these were eventually overcome is a standing testimony to the resourcefulness and persevering energy of the mission.

In spite of all these drawbacks and initial difficulties, it is very refreshing to note that the following industries are actually being now taught in this School :—

- (1) Carpentry according to Western as well as Indian methods.
- (2) Sawing of wood.
- (3) Work in Iron, in Workshops.
- (4) Making of handlooms of different types.
- (5) Fitter's work.
- (6) Carpet making.
- (7) Metal hammering.
- (8) Making of brass and copper utensils.
- (9) Rope making.
- (10) Stone cutting.
- (11) House building.
- (12) Lace making and sewing for girls.
- (13) Lessons in practical agriculture.

Dr. A. K. Coomaraswamy the well-known connoisseur on Indian art, ancient and modern, who has already written so much on the subject contributes a paper on "Swadeshi True and False." All will agree with him, when he deplors the profound decay and in many cases practical extinction of several arts for which India was famous. "One hundred years ago or even fifty years ago," justly complains Dr. Coomaraswamy, "it would have been possible to fill many museums, worthily with every day handywork of Indian artisans ; now this would be hardly possible after years of patient collecting in remote districts. There was a time when in Indian homes, nothing could have been found, that was not either useful or beautiful. All this has now changed and all the vulgar superfluities of European over-production have flooded our homes. Because, according to the writer, there is no serious or consistent ideal behind the present, Swadeshi movement. Says he :—

'The movement has lacked almost totally in those constructive elements which we meet with in similar movements in other countries, such as Denmark or Ireland. Never have I seen in any Swadeshi literature, the wish expressed to preserve Indian manufactures on account of their intrinsic excellence, or because the presence amongst us of these highly skilled craftsmen represented an important element in the

national culture, or because these craftsmen still worked under conditions of life still infinitely superior, physically and spiritually, to those of the European factory-slaves." (p. 269).

"Too often the leaders of our political movement have forgotten (as men forgot in the early days of the development of European industrialism) that elementary principle of state craft, that *men are of more account than things*. They have forgotten that the goal of all material civilisation is not labour but leisure, and that industry without art only brutalises and degrades. For *things* then—things economic, political, temporary—they have been willing to undermine both our immemorial industrial culture, and to degrade the status and destroy the physique of those artisans who once served us so faithfully and who even now if we would let them make our cities and our houses beautiful again."

It is "the province of national education" says Dr. A. Coomaraswamy, "to teach Indian people to lift Indian Art out of its present decadence. But as long as that education is based on the assumption that all true light and learning must come from Europe, so long will the restoration of industrial prosperity remain impossible."

"Swadeshi does not consist in imitating new productions recently imported, this may be left to the speculative business man, who has his due place—but in restoring the status and the prosperity of the skilled artizan and the village craftsman. It is these artisans, who must need the help of our national idealism. It is these skilled craftsmen also, whom we as a nation most need as members of our body politic. We have enough of agricultural labourers and are likely to have too many factory hands, and perhaps too many lawyers and clerks. To assist the skilled artisan and the village craftsman may seem too simple, too unromantic a thing for nationalists to undertake. Even national education requires half a century to bear its fruits. Yet it is assuredly only by such personal activity and gradual recovery of social co-operation that an end so great as the restoration of our status amongst the nations of the world can be achieved. Lastly it is almost a waste of time to work for ends that may or may not be achieved in ten or fifteen years : the greatest work is done by those who scarcely look to see its fruits within their own life time." (p. 278).

In his paper on "The Economic Botany of India," Mr. Bhimchandra Chatterjee puts forth a plea for the study of Economic or medical Botany as it will afford, in his opinion an independent means of livelihood, as well as new channels for industrial and commercial enterprise. The real Indian pharmacy is yet to come into existence and the study of Indian Pharmaceutical Botany will give an

impetus to the scientific study of the Ayurvedic system of medicine. Establishment of factories for the application of Chemistry to Indian medicinal plants with the object of preparing medicines from these herbs and samples, the laying out of pharmaceutical gardens, the establishment of societies for research into the medicinal virtues of these plants and the foundation of Ayurvedic College at various suitable centres—all these taken together open out a long vista of profitable and patriotic endeavour to those who have the imagination to take in its possibilities and energy and perseverance to apply themselves to it.

Mr. B. Vishwanath, Assayist of the Graphite mine of the Raja of Tuni deals with the "Plumbago industry." In his paper he tries at the outset to correct the impression in some quarters that the Plumbago industry of the Southern Presidency is a failure. Mr. Vishwanath then describes the forms in which the mineral is usually found and the uses, commercial and medicinal, to which it is applied. During the last few years the commercial importance of this mineral has so much increased that bright lump fetched in 1910 Rs. 620 per ton, whereas in 1894, it cost less than Rs. 275. This change is due to the variety of uses to which Plumbago is now put, viz, for pencil manufacture, in the manufacture of crucibles, for metallurgy, for lubricants, greases, stove and other polishes, paints, for electro-typing, electric batteries, for foundry and other purposes. The author recommends the establishment of a graphite refinery at a suitable centre and exhorts capitalists to turn their attention to this new industry.

The graphite mining, according to the writer, does not require any complicated machinery.

The last paper is by Mr. Habiboor Rahiman Khan, Deputy Superintendent of Telegraphs, Allahabad on "Water wireless telegraphy." In India where the inventive genius of the people has been dormant as it were for so many centuries, the advent of an Indian as an inventor of a new system of wireless telegraphy will naturally be a source of great pride and satisfaction to his countrymen. Mr. H. R. Khan describes in this paper, the system of water wireless telegraphy which he has invented. The system is yet being experimented with and it

is hoped that with the liberal aid of the Telegraph Department, these experiments will in the near future prove that river or water wireless telegraphy will be a system of signalling of great practical value not only here but between different stations situated on the Coasts throughout the world.

After the papers, the next item forming an important part of the proceedings of the Conference was the discussion of the Resolutions. The number of Resolutions which came up for discussion this year was much larger than on any previous occasion.

The first Resolution recording a vote of sorrow for the demise of His late Majesty King Emperor Edward VII was put from the Chair in solemn silence, the whole audience standing.

The second Resolution tendering homage to his Majesty King Emperor George V was also moved by the President and carried by acclamation.

The third Resolution, dealt with technical education, urging on the Government the necessity of establishing a fully equipped polytechnic College and inviting business, scientific and technical experts to form themselves into a working organization for preparing in the Vernaculars useful literature on scientific, technological and commercial literature. The resolution was proposed by Sir Bhalchandra Krishna, Kt.

The fourth Resolution urged that the time has come for creating faculties of commerce in our universities and the establishment of at least one College of Commerce in each provincial capital.

The fifth Resolution recorded its emphatic protest against the continuance of the unjust and unnecessary impost viz., the excise duty on Indian millmade cloth. The Resolution evoked a good deal of strong criticism on Government Policy and was proposed by the Hon'ble Mr. Gokuldas K. Parekh.

In the sixth Resolution the Conference recorded its opinion that the provisions of Indian Factories Bill of 1909, involved a serious interference with the rights of adult male labour and urged that the sections of the Bill involving such restrictions be dropped. This Resolution was proposed by the Hon'ble Sir Vithal das D. Thackersey and was seconded by Mr. Dinshaw E. Wacha and supported by the Hon'ble Rao

Bahadur R.N. Mudholkar. The Resolution owing to its importance gave rise to much animated discussion, in the course of which a few amendments were proposed but they were lost and the Resolution, as originally framed, was carried unanimously.

The seventh Resolution drew the attention of Government to the misleading nature of the descriptions of several articles manufactured outside India, and the impressions or marks on the same calculated to mislead the purchasers and urged that steps for the prevention of such practices should be taken. This Resolution was moved by Mr. M. B. Sant of Amraoti, and seconded by Mr. J. P. Kotilingam of Madras.

The Resolution No. 8, invited the attention of Government to the desirability of introducing uniform weights and measures all over India to facilitate internal trade and prevent fraudulent practices. It was proposed by the General Secretary of the Conference.

Establishment of agricultural banks was the subject of the ninth Resolution which was proposed by Mr. G. K. Devadhar of Poona. The Resolution expressed its regret that the scheme for the establishment of an Agricultural and Industrial Bank drawn up by a few leading financiers of Bombay was not sanctioned by the Secretary of State and again urged the necessity of establishing such a bank.

The tenth Resolution recommended that the law regulating Joint Stock Companies in India, may be brought into a line with the law in England and was proposed by Mr. J. K. Mehta of Bombay.

In Resolution No. 11, the Conference recorded its sense of deep regret at the action of State Secretary in abolishing the department of industry in Madras. It was moved by Mr. C. Y. Chintamani of Allahabad.

Resolution No. 12, requested Government to levy an adequate import duty on foreign sugar for the benefit of the indigenous industry.

With the last *i. e.*, the thirteenth Resolution regarding appointment of office bearers for the following year and an appeal for funds the proceedings of the Conference came to an end and the Conference was dissolved after the customary vote of thanks to the Chair.

SUMMARY OF PROPOSALS AND SUGGESTIONS

A.—The work of the Conference.

1. To establish a Technical College would mean a large outlay of money, and I think that this Conference should without delay approach the Government of India with a draft scheme, for the establishment in some central part of India, of a well equipped Technical College fitted with proper workshops and up-to-date laboratories, as early as possible on the lines as those now established at Birmingham, Manchester, Leeds and other places. (*Mr. R. N. Mookerjee*, p. lix)
2. This (*i. e.*, Foreign Competition) is a most serious question, and not only this Conference, but every man of this country should continue to constitutionally agitate until Government affords protection, in some shape or other to local manufacturers. (*Ibid*, p. lxiii)
3. The time is therefore opportune for this Conference to approach the Government, to extend the system of primary education and, when the time is ripe, to make elementary education compulsory. (*Ibid*, p. lxviii)
4. I make an earnest appeal to this Conference, and through the Conference to the general public, for taking steps to organise a speedy survey of small industries throughout India and publish a report with practical hints and suggestions. (*Mr. Radha Kumud Mookerjee*, p. 158)

B.—Investigation.

5. *Vide* Suggestion No. 4.
6. It is high time, therefore, for the Indian Community to (1) institute an inquiry into the ancient literature, and traditions on the subject of plants and to report on the modern researches about them and (2) to organise a commission of experts to investigate the history and existing condition of the trades and industries and to

suggest lines of industrial enterprise according to modern methods. (*Mr. Bhim Chandra Chatterjee*, p. 284)

C.—Education.

7. We should press for the establishment, in some central part of India, of a well-equipped Technical College, fitted with proper workshops and up-to-date laboratories. Students from the existing technical schools, now established in different parts of India should, if they so desire, after completing their course, be admitted into the Central Technical College. (*Mr. R. N. Mookerjee*, p. lix)
8. The existing technical schools should be placed in a position to offer suitable scholarships to successful and deserving candidates, who may be desirous of continuing their scientific studies, in this proposed Central College. Government scholarships, which are now offered yearly for the acquisition of technical knowledge abroad, could with advantage be diverted to this purpose and to granting scholarships from the Central College for the purpose of gaining further experience by a course of, say two years, in England or other foreign country (*Ibid*, p. lix)
9. The artisans and craftsmen are very conservative in their ideas, and nothing but the spread of education amongst this class will induce them to welcome and make use of mechanical improvements, which would enable them to compete on more equal terms with the machine-made production. (*Ibid*, p. lxviii)
10. It is highly necessary that gentlemen who want to set up their children as successful and respectable farmers should give them a sound training in scientific agriculture in an Agricultural College. Besides this training in an Agricultural College the intending young farmers should be taught the value and the dignity of labour above all things, and they should be prepared and able to drive the plough and manipulate the spade with their own hands, (should any necessity arise), to work with the labourers in the fields, and to

- exercise a strict supervision over every department of their farms. (*Mr. A. C. Das*, p. 39)
11. We want an extensive spread of primary education, as well as agricultural education among the ryots. (*The Hon'ble Pandit M. M. Malaviya*, p. liv)
 12. The memorial in honor of the visit from their Majesties the King and Queen should take the form of a Technological Institute like the Institute at Tokio. (*Ibid*, p. lv)
 13. We must train up the best talent of the country on new lines from the beginning so as to give it a new turn, and develop industrial aptitudes. We have to devise a new and appropriate scheme of education of which the essential features will be the imparting of manual training in the lower stage and teaching applied science in the later stages as essential factors of a liberal education. (*Mr. Radhakumud Mookerjee*, p. 148.)
 14. Along with a sound system of technical education we must have also as a co-ordinate branch a system of commercial education that will turn out trained commercial agents, bankers, correspondents and the like. (*Ibid*, p. 148)
 15. Self-help is the only course left open to the people in regard to technical education. The princely munificence of public spirited men like the late Mr. J. N. Tata and Sir Currimbhoy Ebrahim on the Bombay side, or Mr. Palit of Bengal clearly points to a moral and proves that much can still be achieved, if joint and concerted action on the part of the leaders of Indian thought takes the place of isolated efforts.
- The problem of Technical education resolves into two schemes:—
- (1) Establishment of polytechnic institutes on a grand scale, capable of imparting instruction in all the subjects mentioned above.
 - (2) Opening of separate schools or colleges on a smaller scale for the training of students in one or more subjects according to the local needs of the Province.

District or the city in which they are located. (*Mr. M. B. Sant*, pp. 168, 169)

16. Special schools for the teaching of the trading classes should be brought into existence. Schools like the newly started London School of Economics should be the final stage of the former institutions. (*Sirdar Madhao Rao V. Kibe*, p. 185)
17. All are agreed that free education must be placed within the reach of the agricultural population and that it is the duty of the state as well as of the rich to provide as extensively as possible, sound elementary education for the labouring classes. (*Professor Jogindranath Samaddur*, pp. 241, 242)
18. To promote commerce and industry, steps should be taken to establish commercial museums, or floating exhibitions, Bounties, Protective Tariffs and Technical and Commercial Education. (*Mr. C. Gopal Menon*, p. 246)
19. We should rouse ourselves to consciousness of the urgent needs, which India stands in for scientific and skilled labour, and that shall have to be obtained at any cost. (*Mr. B. Viswanath*, p. 291)

D.—Capital and Co-operative Credit.

20. The gentlemen, of the legal profession who are so ready in offering suggestions for the encouragement of Indian industries, should each put down, say but one month's earnings out of a whole year, for investment in industrial concerns, and there would be less difficulty in raising capital for the development of our industries. (*Mr. R. N. Mookerjee*, p. lxvii)
21. The small capitalist with a trained business instinct must hit those things for production for which the demand is very general and at the same time inelastic, and in producing he will have to care not so much for ideal finish at the expense of quantity as for practical utility coupled with cheapness. (*Mr. Radhakumud Mookerjee*, p. 149)

22. What is necessary, to achieve success in the Co-operative Credit movement is for the Government to afford ample facilities for its working. Reports of the existing societies in the various districts in India show healthy signs with prospects of future development. But, for greater expansion, a plentiful working capital is essential and for this purpose Central financing agencies should be established in the various Provinces in India. (*Mr. C. Gopal Menon*, p. 198)
23. Investment is a science and not an empirical method depending upon mere chance. This ought to be realized by our investors. (*Mr. R. R. Nabar*, p. 218)

E.—Fiscal Policy.

24. This is a most serious question, and not only this Conference but every man of this country should continue to constitutionally agitate, until Government affords protection in some shape or other to local manufactures. (*Mr. R. N. Mookerjee*, p. lxiii)
25. The question of Protection should be most carefully considered, as otherwise to do good to some of our industries we may court disaster in other branches of commerce. This point should be definitely decided before we actually apply for any protective legislation. I think it is imperative on our leaders to give this question their first consideration and, if we are successful in securing a wise form of Protection, I am sure the country's industrial development will receive a great impetus. (*Ibid*, p. lxiii)
26. The Government should protect the industries of the country by a measure of protection. (*The Hon'ble Pandit M. M. Malaviya*, p. lv)

F.—Agriculture.

27. If the total area of culturable waste lands could be leased out to farmers say, at the rate of one rupee per acre on an average, the proprietors would be richer by an annual income of about one crore of rupees ! This consideration alone should induce even those proprietors,

who are not animated by any patriotic feelings, to lease out culturable waste lands to enterprising, young men at moderate rates of rent. The leases should be made permanent, transferable and heritable, and no difficulties placed in the way of the lessees. The Legislature also should relax all stringencies in the existing landlaws of the country. (*Mr. Abinash Chandra Das*, p. 35)

28. The reclamation of the culturable waste lands would thus bring on a world of good. All patriotic and enlightened proprietors should, therefore, encourage farming among the educated middle classes, and place every facility in their way. (*Ibid*, p. 36)
29. I would, strongly urge our young men to turn their attention to the art of agriculture, and equip themselves with a suitable scientific training for successful agricultural work. (*Ibid*, p. 42)
30. It seems to me that we are now within sight of a power driven waterlift which will involve so small an initial outlay and be so economical in working that it will almost entirely supersede cattle power. (*The Hon'ble Mr. A. Chatterton*, p. 126)
31. It is of considerable importance to develop as far as possible suction gas plants working with the supply of fuel which can be obtained locally rather than be dependent on kerosine oil or liquid fuel. (*Ibid*, p. 125)
32. My scheme for agricultural improvements may be briefly stated thus :—
 - (1) Out of 4 or 5 Circle Inspectors allotted at present to each Taluka, at least one should be a graduate of agriculture with knowledge of practical farming. He should guide the ryots in—
 - (a) ploughing their fields,
 - (b) manures suited to each soil, &c. &c., in fact in all matters which tend towards agricultural improvement. (*Mr. M. B. Sant*, p. 45)

33. Now a well managed fodder farm can produce the right type of fodder throughout the year at half the cost. (*Mr. G. K. Kelkar*, p. 57)
34. If the Government or the people of a province are anxious to revive sugar industry, let them secure experts from Java, Mauritius or Germany, where cane or beet sugar is actually being manufactured on a large scale. Similarly to start oil seed factories, or rubber plantations, cotton cultivation, fruit-growing, canning &c., American experts should be engaged. If Dairy Industry is to be brought to perfection let the Danish farmers and experts be called and necessary machinery imported. The experts should enter into an agreement to train up a few Indian students in their respective branches within a specified period. (*Mr. M. B. Sant*, p. 48.)
35. There are a few important points to which it seems desirable to direct the attention of the authorities, compiling the publications, issued by the Agricultural Research Institute, Pusa.
 - (a) The names of insect pests should be given in the Vernaculars of the different provinces otherwise it will not be possible to translate these treatises or to disseminate the information contained therein.
 - (b) Vernacular equivalents of germicides, insect-eating birds or other parasites having a natural antipathy to these pests should be ascertained and given to make the remedies more intelligible, to laymen and cultivators.
 - (c) Short translations of these and similar publications should be prepared for wide distribution among farmers through the agency of the revenue officials, agricultural departments, and the agricultural and industrial associations, &c.
 - (d) Chemicals and insecticides or germicides advocated should be such as to be within the easy reach of the villagers and obtainable in any desired quality at a reasonable outlay per acre of land. (*Mr. M. B. Sant*, p. 49).

36. I can suggest a few ways of promulgating the knowledge of economic entomology among the cultivators.

1. Demonstration of the methods of dealing with crop pests, comparing the result with non-treated area.
2. Competition prizes for the best work done in fighting out a particular pest.
3. Encouragement to those who exert themselves in combating the pests according to directions.
4. Exhibition of magic lantern slides dealing with the life histories of insects in villages.
5. Wide distribution of leaflets in Vernaculars among the cultivators and school boys.

This is a very delicate work and should be entrusted to reliable trained men. (*Mr. Chotabhai U. Patel*, p. 73).

37. It behoves Government to come with a more liberal hand and finance the work better than it does now, spending a little less than a rupee per 2,500 acres of cultivated land. The scientific men also should spare no pains in the careful study of the important pests, which trouble the Agriculture of India, and be cautious as not to publish immature information, so that the confidence of the people might not be shaken. It is the duty of the educated classes and the Journalism of India, to popularize the knowledge thus acquired, and bring it within the reach of the Agriculturists, who, should be ready to utilize and to furnish the experts with necessary information. (*Ibid*, p. 74).

38. It is the Zamindars who should set up experimental agricultural farms worked not by unskilled labour indiscriminately chosen but by the hereditary peasants themselves of their own tenantry under the superintendence of trained agricultural experts. The capital of the landlord, the scientific knowledge of the expert and the hereditary skill of the peasant are the three necessary factors that must all combine for the improvement of Indian agriculture. (*Mr. Radhakumud Mookerjee*, pp. 149, 150).

Cotton Industry.

39. Improvements in this industry must be based on, (i) the selection and propagation of pure and selected strains of the different races of Indian cottons through the agency of seed farms, (ii) on the introduction of such exotic varieties as may, under certain conditions of soil and climate, prove more profitable than existing indigenous ones, and (iii) on improved methods of tillage and a more extensive use of manures. (*Mr. D. Clouston*, p. 18).

Sugar Industry

40. It is therefore, high time for India to make steady and sure attempts to check if not to stop the rapid inflow of foreign sugar which is soon expected to swell enormously and to destroy the indigenous industry just as the Indigo plantations have suffered from the importation of cheap synthetic Indigo. (*Professor P. G. Shah*, p. 156).

41. It is necessary to point out that the central factory system alone can work satisfactorily with sugarcane. This system is the key to the success of cane sugar factories in other countries. (*Ibid*, p. 160)

42. Moreover, there are many improvements in the refining and crushing for which we must take a leaf out of the foreigner's book. The crushing by wooden mills should be abandoned as soon as possible in favour of heavy iron and steel rollers, which ensure more complete extraction. Even where large factories are not possible to be established, similar smaller mills driven by bullocks would be very useful and economical. (*Ibid*, p. 163)

G.—Other Industries

43. The following methods of production of eri silk suggest themselves :—

- I. As already pointed out, eri silk is best suited for a home or cottage industry. The members of a cultivator's family can in their leisure hours produce the

silk, spin it into thread and prepare cloth. Sericulture is essentially a home industry and is best practised as a subsidiary pursuit of a family.

- II. In the absence of the facilities which exist in Assam the people in other Provinces can simply rear the cocoons and get sufficient remuneration by selling them. The best method would be for the small producers of cocoons to join together and offer their produce in lots of 400 or 500 lbs. to the mills.
- III. The third method of production counts upon centralised combination in the person of the capitalists. A landowner with some capital and influence can get cocoons reared by the families of his ryots or others for remuneration and can sell them in big lots to the mills thus making a profit for himself.
- IV. Instead of selling the cocoons, the capitalist can get them spun into thread, not by engaging paid labour but by the families of his ryots and others for payment. Then the thread can be got woven by local weavers also for payment. (*Mr. C. C. Ghosh*, p. 114).
44. New Sources of raw material supply should be provided, and the paper-maker will do the rest. In suitable localities erect pulping mills to reduce the local raw material to half-stuff, eliminating on the spot the 60% of waste and reducing the freight and handling charges in the proportion of 2½ to 1. (*Mr. William Raith*, p. 136).
45. From the paper making point of view there is of course the bamboo, which I venture to prophesy will ultimately become the leading staple and hold the position now occupied by Wood Pulp. (*Mr. William Raith*, p. 137)
46. It may be possible to establish a museum of Japanese and German toys, along with examples of tools and processes employed in making them at different suitable centres. It would not be very costly and it would be the means of teaching men or rather women, a new and paying industry. (*Sardar Madhao Rao V. Kibe*, p. 142).

47. With a little training and a small capital, the wood distillation industry can be started in the midst of a jungle. This in fact essentially a forest industry and given the facilities of transport, it can be most profitably carried on under the very trees of the forest. (*Mr. M. R. Bodas*, p. 76)
48. If experienced distillers would form an association to undertake to systematically grow and collect the grass from all parts of the District and to distil it in steam stills of improved type, the industry is sure to take a better turn, and from one of the stable industries of the District as well as of India. (*Mr. D.N. Nagarkatti*, p. 101)
49. Anethi seeds aniseed, caraway fruit, clove, cubel, Patch-only plant, Rind (from fruits) of the orange family. All these can be profitably worked in India for their essential oils, which will save to India, freight. England on the Raw material and freight back to India on the manufactured oil, and the profit of the manufacturer. The distillation of the above mentioned products does not require even superior manipulative skill. (*Ibid*, p. 102).
50. The rapid rise in importance of Graphite Carbon must necessarily claim the attention of capitalists some specimens from Travancore State lately examined were very rich carrying 90 % of Graphite Carbon. (*Mr. B. Vishwanath*, p. 287)
51. The establishment of a graphite refinery at a suitable centre would surely give an impetus to the industry. (*Ibid*, p. 290)
52. There is a great opening for Indian labour and capital in attempting large scale industries in some of their cruder stages, e. g., industries like Iron and Steel works, glass blowing. Thus we may take up cutlery, nails, door-fittings, buckets founding and moulding works, etc., under *Iron works*; bottles, bangles and other crude glass works, utilisation of breakages of important crockeries, etc., under *Glass blowing*; use of improved hand looms of all kinds, extraction of fibres, etc., under *textile fabrics*; use of aniline dyes (and coun-

try dyes) to produce chintz, coloured cloths, yarns and silks, etc., under *Dying works* ; paste-board and cardboard works under *Paper making* ; utilisation of fluorescent earth such as reh to produce soda, nitre, etc., under *Alkali works* ; etc., etc. (*Mr. Radha Kumud Mookerjee*, p. 152).

53. A scheme for work in connection with Economic Botany :—

- (1) Starting of factories for the application of Chemistry to Indian Medicinal plants for preparing medicines.
- (2) Laying out of Pharmaceutical Gardens.
- (3) Foundation of Museums for drugs and specimens of Genuine Ayurvedic Medicines.
- (4) Establishment of Academics and Research Societies for identification and experiments on plants.
- (5) Preparation of books in Vernacular for diffusion of Botanical or Pharmaceutical knowledge.
- (6) Starting of Ayurvedic Colleges. (*Mr. Bhim Chandra Chatterjee*, p. 285).

Miscellaneous.

54. We should try to trace the causes of failure of various small industries. In the present condition of our country we should recognize that to develop any industry successfully, we must have, first and foremost, expert knowledge as well as men of undoubted practical experience in the particular industry which we desire to establish. (*Mr. R. N. Mookerjee*, p. lviii).
55. I would suggest to our earnest workers that they should not hesitate to engage foreign experts for the present and do away with the vain prejudices of a narrow minded "Swadeshi" which mistakenly advocates the employment of Indians only the exclusion of foreigners. (*Ibid*, p. lx).
56. The Act, regulating Joint Stock enterprises in this country should be brought more into line with the new

English Act of 1908, with such modifications as the different conditions existing in this country, may suggest. It should give ample protection to the shareholders without being so stringent as to strangle commercial development. (*Ibid*, p. lxi).

57. The patent laws in England proved that, to retain the protection of law, it is necessary, within a specified period, to manufacture the patented article in England. I think that such a law in this country will assist very materially in the establishment of factories and I earnestly commend the adoption of some such law, in a modified form, to the consideration of the Government. (*Ibid*, p. lxiv).
58. We should also agitate for the abolition, or at least reduction, of the gigantic Store Department of the India Office in England. (*Ibid*, p. lxv).
59. It should be our aim and endeavour to emulate the example set us by our English fellow-subjects and to join with them in the industrial development of India. One success in this direction lies in creating for them a personal interest in our concerns as, without their help, co-operation and guidance, it is doubtful if we should succeed, either in our industries or in securing such form of protection as will solidly establish such industries. (*Ibid*, p. lxvi).
60. A few years ago there was an Act before Government authorizing District Boards to levy a special cess for the purpose of guaranteeing feeder Railway lines and it is my belief that such an Act is necessary. Its terms should empower the District Boards to levy such a cess and should provide that such revenue as might be received from a share in the surplus profits might be put against the amount so raised. It would be necessary, also to rise the District Board guarantee to 5 per cent. (*Ibid*, p. lxx).
61. I would like to see a commercial or financial expert as one of the members of the Railway Board. (*Ibid*, p. lxxi).

62. These hereditary craftsmen should be organized in small factories or workshops by the present Indian *entrepreneurs* who must carefully avoid employing indiscriminately unskilled labourers drawn from the general population. (*Ibid*, p. 147)
63. Unless we can restore the fine aesthetic culture which the wealthy and educated classes in India once possessed we cannot hope that our Industrial Arts will flourish. (*Dr. A. K. Coomaraswamy*, p. 277)
64. Swadeshi does not consist in imitating new productions recently imported, this may be left to the speculative business man, who has his due place—but in restoring the status and the prosperity of the skilled artizan and the village craftsmen. It is these artisans who most need the help of our national idealism. (*Ibid*, p. 278)
65. These hand weavers with their rude appliances still weave most of the garments worn by the women of the country. This industry is promising for our boys and girls, because it supplies a demand of their own people. (*Rev'd. H. Fairbank*, p. 266)

Resolutions passed at the Sixth Indian Industrial Conference, held at Allahabad, on the 30th December, 1910.

I. Vote of Sorrow for the death of His Late Majesty King-Emperor, Edward VII.

Resolved.—This Conference places on record its profound sorrow at the death of His late Majesty King Emperor, Edward VII, in whom the people of India have lost a most sympathetic and warm-hearted well-wisher and supporter, the Empire a wise and benevolent sovereign and the world a powerful promoter of peace and general amity, and respectfully tenders its condolence to Her Majesty Queen-Empress Alexandra and the members of the Royal Family.

[Put from the Chair in solemn silence, the whole audience standing and carried unanimously.]

II. Homage to His Majesty King-Emperor, George V.

Resolved.—This Conference begs to offer its respectful and loyal homage to His Majesty King-Emperor, George V, on his accession to the throne of the British Empire, and expresses the hope that His Majesty's gracious sympathy for the people of this country and interest in their well-being will effectively promote their prosperity and advancement.

[Moved from the Chair and carried unanimously and by acclamation.]

III. Technical Education.

Resolved —(a) While gratefully acknowledging the grants to technical and industrial education made by Government in recent years, this Conference places on record its firm conviction that, for effectively promoting the industrial progress of this country, it is essential that the Government should establish here at least one fully

equipped Polytechnic College for imparting the highest kind of instruction in the applied sciences and industrial arts, and further urges that the visit of His Majesty, King-Emperor, George V and Her Majesty, Queen-Empress, Mary should be commemorated by the foundation of such an institution.

(b) This Conference also invites business, scientific and technical experts to form themselves into a working organization for the creation of a scientific, technological and commercial literature in the Indian Vernaculars for the dissemination of information on industrial and commercial subjects amongst the people of India.

[Proposed by Sir Bhalchandra Krishna, Kt. of Bombay, seconded by Pandit Gokarnanath Misra of Lucknow, supported by Babus Laxmi Chand and Thakur Prasad and carried unanimously.]

IV. Commercial Education.

Resolved.—(a) In the opinion of this Conference the time has come for the Indian Universities to create Faculties of Commerce, to institute Degrees in Commerce, and to affiliate Commercial Colleges which will prepare candidates for such Degrees.

(b) That there should be established one College of Commerce in each provincial capital and that it should include provision for the training of teachers for commercial schools in the mofussil.

[Proposed by Mr. C. Gopal Menon of Madras, seconded by Mr. Gulabchand Javeri and carried unanimously.]

V. Excise Duty on Cotton Goods.

Resolved.—This Conference again records its emphatic protest against the continuance of the Excise Duty on Indian mill-made cloth as an unjust and unnecessary impost which presses heavily on the industry and prays that it should be abolished at the earliest opportunity.

[Proposed by the Honourable Mr. Gokuldas K. Parekh of Bombay, seconded by Mr. Mathuradas Ram Chand Javari of Sind, supported by Mr. Mawjee Govindjee Sheth of Bombay and carried unanimously.]

VI. The Indian Factories Bill.

Resolved.—This Conference is of opinion that the provisions of the Indian Factories Bill of 1909 involve a serious, unnecessary and uncalled for interference with the rights of adult male labour and urges that the sections of the Bill which involve such restriction be dropped.

[Proposed by the Honourable Sir Vithaldas D. Thackersey, seconded by Mr. D. E. Wacha, supported by the Honourable Rao Bahadur R. N. Mudholkar and carried unanimously. Two amendments were proposed but they were lost.]

VII. Merchandise Marks Act.

Resolved.—This Conference draws the attention of Government to the use, on several articles manufactured outside India, of misleading descriptions, impressions, or marks calculated to cause the belief among purchasers and consumers that the same were made in India and urges that steps be taken, by legislation, if necessary, to prevent such and similar fraudulent practices by requiring in every case the indication of the country of origin.

[Proposed by Mr. M. B. Sant of Amraoti, seconded by Mr. J. P. Kotilingam of Madras, and carried unanimously.]

VIII. Weights and Measures.

Resolved.—This Conference re-affirms Resolution No. VII of last year's Conference and again invites the attention of the Government of India to the desirability of introducing uniform weights and measures to facilitate trade among the different towns and provinces of India and remove the present inconveniences arising from a multiplicity of weights and measures and from a want of uniform system and standard.

[Proposed by the Honorable Rao Bahadur R. N. Mudholkar, seconded by Mr. Goswami Brijnah and carried unanimously.]

IX. Agricultural Banks.

Resolved.—This Conference notes with regret that the Secretary of State has not sanctioned the scheme drawn up by some of the leading financiers of Bombay of an Agricultural and Industrial Bank, though the same had received the support of the Government of Bombay and of the Government of India; and again urges upon Government its conviction that for securing an amelioration of the economic condition of the peasantry and the land-owning classes, it is necessary to establish agricultural banks for assisting the existing Co-operative Credit Societies and for advancing loans direct to agriculturist wherever such societies do not exist.

[Proposed by Mr. G. K. Devadhar of Poona, seconded by Mr. Mahesh Charan Sinha. Babu Ambica Charan Ookil moved an amendment which the President ruled out of order. The original resolution was carried unanimously.]

X. Joint Stock Companies.

Resolved.—This Conference considers that it is desirable to bring the law regulating Joint Stock Companies in India in a line with the law in England, as laid down in the recent Companies Consolidation Act, with such modifications as will suit the circumstances of this country.

[Proposed by Mr. J. K. Mehta of Bombay, seconded by Mr. B. F. Karbhari and carried unanimously.]

XI. Abolition of the Department of Industries.

Resolved.—This Conference records its sense of deep regret at the action of the Secretary of State in directing the abolition of the Department of Industries in Madras and lodges a protest against the policy laid down by him that

the State should not pioneer new enterprises, as unduly limiting State help in industrial development.

[Proposed by Mr. C. Y. Chintamani, of Allahabad, seconded by the Honourable Sir Vithaldas D. Thackersey and carried unanimously.]

XII. Duty on Sugar.

Resolved.—This Conference is strongly of opinion that it is essential that the Government should impose an adequate import duty on foreign sugar in order to enable the indigenous industry to hold its own.

[Proposed by the Honourable Rai Bahadur Ramanuj Dyal, seconded by Mr. J. P. Kotelingam and carried unanimously.]

A resolution on of Octroi Duty levied in some parts of India was moved but its consideration was postponed owing to a difference of opinion.

XIII. Appointment of Office-Bearers and Appeal for Funds.

Resolved.—That this Conference re-appoints the Honourable Rao Bahadur R. N. Mudholkar as General Secretary and authorises him to appoint an Assistant Secretary with suitable establishment and appeals to the public for a sum of Rs. 5,000 to meet the expenses of the Industrial Conference Office for the next twelve months.

[Proposed by the Honourable Pandit Madan Mohan Malaviya, seconded by Babu Ganga Prasad Varma and carried unanimously.]

R. N. MOOKERJEE,

President,

The Sixth Indian Industrial Conference

ALLAHABAD,

30th December 1910.

R. N. MUDHOLKAR,

General Secretary,

The Indian Industrial Conference.

PROCEEDINGS

OF THE

Sixth Indian Industrial Conference.

The Sixth Session of the Indian Industrial Conference was held in the Congress Pandal shortly after 12 noon on the 30th December 1910, under the most favourable and encouraging auspices, under the Presidency of Mr. R. N. Mookerjee, C.I.E., Sheriff of Calcutta. A large and distinguished gathering of representatives from various Provinces and communities of India was present, amongst whom the following gentlemen were noticed:—The Honorable Sir Vithaldas Thackersay Kt., The Honourable Pandit Madan Mohan Malaviya, Mr. S. P. Sinha, The Honorable Mr. Syed Ali Imam, The Honorable Mr. B. C. Mitter, The Honorable Mr. N. Subba Rau Pantulu Garu, The Honorable Mr. S. Sinha, the Honorable Mr. Mazharul Haque, Lala Harkishen Lal, Sir Bhalchandra Krishna, Kt., The Honorable Mr. Gokuldas. K. Parekh, The Honorable Babu Ganga Prasad Varma, Rai Bahadur Lala Baijnath, The Honourable Lala Sukhbir Singh, The Honorable Pandit Moti Lal Nehru, Mr. D. V. Hanumanta Rao, Mr. Hafiz Abdul Rahim, Mr. Mathuradas Ram Chund, Rao Bahadur G. Shrinivas Rao, Mr. William Raitt, Dr. A. K. Kumaraswamy.

Sir William Wedderburn, the Honorable Mr. G. K. Gokhale, Mr. D. E. Wacha, The Honorable Mr. Justice V. Krishnaswamy Iyer, Mr. Daji Abajee Khare and a few other well known gentlemen, also attended the Conference, in the course of the afternoon after the proceedings had commenced.

The Proceedings of the Conference were opened by the Honorable Pandit Madan Mohan Malaviya, who, as Chairman of the Reception Committee delivered the following interesting speech, in welcoming the delegates, and the visitors,

recounting the progress made in industrial enterprise during past few years and indicating the lines on which similar progress can be achieved in the future.

Speech of the Chairman of the Reception Committee.

The Honourable Pandit Madan Mohan Malaviya said the Conference had been meeting for several years and no apology to justify the movement was needed. The end of all Governments was the highest happiness of the people. This happiness was only possible if the people had wealth. And in trade was wealth not so much in service and not at all in beggary. Agriculture was at present almost the only occupation of the bulk of the community. He (the speaker) dated the downfall of the country, the miseries of the people since the day when manufacturing industries having declined, the people had to fall back on agriculture as their sole means of livelihood. Since then had begun that influx of foreign manufactures the effect of which had been so ruinous to the best interests of the country. Famines were not unknown in ancient India but the rigours of famine had been felt only since the decline of industries. The Famine Commission of 1878 had recorded its opinion that at the root of much of the poverty of India lay the fact that the people were far too dependent on the single occupation of agriculture which failed whenever there was a failure of the seasonal rainfall. The speaker then referred to the great Exhibition across the road which he was sure many of the visitors had already witnessed. The Exhibition had a number of lessons to teach them. It brought to their knowledge the great natural resources of their country and it demonstrated, at the same time how backward they were. They were reminded that their agricultural methods were still primitive while western countries had advanced considerably in the employment of modern methods. Scientific agriculture had made great progress among those peoples. When they came to the industrial Courts what did they find? They had only to look at the industrial and engineering courts of Germany to know where they stood. How could India stand the competition of those countries in the existing circumstances? The Govern-

ment had established excellent agricultural colleges, but they should bear in mind that the Indian agriculturists were almost wholly uneducated and illiterate. A great German economist had said that general education was the foundation of prosperity.

They wanted the extensive spread of primary education and they wanted agricultural education among the ryot population. They had the benefit of the knowledge of the West. The people of European countries had devoted great attention to the consideration of problems of science and industry and had come to the solution of these problems which fortunately were of general application. The speaker emphasised the duty of the State to make greater provision for the education of the agriculturists. They had not yet seen the end of physical warfare, though he hoped they would have much less of it than before, but another kind of warfare was going on incessantly among the nations of the world, and that was the great industrial warfare. Ceaseless endeavours were being made by each nation to advance more rapidly and become more efficient than the rest. England itself which had been but recently the foremost of manufacturing nations had found itself outstripped in the race by other nations more keen and wide-awake, and accordingly had lately been giving much more attention to industrial and technical education in order not to be left behind by America, Germany and France. The speaker referred to the large number of universities in Germany and France, and in England. Those countries had also a large number of secondary schools for imparting technical and industrial instruction. Those people constituted a formidable, very well-equipped army with whom competition was almost impossible for the people of India in their present condition.

It was the prayer of the Conference that a central technological institute should be established in India. And he (the speaker) expressed the hope that their prayer might be granted before very long. They would have next year a visit from their Majesties the King and Queen, their Emperor and Empress, and the unique event was certain to be commemorated in a worthy manner. He suggested that the

memorial should take the form of a Technological Institute like the Institute at Tokio, or like the Institutes of Germany and England. There was the unapplied fund of the Victoria memorial, and what better could be done with it than to apply it for the foundation of a technical institute.? The speaker was sure that the subscribers of the fund would all agree to its being spent in such a manner if the Government would only consult them. The Government should contribute fifty lakhs. His Majesty might well be asked to lay the foundation stone of the Victoria Memorial. No other memorial of the Royal visit could be more fitting or would fill the hearts of the people more with gratitude than a Central Technological Institute.

The Chairman of the Committee went on to say that the Government should increase the expenditure on technical education. The Government had expressed great sympathy with the cause of technical education, but they were putting off the actual increase in expenditure. Their inaction led the people to doubt the earnestness of the Government in the matter. They should no longer postpone action.

Continuing, the speaker said that besides general education and technical education, the Government should protect the industries of the country by a measure of Protection. In ancient days Indian industry received protection from its rulers. In these days too, it got it but it was only protection against unlawful interference. What they urged upon the Government was a change in fiscal policy. Amongst Indians the most thoughtful men were agreed that Protection was necessary. They were agreed that without it industries could not thrive in India, not at least their nascent industries. The speaker cited the examples of the sugar and the gold thread industry. Sugar was a very thriving industry not long ago and most so in these Provinces. But now it was decadent, and the decline was at an accelerated pace. Three years ago in the local Council he (the speaker) pressed on the Government his view that the industry could not be kept up without protection, but his Honour the Lieutenant Governor said he could not recommend the suggestion

to the Government of India. But the position had grown worse during these three years. The imports had increased; till now their value was over 10 crores a year. And if no protection be extended to the Indian industry, the imports would probably be found to have risen to twenty crores in value. Sugar refineries were being started, and one had been started in this very City and he had the honour of being a director of it. But they found themselves undersold by the foreign article. And the situation was that either they had to keep up the concern at a loss, or shut it down. Such was the experience of other factories as well. It was argued by some people that if the poor got their sugar cheap, why should they object to that? But he would ask whether the poor would be better off in the end if twenty crores of Indian money was annually sent out of the country for their sugar. He would say that the future should not be sacrificed for the present.

The second instance he would give in support of his view that Protection was necessary was the gold thread industry of Benares. His friend Babu Lakshmi Chand who had acquired the needed technical knowledge in a foreign country was trying to start a company for working the gold thread industry and Babu Motichand was helping him. But he found that the industry would not be a success without Protection.

In conclusion the speaker urged again that the Government should promote general, agricultural, and industrial education, and give Protection to the nascent industries of India. (*Loud Cheers.*)

Election of the President.

The Honourable Mr. Mazhar-ul-Haque proposed that Mr. R. N. Mookerjee, C. I. E., of Calcutta be elected President of the Conference. Mr. Haque pointed out that the crying need of India was industrial development. The Government could help them a great deal but as matters actually stood, very little help could be expected from that quarter. People of India, ought, therefore, to help themselves. There was a reproach against Bengal that

its people did not go in for trade and industry but the brilliant success achieved by Mr. Mookerjee in mercantile enterprise was a conclusive answer to this general allegation. Mr. Mookerjee was an honor to them and they should strive to follow his example.

Sir Bhalchandra Krishna Kt., paid a high compliment to Mr. Mookerjee as a successful business man, who had only lately declined a seat on the new Bengal Executive Council. The motion was supported by Lala Harkishen Lal and was carried unanimously and by acclamation. Mr. Mookerjee took the chair amid loud and deafening cheers, and delivered the following address:—

The Presidential Address.

MR. CHAIRMAN OF THE RECEPTION COMMITTEE, DELEGATES,
LADIES AND GENTLEMEN,

I thank you, for the great honour you have done me in selecting me to preside over the Conference this year. The honour of being your President for the year 1907 was offered to me, on the day of my arrival in Bombay from Europe, but I could not accept your kind offer then as, much to my regret, it was impossible for me, after an absence of six months from my own business, to spare the amount of time, which the presiding over so important a Conference demands.

I have accepted the honour this year with great diffidence, gentlemen, because I am fully conscious of my own inability to do justice to the duties which devolve upon me as your President. My sense of unfitness is all the more acute when I call to mind that I have been preceded in this honourable office by such able and public-spirited men as the late Mr. Romesh Chandra Dutt, Sir Vithaldas Thackersay, Dewan Bahadur Ambalal Sakerlal Desai, the Hon'ble Rao Bahadur R. N. Mudholkar and the Maharajah of Durbhanga.

I have been emboldened to accept the presidentship by the knowledge that most of the subjects upon which in the ordinary course I should be required to touch, have already formed the subject of discussion during the last five annual gatherings and I feel sure of your indulgence in listening to

one who is a plain business man endeavouring to place the subjects before you from a commercial point of view.

There are now published in India excellent technical journals dealing with practically every class of industry that is capable of development in India. These journals and the records of this Conference furnish us with full details of the numerous industries which we all hope some day to see more fully developed in our country, by the friendly co-operation of capital and labour. Technical papers, exhaustively dealing with various industries, have been read from time to time at these Conferences, by men eminently qualified to speak, containing most valuable suggestions for the industrial development we are so anxious to see established. In fact, the records of the meetings of the last five years furnish sufficient information and it only remains for us to give an impetus to a movement, which will not only supply the ordinary commodities of Indian life, but will keep in the country a large portion of that wealth which now goes to foreign countries, besides giving our country a commercial standing it does not now possess. It is important that we should have some idea of the true direction in which such development lies, added to a practical knowledge, to enable us to guard against the pitfalls of a wrongly directed development, wherein lies the road to disappointment and failure.

I shall only venture to offer a few practical suggestions and to remark upon what I consider fundamental principles, which must not be disregarded, if we are to make any material progress. Several small industries have been started during recent years, in different parts of India, with, in most cases, but indifferent success. We should, therefore, try to trace the causes of failure. In the present condition of our country we should recognize that to develop any industry successfully, we must have, first and foremost, expert knowledge as well as men of undoubted practical experience in the particular industry which we desire to establish. From Bengal students have been sent abroad to Europe and America, at public expense, to acquire scientific knowledge. Some of these students have returned, and doubtless, have acquired a fair knowledge of what they were sent to learn

but they must necessarily lack that practical training and capacity for management, that comes only with long experience and is so necessary for men who hope to become pioneers of new industries. None of these students, so far as I am aware, has shown any capacity for taking charge of, or efficiently managing, any large industrial concern. Nor do they get any opportunity, prior to being sent abroad, to acquire sufficient technical knowledge here that they might ascertain for themselves, whether they have any liking for, or aptitude in, the particular line in which they are to become experts. It has happened that some of these young men, on returning to their country, have taken up an altogether different profession from that, to learn which, they were sent abroad, and the public money expended on their training has therefore been wasted. If we are really serious in our desire to give an impetus to the development of our industries, we should press for the establishment, in some central part of India, of a well-equipped Technical College, fitted with proper workshops and up-to-date laboratories. Students from the existing technical schools, now established in different parts of India should, if they so desire, after completing their course, be admitted into the Central Technical College. This, I do not think, would clash in any way with the Tata Institute, which, if I am not mistaken, is intended for original research.

With the establishment of a Central Technical College, students from the Universities—(those for example who take the B. Sc. degree), would be afforded an opportunity of continuing further their scientific education and of acquiring practical knowledge in this College. To establish such a college would mean a large outlay of money, and I think that this Conference should without delay approach the Government of India with a draft scheme. The existing technical schools should be placed in a position to offer suitable scholarships to successful and deserving candidates, who may be desirous of continuing their scientific studies, in this proposed Central College. Government scholarships, which are now offered yearly for the acquisition of technical knowledge abroad, could with advantage be diverted to this purpose and

to granting scholarships from the Central College for the purpose of gaining further experience by a course of, say two years, in England or other foreign country.

Apart from the doubtful result of sending our young untrained students to foreign countries, as is now done, to acquire technical knowledge, there are grave dangers at the present time, both personal and political, in sending a large number of students abroad, selected in a more or less haphazard fashion, and the Government of India would, perhaps, be prepared seriously to consider this point, when deciding as to the necessity of establishing a well-equipped Technical College in India. This, gentlemen, is only a rough outline of the scheme. Details would have to be carefully worked out, if the general idea is approved. No private individual, or association, I am afraid, would be able to control or manage such a technical college, or to carry out the scheme in its entirety. The Conference should, therefore, as I have said before, represent the matter to the Government of India and press for the establishment, as early as possible, of a Central Technical College, on the same lines as those now established at Birmingham, Manchester, Leeds and other places.

In the meantime, however, we must not neglect to take advantage of the general feeling that something should be done towards industrial development and I would suggest to our earnest workers that they should not hesitate to engage foreign experts for the present and do away with the vain prejudices of a narrow-minded "Swadeshi", which mistakenly advocates the employment of Indians only, to the exclusion of foreigners.

The next problem to be considered is the raising of capital. Having obtained a reliable expert and established confidence in the public mind, our next difficulty is the finding of the necessary capital. This, indeed, is a difficult problem—private enterprise in this country is only in its infancy, and therefore companies with a really sound and promising future often fail to attract capital. Indian capital, gentlemen, is proverbially shy and unenterprising but this I ascribe largely to a want of industrial and commercial knowledge on the part of Indian

capitalists and a consequent failure to realise the potentialities of the various schemes placed before them, coupled with a disinclination to depart from those time-honoured methods of investing and lending money, which have been in force for so many centuries and, in many instances, bring in a return which can only be considered as usury. India, generally speaking, is a poor country, that is to say, the majority of the population are poor. But there is wealth in India, and the possessors of it could, with but a fractional part of their amassed wealth, not only develop many of the industries, that are dormant to-day, but make India industrially equal to any other country in the world.

There must always be a certain amount of risk and uncertainty involved in the early stages of any new industry and it is the want of knowledge, referred to before, which prevents Indian capitalists from correctly estimating what those risks are, as against the higher return on their capital which industrial concerns usually give. No new industry in any country, and particularly in India, can be sure of such success as to shew a remunerative return from their very inception. Unless, therefore, our capitalists could be assured of at least $3\frac{1}{2}$ to 4 per cent. interest on their outlay, it is not likely that they will help in the promotion and financing of such companies. The Government cannot be expected to guarantee a minimum return, even for a short period of years, and it would not be for the ultimate good of the industry itself to be dry-nursed to this extent, but in a country, industrially new, as India is, a certain amount of dry-nursing has to be done and a great deal more could be done in this direction, by granting bounties, or even by preferential duties.

The most convenient method of establishing and working large industrial concerns is undoubtedly that of the Joint Stock Company whereby the investor's liability is limited to the amount subscribed. The Act, however, regulating such enterprises in this country is far from perfect and should be brought more into line with the new English Act of 1908, with such modifications as the different conditions existing in this country, may suggest. It should give ample

protection to the shareholders without being so stringent as to strangle commercial development. I believe the matter is already receiving the serious consideration of Government and I hope that we may shortly have an Act that will stimulate enterprise, while providing the necessary safeguards to investors.

In forming a Joint Stock Company the first step is the formation of a strong Board of Directors. Our Boards hitherto have consisted too largely of figure heads. We must, in addition, have on our Boards a few workers,—genuine sincere workers—and men of experience, who are prepared to work honestly and whole-heartedly for the good of the concern. In the present state of our commercial ignorance, I venture to think that it is not only desirable, but indispensable, to secure the services of a fair proportion of commercial European gentlemen on our boards, selected for their sympathy with, and their knowledge of and experience in, the industry to be developed.

The Board thus formed should have only a general control over the Company, the details of working and manufacturing should be left with the manager responsible for the production, who would, of course, be duly selected for his business qualifications and fitness for the post.

There should also be a commercial firm, of good status, selected as Managing Agents, whose functions would be to look after the commercial part of the concern.

What I have said above will doubtless appear very elementary to my Bombay friends, who are managing, and most successfully managing, much bigger concerns than I have in view. My remarks are meant for those who have not been so successful and I am prompted to make these remarks as I have regretfully seen the failure of many promising ventures through want of the right sort of men on the Board, the lack of good managing agents, and through undue interference, by well-meaning but incompetent directors with the manager working the concern.

The last and most important requirement is the easy and quick disposal of the articles manufactured. Notwithstanding the best expert knowledge, the required capital,

the formation of competent Boards and the securing of capable managing agents; unless our productions can be quickly disposed of, and at a remunerative price, we cannot achieve that financial success which is the object of all commercial undertakings. When we begin manufacturing goods that are now imported from Europe, we shall find many difficulties,—the most formidable being foreign competition. I am sure that any industry started in this country, calculated to decrease foreign imports, will lead to foreign manufacturers putting down goods at our doors at a price considerably below that at which they can be produced in this country, and we shall not be able to find a market for our goods unless we have Protection in some form. Such industries, as we may develop in our country, will not for years to come, seek a foreign market for their manufactures and our home market, under present conditions, might be practically closed to us by foreign manufacturers, who, with unlimited resources at their command, might possibly consider it policy to dump their goods in the country at a price below our manufacturing cost, with the object of killing local competition and then again raising the prices to a profitable figure.

This is a most serious question, gentlemen, and not only this Conference but every man of this country should continue to constitutionally agitate, until Government affords Protection, in some shape or other, to local manufactures.

Gentlemen, we all know that if the Government of India were left alone to do its duty towards India, there would be no hesitation in introducing some such measure, suitable to the special needs of India. But there are stronger influences at work, whose interests clash with our own, and without the combined efforts of the Government and the people, I am afraid, we shall never get a satisfactory solution. The question of Protection is, I admit, a complicated and serious one and it is with a great deal of hesitation and diffidence that I refer to it at all, but it is a question that should be most carefully considered, as otherwise to do good to some of our industries we may court disaster in other branches of commerce. I would suggest that the Government

should be approached and asked to appoint a Joint Commission of officials and commercial men to discuss and decide in what particular form Protection would be most beneficial to India. This point should be definitely decided before we actually apply for any protective legislation. I think it is imperative on our leaders to give this question their first consideration and, if we are successful in securing a wise form of Protection, I am sure the country's industrial development will receive a great impetus.

In connection with foreign competition, I should also like to add that the Patent laws are a very important consideration. In recent years this law has been revised in England by which it is provided that, to retain the protection of law, it is necessary, within a specified period, to manufacture the patented article in England. I think that such a law in this country will assist very materially in the establishment of factories and I earnestly commend the adoption of some such law, in a modified form, to the consideration of the Government. It has been in operation in England sufficiently long to enable one to form an opinion as to its success or otherwise.

The prosperity of the country should be our first thought and, I venture to think that the gratification of our political aspirations is of little avail, if this be lost sight of.

Another point which I think the Government of India might reasonably be asked to insist upon, is that every Government Officer should purchase his requirements from Indian manufacturers, if the price be the same as imported goods, and provided that the quality of the Indian manufactures is in no way inferior to that of imported goods.

A benevolent inactivity is not the attitude we have a right to expect from Government and indefinite promises of assistance are not of any practical value. Nothing short of definite, and fully authorised assurances of support, confirmed, if necessary, by legislative enactment, should satisfy us. Indefinite promises, in such matters, are subject to different interpretations by different people.

You will pardon my quoting an instance to emphasise the discouraging treatment industrial concerns receive in this country at the hands of Government. A few years ago the

Government required a large quantity of materials for the State Railways and an Indian Concern asked that it might be allowed to supply these. The local manufacturers were asked if they would agree to their goods being subjected to the same tests as the English manufactures were, and on their agreeing to this, it might reasonably have been expected that the Government would have willingly paid the same rate in India as the cost of the same goods from England.

Instead of this, it was stipulated that the goods should be supplied at 5 per cent. less than the imported cost.

We should also agitate for the abolition, or at least reduction, of the gigantic Store Department of the India Office in England. When the Store Department of the India Office was established, conditions were entirely different to what they are to-day and it was not possible to obtain locally the requirements of Government. There are now hundreds of firms of repute established in India, capable of supplying the requirements of all the State Departments. The competition, and the staff which the Government of India now has in India, would ensure all goods being supplied at rates quite as low as at present, when the saving that would be effected by the abolition of this department, is taken into account.

Illustrative of the attitude of Government towards the local purchase of stores I may be permitted to refer to a recent order on the subject.

The Government of India issued on the 29th of October last, a revised rule for the supply of articles for public service. It says "when serious inconvenience to the public service would be caused by waiting to obtain an article from England through the Director-General of Stores, or when, owing to the greater promptitude of supply, an economy can be effected by purchasing in India articles which, under the foregoing rules, should be obtained through the Stores Department, the purchase may be made in India, subject to rule 13 : provided that the articles are already in India at the time of order; but in such cases, if the value of the articles exceed Rs. 50, the sanctioning officer should place on record the reasons which make the local purchase desirable. This

declined and our industries have languished. To such perfection has manufacturing by machinery now been brought that it has become impossible for our artisans and craftsmen to make even the scantiest livelihood and the industries are consequently either dead or moribund. This is a matter of common knowledge. But what I should like to emphasise and especially draw your attention to, is that for want of elementary education, the artisan and craftsmen classes, even if they had the necessary capital, cannot appreciate the advantage of introducing machinery to cheapen the cost of production. They are very conservative in their ideas, and nothing but the spread of education amongst this class will induce them to welcome and make use of mechanical improvements, which would enable them to compete on more equal terms with the machine-made production. I have come in contact, in my experience of over 25 years, with thousands of artisans and mechanics of different grades. Their natural intelligence and hereditary aptitude, make them skilful workmen in their respective callings, and they do their work, under proper guidance, with a care and skill in no way inferior to the same class of workmen in any part of the world. But, being universally illiterate and thus shut out from a knowledge of any improved methods in their respective trades, they make no advancement or progress throughout their lives and are content to continue working on lines that for generations have become obsolete. They are handicapped by the want of that primary education which their fellow-workmen in other countries have enjoyed for several generations. This state of things has, for some time, been felt to be unsatisfactory and the Indian Government have recently created a separate education department, for the better advancement of education. The time is therefore opportune for this Conference to approach the Government, to extend the system of primary education, and, when the time is ripe, to make elementary education compulsory.

It has been said that one great difference between India and Japan is, that in India 95 per cent. of the population *cannot* read and in Japan 95 per cent. *can*, and this, I am

convinced, is the real secret of the disparity that exists between the commercial development of India and Japan.

And, now, gentlemen, I pass to a subject, which though, strictly speaking, is not industrial development, is so bound up, and intimately connected therewith, as to form an integral part of any well-considered scheme of this kind. I refer to the building of new railways and extensions to existing ones.

I think we all recognise that the Government of this country has for years followed a consistent policy of building trunk and main lines, as far as the funds at their disposal warranted, and these lines, which may be described as the main arteries of the commercial life of India, are in a prosperous and thoroughly sound condition and form a most valuable asset of the people. I think you will agree with me that this portion of the railway development of India is being well looked after by Government.

What, however, I wish to draw attention to is the vast opening which exists for light feeder railways. The main lines of railway are made chiefly to establish communication between important towns and sea-ports and to carry the export and import trade of the country. They must, of necessity, leave untouched large intermediate tracts and these provide an unlimited field for cheaply constructed feeder lines which would provide facilities for a traffic which is not sufficient to justify the construction of an expensive broad gauge line.

Such lines should be constructed on terms sufficiently liberal to attract, what has been aptly termed, the "buried millions of India." Government has endeavoured to meet this undoubted want in the new "branch line terms," which are much more liberal than those they have superseded.

These, however, in my opinion, do not go far enough. It is true that the rebate terms give a reasonable certainty of a minimum return, where the lead over the main line is sufficiently long. It is otherwise where the light railway is situated within a short distance of the port or city to which its traffic is destined.

In such cases something more is needed. There are

already a number of successful light railways, constructed and worked under a District Board guarantee of four per cent., with a division of profits above that figure, but every District Board is not financially strong enough to contemplate lightly such a guarantee, with the present means for raising funds allowed by the law. The branch line terms, by raising the "rebate guarantee" interest to 5 per cent. encourage the construction of branch lines, under certain conditions, but cut the ground from under the feet of those promoted by District Boards with a guarantee of 4 per cent.

It is a fact beyond contention that more lines of the "light narrow gauge railway" type, would be constructed, were the District Boards encouraged to promote such within their districts. Such bodies are, or should be, the best judges of local needs and the possibilities of financial success or otherwise.

A few years ago there was an Act before Government authorizing District Boards to levy a special cess for the purpose of guaranteeing such lines and it is my belief that such an Act is necessary. Its terms should empower the District Boards to levy such a cess, and should provide that such revenue as might be received from a share in the surplus profits might be put against the amount so raised.

It would be necessary, however, in order to bring the Act into line with the branch line terms to raise the District Board guarantee to 5 per cent.

It has probably been noticed by many of you here, that during the last decade monetary conditions seem to have changed and people, who were previously content with a safe return of 3 per cent. to $3\frac{1}{2}$ per cent., now look for a much higher return. It is not for me to attempt to diagnose the economic conditions which have brought about this feeling, but it is not common to India alone. In the past it has, at favourable opportunities, been possible to raise capital on a District Board guarantee of 4 per cent., in the same manner as it was possible for Government to raise loans cheaper than it is at present, but that time seems to have passed and it is now necessary to offer more liberal terms.

I would ask our new Commercial Member and the Rail-

way Board to give this question their consideration, as it is possible that the effect the new Branch line terms would have on the promotion of District Board lines, was not considered. It may be possible, in some form or other, to combine the District Board guarantee with a rebate from the main line on interchanged traffic.

Talking about the Railway Board, as a commercial man, I would like to see a commercial or financial expert as one of the members. As at present constituted the Board is what I may call a technical one. Each member has wide and expert experience and knowledge in the construction and working of Railways but, inasmuch as Railways are inseparably connected with the commercial interests and development of the country, what is wanted, in my humble opinion, is an additional member who should be a commercial and financial expert. I will give an instance where the trade of the country is suffering for want of such knowledge.

In the Central Provinces we have a valuable industry that requires to be fostered or it will die out altogether. I refer to the trade in Manganese Ore. This trade, so far as India is concerned, only came into existence a few years ago, when after much prospecting, valuable Mines were discovered. The chief rival of Indian Manganese is the Russian Ore, from Mines in the Caucasus, where, it is reported, sufficient ore exists to continue producing at the rate of 6,00,000 to 7,00,000 tons per annum for the next 20 or 30 years. Therefore, the competition with Indian Ore must continue. In quality the Indian Ore is somewhat superior to the Russian and, given reasonable facilities in transport, would always be able to hold its own on the European Markets. As a matter of fact, however, the exports of Manganese from India have been steadily on the decline, and during the last 3 years, our competitors in Russia are actually going ahead.

In 1908 (January to September) the imports of Caucasian Ore into the home market were 2,86,416 tons. In 1909 for the same period they advanced to 4,26,488 tons and, up to September 30th of the present year, have reached 5,85,205 tons. The trade, therefore, from Russia has doubled itself in 3 years and this is entirely due to the reduced transport charges

sanctioned by the Russian Government, with the object of fostering and holding the trade.

To enable India to retain some portion of the trade it is necessary to reduce the railway freight from the mines to the port. Such a reduction, as would enable this to be done, would still leave the railways concerned a handsome profit, inasmuch as a large proportion of the wagons now returning empty, particularly on the B. N. Railway, would then be carrying manganese.

Before I conclude, I would like to say a few words about agriculture which, as we must all admit, is the main stay of the country. Two-thirds of the population of India are directly dependent on agriculture. Both the Government of India and the Local Governments are making serious efforts for the improvement of agriculture, according to recent scientific methods. As we are all aware, a splendidly equipped Scientific College has been established at Pusa under the Government of India. Local Governments have also provided provincial agricultural colleges, with a home-farm attached, for imparting instruction in improved methods of agriculture. But I have my misgivings as to the amount of direct good these schemes will achieve, in proportion to the money expended by Government. For want of elementary education amongst the cultivators, the sons of middle class men, who have hitherto been educated to earn a livelihood as clerks, etc., are largely admitted into these Colleges and they will doubtless, in course of time, acquire a knowledge of agriculture, according to recent scientific methods. The question that arises, however, is, how will such students employ the knowledge thus acquired, at enormous expense, in actual, practical cultivation. Throughout India cultivation, as a rule, is carried on by the cultivators themselves in small lots of from 3 to 20 acres, according to their means, and the number of men in the family. These cultivators carry on the work according to their own ideas, and it is very difficult—almost insurmountably so—to persuade them to adopt any new suggestions or improved means, which involve extra expenditure at the beginning. I also know from my own personal experience, that they are very

averse to allow any improvements or experiments to be carried on in their fields, even if they do not bear the extra expense. The students of these agricultural colleges have generally speaking, either no land to cultivate or no capital to start work, even on a moderate scale. There is very little land, suitable for cultivation, which is not already cultivated except jungle land, which might be cleared, or such places as the Sundarbans. Few of our landed aristocrats or Zemindars have large areas in their Khas possession, which they would be willing to place at the service of these students to experiment with. The only satisfactory solution seems to be the elementary education of the ryots, to enable them to appreciate the advantages they would derive by adopting improved methods of agriculture, and by joining together in small groups to utilise the services and advice of the students who graduate from the agricultural colleges. I am not an advocate of compulsory education at this stage. This is impracticable for many reasons, but there is no doubt that without the extensive spread of primary education amongst the illiterate classes, both artisan and cultivator, there is very little hope of any real improvement or advancement in either small industries or agriculture.

Here, in sight of this great Industrial Exhibition, we should indeed be lacking in gratitude (a quality which, despite our critics, we are by no means deficient in) if we did not acknowledge our indebtedness to the Government and all those who have worked so hard to make it a success.

Many of us may have our misgivings that here again the ultimate result—the industrial advancement of our country—achieved by this effort, will not be commensurate with the expenditure of money upon it, for the same reason that many thousands of the visitors have not had sufficient education to appreciate what they see. But I am sure that we all realise the good intentions which prompted the Government to organise this Exhibition and appreciate the devotion and energy with which Sir John Hewett and his officers have worked to make it a success.

There is no doubt that these Exhibitions do a great deal

of good, but until the industrial development of the country has made considerably more advance, than is the case at present, they are very much on a par with a manufacturer who spends large sums on advertising in a country, the inhabitants of which cannot read the language in which he advertises.

I thank you, gentlemen, for the indulgent hearing you have given me. The subjects I have spoken of are not new to you. They are old ideas, in other clothing. If I have succeeded in placing them before you in a different guise and in a manner that has brought forth fresh ideas and new thoughts I shall feel that I have not occupied so much of your time in vain.

Allow me again to express my thanks for the cordial welcome I have received and appreciation of the confidence you have shown in me in electing me your Chairman.

ANNUAL REPORT.

After the conclusion of his speech, the President called upon the General Secretary to present the annual Report to the Conference. The Honourable Rao Bahadur R. N. Mudholkar, the General Secretary said that the report being a bulky document it would not be possible to read the whole of it. He, therefore, laid it on the table and made a few remarks in the course of which he complained of the lack of response from the people—the aristocracy as well as the middle classes—to appeals made to them for funds. He emphasised the importance of technical education referring to the debate raised by him in the Viceregal Council. He also alluded to the Industrial Conference which was going to be held at Nagpur in which he was invited to take part, both in his personal capacity and as the General Secretary of the Conference. He suggested that advantage should be taken of the coming Royal visit to get a Technological Institute established as the most fitting memorial of the event.

The Honourable Sir Vithaldas D. Thackersey proposed and the Honourable Mr. N. Subba Rao Pantulu seconded the adoption of the Report, which was carried.

THE PAPERS.

The Hon'ble Rao Bahadur R. N. Mudholkar in placing on the table a number of papers presented to the Conference by various gentlemen qualified to deal with the subjects selected by them, said :—"Gentlemen, we have received a number of very useful and informing papers; and as usual such of them as were received by the end of the first week of December have been printed and copies of them are available to those who take an interest in the matters treated therein. The papers are nearly 31 in number and it would be impossible to read even one or two of them for want of time. Several of them are very instructive; it is only by reading them in our leisure hours that we can profit by the instruction which they are calculated to give to us. What I shall therefore do is to lay them on the table and read a list describing their nature. The first paper is from our friend, Mr. Chatterton, who was the Director of Industries of Madras till recently, but whose post will now be abolished and who will hereafter be made the Superintendent of Industrial Education. His paper deals with the progress of irrigation by pumping. He believes that it is quite feasible to have good irrigation without even the costly schemes of canals involving an expenditure of lakhs and lakhs of rupees. He shows the very great progress which has been made in the Madras Presidency in that direction. The next paper is on the "History of Cotton improvements in India, with special reference to Central Provinces and Berar," and it is written by Mr. D. Clouston, Deputy Director of Agriculture in Central Provinces and Berar, and it deals with one of the main staple industries of the country. The third paper is from Mr. G. S. Henderson, Deputy Director of Agriculture and he deals with the "Long staple cotton in Sind".

The General Secretary then read the whole list of papers contributed to the Conference.

THE HISTORY OF COTTON IMPROVEMENT
IN INDIA WITH SPECIAL REFERENCE
TO THE C. P. AND BERAR.

BY D. CLOUSTON Esq., M. A., B. SC.,
Deputy Director of Agriculture, C. P. and Berar, Nagpur.

The Dawn of the Cotton Industry:—

From very early times man has used various fibres for the manufacture of cloth with which to clothe himself. Flax, wool, silk, hemp and cotton have all been employed for this purpose; of these cotton fibre is by far the most universally used at the present day. It forms part of the clothing of 70% of the population of the world. It is believed that cotton fibre has been used by the Hindus for the manufacture of the cloth for at least 4000 years. The Sanskrit name was *Carpasa* from which the term kapas (cotton) is supposed to be derived. We know for certain that from 1500 B. C., till the 16th century of the present era, India was the great centre of the cotton industry, that she supplied Europe with cloth for ages and that from India, the West learned spinning and weaving.

Many references are made by ancient writers to the cotton grown in India and to the fineness of the cloth made from it by the natives on their primitive hand looms. In the Institutes of Manu written about 800 B. C., it is decreed that the sacred thread of a Brahman must be of cotton (*Carpasa*), that of the Kshatriya of *san* thread and that of the Vaishya of woollen thread. Herodotus who wrote about 450 B. C. says that "there is a tree growing wild in India, the fruit of which is a wool exceeding in beauty and goodness that of a sheep and the Indians made their clothes of it." Theophrastus (350 B. C.) another writer speaks of the cotton trees from which the people

of India make cloth, as having leaves like that of a black mulberry, and as being planted in rows in their fields so as to look like vines in the distance. Nearchus, the Admiral of Alexander, speaks of the trees which in India "bore bunches of wool from which the natives made their garments consisting of a shirt reaching to the middle of the leg, a sheet folded about the shoulder and a turban round the head." The cloth made from the fibre was, he said, "finer and whiter than any other." Other writers speak of Indian muslins which under the Roman Emperors were so much prized as an article of dress by the coquettish dames of that time. Arrian describes Arab traders as bringing cotton goods from Barygoza (the modern Broach) to Ports on the Red Sea in the early centuries of the Christian era. The muslins of Dacca were described by the same author as being superior to all others.

The cotton plant was probably first cultivated for its fibre in Egypt in the 13th century and in Japan about the same time. It is said to have been introduced into Spain and Northern Africa by the Mohammedans in the 10th century and in the 14th century we know that it was grown in Southern Europe. From India its cultivation is said to have spread into Persia, Arabia, Egypt, Syria and Asia Minor and from thence into Turkey and other parts of Southern Europe. In 1492 Columbus found it growing in the West Indies and America. In England which is now the great centre for the manufacture of cotton goods this great industry was only started about 1635. Cotton cultivation in the United States of America dates from about the same time, but the quantity produced was small till the beginning of the 19th century.

The Hindus then can rightly claim to have been the pioneers both in cotton cultivation and in the manufacture of the cloth. Till the 15th century their dyed and printed calicoes and muslins were carried to Venice, Genoa, Alexandria and Constantinople by Phœnician and Arab traders from the Mediterranean Coast. The discovery of

the new route round the Cape by Vasco de Gama in 1498 encouraged the Portuguese to take part in the eastern trade. They were followed by the Dutch in the 17th century and by the English a little later. It is worthy of note that for centuries before power-looms had been dreamt of, India had a trade in cloth of so fine a quality that an early writer has described it as the "mere shadow of a commodity." Tavernier, writing in 1660, says of this fine Indian fabric that "when a man puts it on, his skin appears as plainly through it as if he were quite naked."

Progress of the cotton Industry in India :—

Dr. Royle in his book on the culture of cotton in India published in 1857 says "The cotton manufacture was no doubt established in India long before we find it noticed in any reliable history. The natives of that country early attained excellence in the arts of spinning and weaving, employing their fingers and the spinning wheel for the former ; but they seem to have exhausted their ingenuity when they invented the hand-loom for weaving, as they have for ages remained in a stationary condition." The Indian fabrics were cheap, beautiful and popular though the dyeing and printing were effected by rule-of-thumb methods handed down from father to son. The printing was done by means of blocks pressed by hand on the fabrics. The dyer possessed no chemical knowledge of his subject. Before the close of the 18th century the inventions of Wyatt, Pane, Arkwright and Hargraves gradually led up to that of the power-loom which enabled the manufacturers at home to produce enormous quantities of the finest cloth at comparatively cheap rates. "India which hitherto had been supplying the Western World with her matchless fabrics was to be beaten out of even her home market by the gigantic cotton manufactures of England," and her long-established hand-loom industry was shortly to suffer in competition with this more advanced and cheaper method of manufacture. As early as 1793 we find a Select Committee of

the Court of Directors of the East India Company upon the subject of the cotton manufacture, stating that, "Every shop offers British muslins for sale equal in appearance and of more elegant patterns than those in India for one-fourth or perhaps more than one-third less in price." Exports of cloth and yarn from England to India increased by leaps and bounds. In 1877 it had risen to 1,304,935,496 yards of cloth and to 36,030,025 lbs of yarn; 20 years later India took 1,758,837,600 yards of cloth and 47,696,100 lbs of yarn; while last year (1909) her imports of English cloth and yarn amounted to 2,046,799,100 yards of the former and 36,023,200 lbs of the latter.

With the advent of the power-loom in England arose a very great demand for raw cotton. At this time the world's supply was very limited; for America had not yet become a great producer. That imported into England before the introduction of the new spinning and weaving machines had come almost entirely from the Mediterranean ports, especially Smyrna. About 1780, the West Indies and Brazil became the principal sources of supply. India had no export trade in the raw staple till 1783. In that year about 280 bales were imported from India for the use of English mills. By the first decade of the 19th century India supplied about 12,000 bales annually, which in 1866 had risen to 1,847,759 bales. Though the consumption of cotton in English mills has increased enormously since then, India has furnished much smaller quantities for the following reasons:—(I) Most of our Indian cotton is too short to meet the requirements of the English mills. During the years of the cotton famine when it was used in large quantities under the name of "Surats" English mill-owners complained that it was badly cleaned, and that the staple was short, harsh and brittle. The name "Surats" became a common epithet in Lancashire for anything that was inferior in quality. (II) There is a good demand for Indian short-stapled cotton

on the Continent, in Japan and in India itself which have mills fitted up for spinning and weaving low counts of yarn and coarse cloths. This demand has raised the price of Indian cotton above its intrinsic value for English mills. (III) Indian cotton contains more dirt and waste than American. (IV) The bulk of the cotton now grown in India is of inferior staple. The comparatively small quantity of superior staple produced is often adulterated with low grade fibre; the mixture is not suitable for spinning the higher counts of yarn required by English mills.

Though England gained a march on India by the invention and introduction of power looms, India has shown most remarkable enterprise in following in her footsteps in developing her cotton industry. Spinning and weaving mills and ginning factories are now to be found scattered over the whole cotton tract. The first mill was built near Calcutta in 1818; the number last year (1909) had risen to 259 with 60,53,231 spindles, 76,898 looms and employing 2,36,924 people. Within the last 12 years there has been an increase of 55 per cent. in the production of yarns; but the quantity of cloth produced in the same time has been more than trebled. The great bulk of this yarn is of low counts (4s to 12s) spun from short-stapled cotton of which there is always an ample supply available in India. The two great markets for coarse Indian spun yarn are China and the village weavers in India. China alone imported last year 5,10,746 bales (each 400 lbs). The cloth on the other hand is nearly all woven from yarn of medium counts (20s to 32s) warp and 24s to 40s. (counts) weft.

In the Central Provinces and Berar the quantity of cotton suitable for spinning medium yarn is very small; within the last 40 years it is believed to have deteriorated very much in quality. The mills on the other hand have gradually been increasing their output of cloth spun from yarn of counts higher than 20s., for which cotton of medium staple is required. To meet their requirements mill-owners in these Provinces

have therefore to import large quantities of Broach, Kumpta and Dharwar American cotton from Bombay ; Coconada, Western and Tinnevely cotton from Madras, Karkeli (Bani) cotton from the Nizam's dominions and American and Egyptian cotton from abroad. Khan Bahadur Bezongji, Manager of the Empress Mills, Nagpur, writing on this subject says, " The more long stapled cotton is grown in this country, the greater will be the development of the Indian cotton industry which is simply held back for want of it." With a more advanced civilization in the East has come a pride in the wearing of fine fabrics, and Indian mills will be compelled on economic grounds to produce the finer cloths for which there is a gradually increasing demand.

As the demand for long staple cotton in these Provinces far exceeds the supply, the price for the very small quantity grown should therefore be comparatively high. That the cultivator does not always get the full market value for it may be due to any one of the following reasons, (i) that he is taken advantage of by the middleman who for a small quantity will pay only the same price as he pays for short staple, (ii) that he has brought long staple cotton to a market where low grade cotton only is sold and where no attention is therefore paid to quality of staple, (iii) that the cotton is seldom or never uniform in length consisting as it does, of a mixture of different types and varieties, and (iv) that the long staple cotton grown *viz. bani* contains a higher percentage of dirt than the coarser cotton which detracts considerably from its value.

The only indigenous long staple cotton grown in the Province is *bani*, the cultivation of which is confined to small tracts of soil specially suitable for it on the borders of the Nizam's dominions. When brought to any of the markets where high grade cotton is sold such as Basim, Akola, Hinganghat and Warora its lint fetches about 10 per cent. more than that of ordinary *jari*. Very little

pure *bani* is now grown, however, for the cultivator's seed comes mostly from the local ginning factory where but little care is taken to keep that of different varieties separate. The cultivators will generally realize the full market value for his long staple cotton by dealing directly with the agents of our local mills.

The Demand for Indian cotton :—

The prices of raw cotton in India are less dependent on the local demand and supply than on the requirements of other cotton manufacturing countries. America being the largest producer to a great extent controls the cotton markets of the world. Any decrease in the supply of American cotton has invariably resulted in high prices for Indian cotton. During the American war of 1812-14 and again during the Civil war of 1862-66 the prices of Surat cotton from Bombay rose to 17 and 14 pence per pound respectively. The poor American crop of the past year (1909) raised the price to 6½ pence a pound, notwithstanding the fact that the Indian crop was one of the largest on record, being estimated at 4½ million bales. The bumper crop of India was utilized in meeting the increased demands of Europe and Japan due to the American failure. The mill consumption of the raw material in Great Britain, America, India and on the Continent has increased enormously within the last 20 years, while there has been no proportionate increase in the production. The continued high prices due to the shortage of supplies, is one of the most important of the economic problems with which the industrial world is faced to day. The demand for cotton cloth within the last 60 years has increased so fast that the quantity of the raw material required has doubled in each period of about twenty-two years. The reasons are manifold. Thanks to the enormous benefits derived from the railroads, steamers and telegraph which link together the different peoples of the world, civilization is reaching the most remote places and more and better clothing

is being worn. The population of the world, also, is increasing in number, and wealth. New uses are daily being found for this fibre. It is now used largely for mixing with wool in making coarse cloth and with silk for lighter cloths. There is, therefore, good reason to believe that the shortage in the supply of the raw fibre is likely to be a permanent one unless the present cotton producing area of the world can be largely increased. Prices this year are again high, despite the fact that the world's cotton crop is at least an average one.

The cultivation of cotton is mostly confined to America, India, Egypt, Brazil, China, the West Indies and the Russian Territory in Asia. To increase the world's supply attempts are being made to push its cultivation in East, West and Central Africa, the West Indies, Australia and other parts, but with only a small measure of success so far. The problem of how to meet the demands of the cotton trade is still further aggravated by the fact that about three-fourths of the world's supply is at present grown in the Southern States of America which therefore practically have a monopoly of the cotton of commerce. The area suitable for cotton cultivation there, too, is limited. The American cotton-grower, moreover, is beginning to go in for more diversified cropping systems, in which other crops are being substituted for cotton. The labour required for its cultivation in the Southern States is getting dearer also, consequent on the rise of new industries; and America is now using up a larger share of her raw produce every year in her own mills. While in 1890 she produced about 7 million bales of which she consumed one million bales in her own mills; in 1908-09 she produced $13\frac{3}{4}$ million bales and consumed in the same year $5\frac{1}{2}$ million bales. While in 1890 the Americans consumed only about 18 per cent. of their own cotton; in 1908-09 they consumed nearly 40 per cent., in spite of the fact that that supply had nearly doubled.

Of the other cotton-producing countries India is

the only one which is in a position to extend the cultivation of that staple to any great extent in the near future. In 1868-69 the area under cotton in the Central Provinces and Berar was 20,37,617 acres. 40 years later (1908-09) it had risen to 4,176,361 acres. If prices continue to rise there is no reason why it should not again more than double within the next four decades, for there is still a very large area suitable for cotton cultivation under other crops at present. The same rate of increase might well take place over all India and her last year's production of $4\frac{1}{2}$ million bales of raw cotton might well rise to 9 millions. That the outturn per acre can also be increased by better cultivation combined with a judicious use of manures is a fact which has been clearly proved on the Akola Experimental Farm which is near the centre of the great cotton tract in these Provinces. While the average outturn for Berar has been found to be about 300 lbs of *kapas* per acre the cotton area of 158 acres on the Akola Farm gave last year (1909-10) an average outturn of over 500 lbs.

While the world's supply of the raw material continues to fall short of the demand, prices even of short-stapled Indian cotton must necessarily remain high. Owing to the expansion of the mill industry in Japan, India and on the Continent of Europe there has been a proportionate increase in the demand for the Indian staple, consequent on the dearth of American cotton. Several hundred bales of Indian cotton were imported by American mill-owners in the Southern States last year (1909) for experimental purposes. Should it be found suitable for mixing with the better American staple, it will mean the opening up of a new cotton market for the Indian cultivator.

There is therefore a most promising future for the cotton grower in India. There are, however, formidable obstacles in the way of progress. Proper attention is not given to the selection and ginning of the seed.

Most of the cotton grown is of very short staple. The small quantity of medium stapled cotton produced is grown as a mixture with the coarser types. The supply of available farm yard manure is altogether inadequate, and the cultivator has not yet learned to supplement that supply by the use of other manures. The continuous cultivation of cotton on the same land, too, has in many places, led to the spread of a wilt disease which, where it exists, reduces the yield by about one-half.

History of improvements in cotton cultivation in India :—

During the last half of the 19th century the area under cotton in India increased enormously. Previous to that time little inducement had been offered to the grower to exercise care in harvesting his crop, as no more was given for clean samples of lint than for dirty ones. Owing to the absence of railways, too, he experienced great difficulty in marketing his produce. The Central Provinces and Berar were in those days almost inaccessible. The two great cotton marts outside the Provinces were Mirzapore on the Ganges and Bombay. To these cotton was carried by road by the *Banjaras* ; the load (*bojha*) of about 240 lbs consisted of two loose bags of cotton slung pannier-fashion on a bullock's back. In these early days it was no uncommon experience to meet a drove of 1000 bullocks laden with cotton wending their way along the dusty road to these markets. Much of the cotton exported from Berar was carried to Bombay, the distance varying from 126 to 450 miles ; but some of it was sent north to Mirzapore a distance of 500 miles to avoid the extremely heavy and arbitrary duties levied upon it when passing through the Nizam's Territories. From the north of the Provinces nearly all the cotton was sent to the latter town. The cost of transport was excessive; in most cases it exceeded half the value of the cotton. Much loss was suffered in transit, too, for the cotton was eaten by the bullocks, stolen by the drivers, and damaged by the dust. In years of

light rainfall the difficulties of transport were still further increased, owing to the want of water and forage on the road.

The dirty state in which Indian cotton was exported had long been a cause of complaint among English mill-owners. The ryot, it was said, generally sowed his cotton broad-cast as a mixture with three or four other crops. He seldom did any weeding and did not start picking till all the bolls had matured. The fallen cotton mixed with earth and leaf was then mixed with the clean cotton picked from the plants. The *Bania* added to his profits, as middle-man between the ryot and exporter, by adulterating his purchases with cotton seed, earth and water. The exporter, who was directly interested in getting cotton of good quality, was stationed in one of the big marts, and never came into direct touch with the producer. Under these conditions the quality of Indian cotton became a by-word among English mill-owners, and the general opinion was that Indian cotton would never be used in English mills except as a make-shift in the event of a shortage in the American supply; for not only was it dirty, but the staple was as a rule shorter, coarser and less uniform than that of America.

The attempts to improve cotton cultivation in India date from the year 1788, when a court of Directors called the attention of the Indian Government to the cultivation of cotton in India with a view to affording every encouragement to its growth and improvement. In the following year screws for compressing cotton were established both by the East India Company and by private individuals. In 1794 cotton gins were sent out from England and in 1810 several exotic varieties of cotton from the Western World were under trial. From 1829 till 1841 further efforts were made to introduce American cottons, saw-gins, ploughs, and hoes. Experimental Farms were started in Bombay under the supervision of American expert cotton growers; and to encourage cultivators to keep their cotton free of

dirt, rewards were offered for clean samples. In 1857, the short crop in America produced alarm among English spinners, who complained of their dependence upon one source of supply for their raw material. The "Cotton Supply Association of Great Britain" was established by the Manchester spinners, who in a time of stress always considered it to be their duty to enquire whether an increased supply of cotton could not be obtained from other countries, so as to lessen their dependence on the United States." Plans were formed for obtaining Government aid in increasing the transportation facilities of India, but the outbreak of the Indian Mutiny prevented any improvements being effected at that time.

The great cotton famine of 1862-64 caused by the American Civil War gave a fresh impetus to cotton cultivation in other cotton-producing countries. English mill-owners turned to India, the ancient seat of the cotton industry to meet their wants; and through the agency of the Cotton Supply Association again urged on Government the necessity of extending and improving cotton cultivation in the Empire. The Government of India responded willingly to this request. For the Central Provinces and Berar, a Cotton Commissioner in the person of Mr. Rivett Carnac was appointed in 1866. The object of his appointment was, (i) the introduction of foreign staples, (ii) the improvement of the indigenous plant, and (iii) to watch over all affairs relating to cotton and to further, so far as might be legitimately possible, all interests connected therewith. The cotton farms were started under the supervision of trained gardeners from home and American and Egyptian varieties of cotton were tried.

The idea of improving the indigenous varieties was a new one; previous measures for improvement had all been planned on the assumption that Indian cotton was of inferior quality, and that the trade could be greatly benefited by the substitution of exotic varieties of good staple for the indigenous varieties grown. At this time

the cottons of the Central Provinces and Berar were classified as Chanda *jari*, *bani* or Hinganghat, and Berar *jari* or *oomras*; Chanda *jari* and *bani* were different names for the same variety, which was known as Chanda *jari* when grown as a cold weather crop, and as *bani* or Hinganghat when sown in the beginning of the rains. The staple of this cotton was fine and silky and quite suitable for the English mills, being nearly equal in value to middling New Orleans. Berar *jari* or *oomras* was slightly inferior to Hinganghat; the name was applied very possibly to all cotton containing a mixture of *bani* and the better types of *jari*.

With a cotton of the Hinganghat class ready to hand the Cotton Commissioner made vigorous efforts to extend its cultivation and to improve its quality by seed-selection. Seed farms were started and different manures and methods of cultivation were tested. Large quantities of Hinganghat seed from Wardha District were sent for trial to the Berars, Nimar, Jubbulpore, Chanda and Chhattisgarh; still larger quantities were sent to other Provinces. In 1867 no less than 24,046 maunds of Hinganghat seed were distributed.

The results were on the whole disappointing; despite the fact that the exotic varieties under trial were grown with great care, the outturns of cotton obtained were low and the staple was weak. It is interesting to know that the so-called upland Georgian, an American variety introduced at this time, has since continued to be grown as a mixture with the indigenous varieties. In Bombay Presidency an Orleans variety now known as Dharwar American had been successfully introduced in Dharwar previous to this, and has been grown there on a large scale ever since. The efforts made to improve the indigenous staples also failed to produce results of any permanent value. *Bani*, which when grown in certain well-drained areas had given a good yield of cotton of a quality second to none in India, did badly in other localities where the soil was less suited to it. From the selection of seed no results of proved value were reported.

In one respect, however, the measures adopted by the Cotton Department at this time were beneficial to the trade, namely, in facilitating transport. Owing to the great extension of cotton cultivation in these provinces, buyers suffered much loss on account of the inadequate facilities for export which then existed. Baling presses had not come into use and the cotton had therefore to be despatched by rail in loose capacious bundles (*dookras*). Much delay in marketing the cotton was thus experienced and large quantities were stolen or damaged by fire at the railway stations. Owing largely to the exertions of the Cotton Department the rolling stock of the railway was increased, new branch lines were opened to Khamgaon, Hinganghat and Amraoti, suitable yards for storing the cotton provided with a police guard stationed at each and baling presses were introduced which both cheapened and greatly facilitated transport. The rapidity with which presses came into favour is amply proved by the fact that in 1865-66, there was no cotton pressed in the C. P. and Berar; while in 1868-69, 92% of the total quantity exported was pressed; thereby reducing freight charges on the railway by one-half or about £ 2-11 per ton.

The next important attempt at improvement dates from the year 1904. It was based on an order from the Government of India, advised by the then officiating Inspector-General of Agriculture, Mr. Sly. In that letter it was stated that a Cotton-growing Association had been formed in the United Kingdom for the promotion of cotton cultivation within the limits of the British Empire, and that the importance of improving the Indian supply had been pressed upon the Secretary of State by that Association and by the representatives of the textile interest in Lancashire. The Government of India, while recognising that the problem was largely a commercial one, suggested the following lines on which improvements might be carried out. (1) The botanical

examination and classification of all existing varieties of cotton both wild and cultivated. (2) The introduction of better varieties and improved methods of cultivation. (3) The provision and distribution of good seed of the varieties ordinarily grown. It was pointed out, moreover, that in the past too much time had been devoted to the acclimatization of exotic species and special attention would therefore be given to the improvement of existing indigenous varieties. The next steps in this process were to be the extended cultivation of the selected forms on demonstration areas and seed farms, and the distribution of seed so grown to picked cultivators under official supervision. It was pointed out, too, that one of the main causes of the general deterioration which had occurred, in the quality of the cotton produced in many parts of India was carelessness in the selection of seed, owing to the practice which had become prevalent of sending all cotton grown to ginning mills, and getting back from them, for sowing purposes, any kind of seed they happened to have ready for sale, instead of hand-ginning at home the produce of their best fields for seed purposes. The decline in the long stapled cotton of the hilly tracts of Berar was attributed principally to the seed being mixed in the ginning factories, which had sprung up of late years.

The Government of India has done its very best to effect improvements on the lines suggested in 1904. An Imperial Cotton Specialist has been appointed, existing varieties of Indian cottons have been classified, and each Province is tackling the question of cotton improvement in a much more scientific manner than has ever been done before. In the Provinces to which I am attached it is our most important crop, and is receiving more attention than perhaps any other. The scheme for improvement which is being followed was modelled on the lines suggested by the Government of India in 1904. (1) The Imperial

Cotton Specialist and his classification of Indian cottons has been freely consulted. (2) The different races of cotton grown as a heterogeneous mixture under the name of *jari* have been classified and are now being grown separately. (3) Improved methods of cultivation involving deeper tillage, the application of manures not at present in use, the better spacing of the plants and the selection of seed are being demonstrated on private Cotton Seed Farms of which there are now three or four in each cotton growing district. (4) A system of seed distribution through the agency of these seed farms has been evolved, and is already doing most useful work in propagating and distributing to cultivators seed of selected strains of the indigenous varieties and of the exotic variety which has been found to do well in these Provinces.

The system of distribution followed by which seed of the desirable types of cotton is selected on the experimental farms, and distributed later to different cotton seed farms belonging to private individuals, who in turn propagate it in their own fields and distribute it to cultivators has worked very well. It enables the Department to introduce pure strains of selected seed on a large scale. The owners of most of these seed farms are among the most intelligent of the members of our District Agricultural Associations. They now run these farms as private and profitable enterprises—the only pecuniary help which they receive from Government consists in the small quantity of selected seed which they get free of cost from the experimental farms for each year's sowing. The farms are inspected at short intervals by agricultural assistants, who advise the owners in their management. The owner gins his *kapas* on hand gins and the quantity of seed available for distribution is advertised in the Agricultural Gazette—a monthly periodical published by the Department of Agriculture; but the owner fixes the selling price, and disposes of the seed as he cares to. As specially selected seed is supplied each year from the Go-

vernment Experimental Farms, the risk of deterioration or mixing with inferior strains is avoided. This system of seed distribution has been highly recommended by the Imperial Cotton Specialist, by the Secretary for the International Federation of Master Cotton Spinners and Manufacturers and others who have looked into it. It is a popular system: it encourages co-operation between the Department and the owners: it brings the Department into closer touch with a large body of cultivators. These seed Farms are private enterprises, being under the direct management of the owners: Government lends its assistance by supplying gratis advice as to their management and selected seed for each year's sowing.

The pecuniary outcome of this system of cotton improvement will, we believe, mean in the long run an addition of crores of rupees to the annual receipts for cotton grown in these Provinces. By raising the ginning percentage by 3 per cent. even, as is now being done by growing that selected type of *jari* known botanically as *roseum* of which pure seed is now being distributed by the Department of Agriculture we can increase the annual production of cotton grown in these Provinces by 40 million pounds of lint worth nearly 17 million rupees at present prices.

Much can be done, too, we believe by introducing a wilt resistant cotton in areas in the cotton tract where the indigenous varieties suffer much from this fungoid disease at present. *Buri*, an exotic variety, is admirably suited for this purpose; it is not only immune to wilt, but is the most promising long-stapled cotton which has yet been tried in these Provinces. It has the further advantage of thriving better in waterlogged areas than our indigenous cottons, and can be grown successfully in the rice tract where the rainfall is too heavy for the latter. The value of *buri* at present is Rs. 180 per *bojha* of 345 lbs. as compared with Rs. 140 for *jari*. The area under this desirable cotton is extending very fast.

The better manuring is another phase of cotton cultivation which offers much scope for improvement.

The cotton-grower at present starves his land. The possibility of applying artificial fertilizers or other supplementary supplies of manure has not yet impressed him as being a practical proposition; though the black cotton soil with which he has to deal is most responsive to dressings of nitrogenous manures, such as nitrate of soda or sulphate of ammonia. It has been proved that when these are applied as a top-dressing to land which has been previously lightly manured with cattle dung, the increased outturns far more than cover the cost of the manure. It has also been proved that, as a manure for cotton, cattle urine conserved by the dry earth system recommended by the Department is equal in manurial value per animal to the dry excreta, so that the increase in outturn obtained from the use of dung alone, could be about doubled if this method of conserving the urine were employed. But these are only a few of the possible ways by which the productiveness of the cotton tract could be largely increased. It is impossible to foretell with precision what the pecuniary outcome of all these investigations is to be. If we succeed in modifying practice even to a small extent; if we can succeed in introducing new factors each of which will raise the value of the produce per acre by one or two per cent. the gain on the aggregate will represent enormous sums when considered in relation to the large area involved. We are convinced that there is a most promising future for the cotton-grower in India, and that much progress will be made in improving this industry within the next decade or two if the various Departments of Agriculture continue to work on present lines. Improvements must be based on, (i) the selection and propagation of pure and selected strains of the different races of Indian cottons through the agency of seed farms, (ii) on the introduction of such exotic varieties as may, under certain conditions of soil and climate, prove more profitable than existing indigenous ones, and (iii) on improved methods of tillage and a more extensive use of manures.

LONG STAPLED COTTONS IN SIND

BY G. S. HENDERSON ESQ.,

Deputy Director of Agriculture in Sind, Mirpurkhas.

From early times the resemblance of Sind to parts of Lower Egypt has struck many observers. Possibly from this arose the belief in the possibility of a great future before Sind in long-stapled cotton cultivation. As far back as 1852, Sir Bartle Frere then Commissioner in Sind appointed an American cotton planter to superintend cotton experiments in Sind. After 3 years, however, the experimental work was abolished. Again in 1860, 5 bags of Egyptian cotton seed were distributed, the best results were obtained at Ratodero in Larkana, the yield being at the rate of 6 maunds of seed cotton per acre. Other trials were made at Salaro near Hala, at Malir near Karachi, and in the gardens in Hyderabad. This work was continued till 1889, and a large number of cottons were experimented with including American, Egyptian and Indian cottons. The best results were obtained from New Orleans. Mr. Strachen who was in charge of the work came to the conclusion that Egyptian cotton was not suitable for cultivation in Sind but he was of opinion that it might succeed in Shah Bundar in Tatta District which is near the sea. Afterwards trials of Comilla cotton were carried out in various parts of Sind but was found to produce less than the indigenous variety.

II. So far all attempts at improving the cotton cultivation in Sind were made by people who had no actual experience of the work in Egypt. In 1904 however Mr. Fletcher, Deputy Director of Agriculture, Bombay after a tour in Sind got permission to start experimental work at

Dhoro Naro in Thar and Parkar district. From his Egyptian experience he was able to point out that it was all important that the seed should be sown in March and not in June as is the usual custom for indigenous cotton in Sind. This limited the choice of ground to practically the Jamrao canal area, this being the only canal where water could be made available for sowing in time. The experimental farm was removed from Dhoro Naro to Mirpurkhas and seed for sowing 1500 acres was distributed to zemindars on the Jamrao Canal. The growers being selected by zemindars the cultivation was carefully carried out and cotton was in many cases sown in ridges and carefully hoed and weeded. The prices obtained for the produce were poor as it was found that there was no demand.

III. In 1907 and 1908 about 6,000 acres were under cultivation each year but several untoward circumstances were against the success of the cultivation. In 1907 boll-worm attacked the cotton badly and in 1908 the water supply was late. A system of auctions was instituted by Mr. Chatfield the Colonization Officer, Jamrao Canal and these were widely advertised. A number of buyers were attracted and good prices were obtained—up to Rs. 14 per maund of 81 lbs. seed cotton for Abassi. Mit-Affi variety which has a slight khaki tinge produced less. In 1908 however the auctions were a complete failure and the cotton of that year had to be disposed of privately to a Bombay firm at a reduced rate. This was the last year of Egyptian cotton cultivation on the Jamrao as in 1909 there was a complete failure of water in the canal in early kharif and in the present year 1910 it was decided to remodel part of the Jamrao Canal in 1911. So in 1912 the field will be again clear for renewed efforts in growing Egyptian cotton and with the advantage of much experience gained from the preceding years' trials.

IV. The Jamrao Canal area consists of about 700,000 acres of which possibly 100,000 acres of cultivation in any year might be suitable for Egyptian cotton. So until the

new proposed perennial canals are in operation in Sind, it is not likely that a greater area will be obtained in Sind than about 20,000 acres of Egyptian cotton.

V. The main points for the successful growing are :—

- (a) Proper cultivation including sowing before 1st week in April, avoiding 'kalar' or alkali ground and if possible growing in rotation with 'berseem.'
- (b) System for disposal ensuring proper treatment after marketing seed cotton, ginning, grading and selling at current market prices.

VI. The cultivation is far the simpler part of the problem. The disposal is however a more difficult matter. Formerly 2 varieties of cotton were grown, Abassi and Mit-Affi. These were collected from the cultivators in sub-depots and sent to Mirpurkhas in different lots and sold by auction. There were always considerable variations in the quality, cleanness and value of the different lots. For the first few years very fair prices were obtained. The buyers were of two classes :—

- (a) Mill owners from Ahmedabad and Bombay.
- (b) Exporters from Karachi and Bombay.

VII. The owners of Mills several of which use imported Egyptian cotton, soon stopped coming. They complained that when they bought Egyptian cotton in Alexandria or Liverpool they got a certain grade, e. g., 'Fully Good Fair' which was uniform and could be depended on to produce certain 'counts'. Whereas for Sindh Egyptian they had to send their agents to Mirpurkhas at an unhealthy time of the year and not knowing Sindhi language were at a great disadvantage. To buy any quantity they had to bid for a number of small lots some dirty, some stained and some good. These they had much difficulty in getting ginned as the local gins which are only suited for short staple cotton had plenty of work of their own. There does not seem to be the least chance of Mill owners taking the cotton

direct from the cultivators, they would probably use a considerable quantity if an assured supply of baled and graded cotton was available. A Mill owner is not a cotton broker and the cotton broker is an essential link between the cultivator and the user of the cotton. An Indian cotton broker has no knowledge of Egyptian cotton, as a commercial knowledge of one kind of cotton takes a life-time to acquire.

VIII. The exporting firms always fought shy of Mit-Affi and one firm got 'its fingers burned' by sending a consignment of so-called Abassi to Liverpool. It had never been properly cleaned and was full of dirt and pieces of leaves. Naturally it was unsaleable. It does not seem probable that Indian export firms will take up an entirely new and unproved branch while they have as much work as they can possibly do with existing cottons.

IX. Carefully taken average samples of Abassi and Mit-Affi have been forwarded to three leading Alexandria brokers during the last years. Their verdicts are very important and are all unanimous to the effect that the Mit-Affi is of a good strong and useful quality but that the Abassi would never grade as such in any market. The Mit-Affi has been up to the standard of 'Fully Good Fair'; which is to say, if properly cleaned, properly ginned and baled and sent to Liverpool, it would fetch the current market price for 'Fully Good Fair' Egyptian brown. It is not to say however that if shoved through an 'opener', badly cleaned, or crushed while ginning, in a gin meant for Indian cottons, that it will reach this grade. There is no sale for Mit-Affi in India, it is not used and its colour is against it. It will, therefore, be necessary to export it. As for Abassi, it is quite useless to continue it. It is not up to export quality and though it might be sold in India as a miscellaneous cotton, it would probably not yield as well as ordinary Upland American in price and produce. The cultivators on the Jamrao fairly generally hold what experience has already taught in Egypt, viz, that

Mit-Affi is hardier all round than Abassi. However as Abassi has always brought a high price at the auctions, the cultivators have naturally generally elected to grow it.

X. Briefly then it is proposed that after harvest the cotton should be gathered in a few conveniently selected sub-depots. Only clean cotton would be accepted and one uniform grade of Mit-Affi would be produced. The British Cotton Growing Association might be asked to step in at this stage and clean, gin and export and sell the cotton, or Government by means of the existing Agricultural Department might buy the crop outright, export and sell it for a few years to see if local firms will not then take it up. The first is by far the simpler and if a good area of say 10,000 acres Affi could be guaranteed it would be worth their trouble to send an experienced agent to take over the cotton at Mirpurkhas to clean, gin, bale and export it. Arrangements could be made to get half the value paid to the cultivators on delivery at the sub-depots, the remainder after selling at Liverpool.

XI. Provided the cultivator gets Rs. 12 or over per maund of 81 lbs. for seed cotton Affi it will be more profitable in average years than cultivating Sindhi cotton. The average yield under fairish cultivation may be put at 5 maunds per acre; under similar conditions the yield of Sindhi cotton might average 7 maunds at Rs. 6 per maund.

XII. The importance of Egyptian cotton in Sindh is very great as when the proposed new perennial canals are made there will be a large area in which it will be possible to cultivate it. One of these canals is to command over 1,000,000 acres and if the cultivation of a high grade cotton is introduced on a practical scale, it will go far to raise general cultivation to a much higher level than it is at present.

XIII. American Upland cotton of several varieties has been extensively tried during the last season and promises fair to be successful. At present the indigenous cotton is grown in parts of Hyderabad and Thar and

Parkar Districts, it is practically unknown in Karachi, Larkana, Sukkur and Upper Sindh Frontier. The cotton area is about 300,000 acres out of say 5,000,000 acres of total cultivation. This area is capable of great expansion either with the ordinary indigenous Sindhi variety or possibly with some of the ordinary Upland American varieties. The local Sindhi is a very short stapled variety and is all exported to the continent and used for mixing with wool. It is hardy and a quick grower and prolific. The points which enable American to compete with Sindhi are as follows :—

XIV. (a) Short growing period, shorter than Sindhi, and thus it can be sown on the ordinary inundation canals in Sindh. There is consequently a very large area on which it can be grown.

(b) It is hardy but on other hand is easily affected by 'kalar' or alkali and on lightish land suffers severely from white ants.

XV. During the past year some good yields were obtained and in many cases, it produced as much seed cotton as neighbouring plots of Sindhi. In other places however it suffered from white ants or 'kalar'.

XVI. The reports from Liverpool Brokers were good both as to quality and ginning percentage. The following is the report :—

"I now have much pleasure in enclosing report on the different samples of cotton, which are most satisfactory. Cotton of any of these types, if produced in commercial quantities, could be readily sold at satisfactory prices in Lancashire and in any quantity. You will notice that the lowest in price, namely, Boyd's prolific, is worth 20 points more than 'middling' American, and over $\frac{3}{4}$ d. more than fine Broach. Quotations for 'middling' American and 'fine broach' are given at the bottom of the valuation.

As is pointed out by Messrs. Wolstenholme and

Holland these are just the quality of cotton required by Lancashire.

I will let you have a report on the percentage of lint to seed by a later post. It would be interesting to know the weight of cotton produced per acre, so that one could form some idea as to which quality would be most suitable for cultivation. It often happens that the shorter stapled cottons, although fetching a lower price, may, by increased yield, be more profitable to the cultivator than the longer stapled varieties, as the longer stapled cotton requires more care in cultivation, but in this connection I must point out that there seems to be every probability of very high prices being realised for long stapled cotton, owing to the scarcity of such cotton in America and also to the partial failure of the Egyptian crop.

I am, etc.,

(Signed) P. HUTTON,

CHAIRMAN.

British Cotton Growing Association.

"We enclose valuation of samples of cotton grown from American seed in Sindh, Mirpurkhas, India.

"We are pleased to say that the quality is excellent and very suitable for the English market. As the cotton is ginned, you will know the percentage of outturn, if they have gone through your own gin. This is just the cotton required by Lancashire.

(Signed) WOLSTENHOLME & HOLLAND.

Copy of Brokers' report on samples of cotton received from the Deputy Director of Agriculture, Sindh.

Black Rattler. "Strict Good Middling" in grade, "good colour, staple 1. 3/16 inch, little irregular, fairly "strong, value 9.25 d."

Peterkin. "Fully Good Middling" staple 1. 1/16 to "1 1/8 inch, fairly strong, value 8.50 d."

Griffin Variety. "Fully Good Middling," staple 1·5/16 inch, inclined to be tender, value 11·00 at 11·50 *d.*"

Boyd's Prolific. "Strict Good Middling" staple 1·1/16 inch, fairly strong, value 8·40 *d.*"

Triumph. "Fully Good Middling" staple full 1½ inch, rather soft, value 8·60 at 8·70 *d.*"

Toole Variety. "Fully Good Middling", staple 1½ inch, fairly strong, value 8·60 *d.*"

Allen's Improved Long Staple. "Fully Good Middling", good colour, staple fine, rather irregular, inclined to be soft, value 10½ *d.* at 11 *d.*"

Texas Big Boll. "Fully Good Middling", good colour, staple 1½ inch strong, value 8·60 *d.* at 8·70 *d.*"

Sd. WOLSTENHOLME & HOLLAND.

Middling American value 8·20/100 *d.*"

Fine Broach, 7·9/16.

PERCENTAGE OF LINT TO SEED.

Variety	Per cent. of Lint	Per cent. of seed & dirt.
Texas Big Boll	31·25	68·75
Boyd's Prolific	31·23	68·77
Triumph	35·71	64·29
Allen's Improved	30·56	69·44
Toole's	33·33	66·67
Peterkin	33·30	66·70
Black Rattler	33·37	66·63
Griffin	30·00	70·00

XVII. The disposal is the difficult point. Local buyers do not seem to care about dealing in it and in some cases growers last season mixed it up and sold it as Sindhi. Very little seed was distributed to zemindars this season though many applications were received, for the above reason.

During the present season American cotton is growing at the following places :—

In Upper Sindh where at present practically no cotton is grown.	Jacobabad
	Shikarpur
	Sukkur
	Ubauro
	Noushahro Feroz
In lower Sindh	Nawabshah
	Halla
	Nara Valley
	Mirpurkhas
	Hyderabad
	Tando Mahomed Khan
	Talhar
	Phuleli Escape

This only leaves out Larkana and Karachi districts where for want of necessary staff, it is not under trial. Provided that results from the above centres are successful, it will be necessary to arrange some means of disposal before any extension of the cultivation in the districts can be contemplated.

AGRICULTURE IN BENGAL

By ABINASH CHANDRA DAS Esq., M.A., B.L.,
• Bankura.

I

I have selected "Agriculture" for the subject of my paper, not because I am an expert in agriculture and in a position to suggest any scheme for its improvement, but because I think that the subject has been too much neglected by our country-men—the educated middle-classes, and the landed gentry—and has not received that amount of attention from them, which it so eminently deserves. Agriculture is an occupation which is usually considered by them to suit best the burly, unkempt, illiterate cultivator whose very nickname *chasa* has passed for an uncomplimentary and reproachful term, connoting a general want of culture and refinement, and a conspicuous absence of good manners. As

such, the occupation of the cultivator is looked down upon by well-to-do and respectable folk as low, if not actually mean. And yet I can scarcely name any occupation in the world, which is nobler, more useful and more dignified than Agriculture. Our Aryan forefathers did not certainly view it in the same light as we do it now. If learned philologists are to be relied upon, the very name *Aryya* or *Aryan* owes its origin to a Sanskrit root, signifying "tillage of the soil": a characteristic occupation that distinguished our ancient forefathers from the wandering hordes of savages who were situated in the lowest rung of the ladder of human civilisation, and who depended mainly on animal food, procured with difficulty by hunting, for their subsistence. The term *Aryya* was, therefore, a term of honor and dignity with our ancient forefathers, and agriculture an occupation in which they took a just and legitimate pride. What bright hopes, what new ideas, and what wonderful possibilities of intellectual, moral and spiritual culture did the adoption of the art of agriculture unfold before their minds' eye! A settled life of peace, plenty and prosperity for a nomadic, restless and precarious existence; the springing up of permanent homesteads and hamlets around fertile plots of arable land and rich pastures, over which herds of noble cattle leisurely sauntered about, browsing the grass, instead of a camp of mean looking temporary tents and huts that hardly protected the occupants from the inclemencies of the weather; and the grouping of the homes into villages and village communities, presided over by sturdy, white haired and venerable-looking patriarchs, that furnished the very wits of that noble structure that ultimately developed into well-organised society and government. It was the adoption of the art of the agriculture that gave birth to that communal life that marks the very beginning of human progress, and fostered the growth of that strong and irrepressible yearning after a right knowledge and understanding of the visible yet inscrutable powers of Nature, that ultimately found expression in the spontaneous outburst of noble hymns that primitive and progressive man was ever destined and privileged to sing! It was a strange and glorious revelation that the adoption of the art of agri-

culture produced in the mind of our ancient forefathers. It helped them to realise the wonderful powers and potentialities of man on paths altogether new, and marked the permanent boundary-line, as it were, between human savagery and civilisation. No wonder, therefore, that they prided themselves on the glorious appellations of *charsanaś* (the same as our modern *chasa*, but with what a terribly perverted sense!), *Krishnayas* (the same as our modern, *Krishanas*) and *Visas*, i.e., "settlers" (as Weber has rendered the word), which was the same as the modern *Vaisyas*, the class or rather classes of people who are now looked down upon for engaging in the very occupations that once glorified their noble forefathers. These words gradually came to mean "men," i.e., civilised humanity, as distinguished from the nomadic savages—the dark-skinned *Dasyus*, and blood-thirsty *Rakshasas*, low and abject types of humanity, who waged a constant warfare with the Aryans, and whom to kill, subdue or extirpate was the one principal end and aim of the latter's activities. It was a life-and-death struggle between the two races, that is to say, between the powers of light and darkness, and upon the momentous issue of that struggle depended the well-being not only of the Aryan race, but of the whole world. Mark in the hymns of the Rigveda, with what exultation (which now would be considered almost brutal) did the ancient Aryans commemorate a sanguinary victory over their dark-skinned foes. It was an exultation born of the very consciousness of having won a moral and spiritual victory, and dissipated the dark ominous clouds that had been gathering thick and fast to choke the first rosy streaks of the golden dawn of civilisation. Side by side with these warlike hymns, you come across hymns like the one quoted below, which bespeak the inward glee and joyousness of a new life of hope and peaceful activity:

"Let the oxen work merrily; let the men work merrily; let the plough move on merrily. Fasten the traces merrily; ply the goad merrily."

"O Suna and Sira, accept this hymn. Moisten this earth with the rains you have created in the sky.

"O fortunate Sita (furrow), proceed onwards; we pray

unto thee, do thou bestow on us wealth and an abundant crop.

"May Indra accept Sita (furrow). May Pushan lead her onwards. May she be filled with water and yield us corn year after year."

(*Rigveda IV, 57, 407.*)

The above hymn is characteristic of a young, progressive people who have noticed the potentialities of material, moral and spiritual progress in the noble art of agriculture. "O fortunate Sita (furrow), proceed onwards; we pray unto thee, do thou bestow on us wealth and an abundant crop." This beautiful and simple prayer strikes, as it were, the very keynote of their new-born hopes and aspirations.

The domestication of wild animals for meat and milk had been the first step towards civilisation. People, in ancient times, owned *pecus* (Sank. *Pashu*) or herds of cattle, and *pecus* was the earliest form of wealth. A man was considered rich or poor, according to the large or small number of cattle that he owned. These herds had to be constantly shifted from place to place for pasturage. We, therefore, find the Aryans, in the first stages of civilisation to be nomadic. The second step towards civilisation was the adoption of the art of agriculture, and settling down in places in well-organised communities. When Peace and Plenty reigned in the homes and the communities, people found time and inclination to devote their attention to arts, industries and the development of social, political and religious institutions. In this way, the ancient Aryans made rapid strides towards progress. Cattle-keeping and agriculture might therefore be said to have formed, as it were, the very basis of ancient Aryan civilisation.

These were ordinarily the two principal occupations of the Aryans in ancient India. But some of them also made fighting the profession of their life; while others took to the ministration of the spiritual wants of their brethren. These various occupations afterwards became hereditary, giving rise to the formation of Castes which, in course of time, became crystallized in society.

Down to the Epic age of Indian history, we find cattle-keeping and agriculture the principal peaceful occupations of the three higher castes. The gifts of land and cattle made to a Brahman were (as they still are) considered highly meritorious. But the preaching of the doctrines of Buddhism, inculcating good will (*Ahimsa*) towards all animal life, seems to have created a revolution in the thought of the people, and agriculture came to be regarded as an occupation which was far from conducive to spiritual culture. The ploughing of land causes the destruction of myriads of worms, and was thus regarded as sinful. This sentimentalism, attaining morbidity in course of time, was responsible for putting agriculture under a ban, and lowering the status of the agriculturist. Mark what the *Manu Samhita* as compiled by Vriṣṇu says on the subject :*

कृषिः साध्विति मन्यन्ते सा वृत्तिः सन्निगर्हिता ।

भूमिं भूमिशयांश्चैव हन्ति काष्ठमयोमुखम् ॥

"People say that agriculture is a decent occupation; but it is really condemned by all good folk, (inasmuch as) iron-pointed wooden implements (ploughs, hoes, &c.) destroy the earth as well as those creatures that live under it."

Mark also what *Parasara* says on the subject:—

संवत्सरेण यत् पापं मत्स्यव्रती समाप्नुयात् ।

अयोमुखेन काष्ठेन तदैकाहेन लांगली ॥

"The sin that is committed by the fisherman (by killing fish) during a whole year, the ploughman commits in one day (by driving his plough)."

No wonder that, after such authoritative pronouncements, agriculture should have come to be looked upon as a low and unclean occupation, and that, even to this day, the three higher castes should consider plough-driving a sinful and degrading work.

The prevalence of this sentiment as regards agriculture among the descendants of the ancient Aryans marked a turning point in the economic history of this country. With

* The present *Manu Samhita* is only an abridgment and compilation from the older and larger book of the same name, not now in existence.

the degraded social condition of the agricultural classes in India, the art of agriculture degenerated and the poverty of the people also increased a hundred fold. It is true that there was a development in the arts and industries of the country; but these having been relegated to the Sudras (handicraft being regarded as mean and unworthy of the three higher castes), they too languished and degenerated in the long run. Foreign competition subsequently killed them outright, and the India of to-day is more an agricultural than an industrial and manufacturing country. But agriculture being in the primitive condition of the Vedic ages, the agriculturist is no better of than the mechanic and the handicraftsman. We need not, therefore, be at all surprised, if thousands upon thousands of people should die of starvation in years of draught and famine. And yet India has sufficient resources to feed and maintain not only her teeming millions, but also thousands of hunger-stricken peoples of other countries. It is high time that we studied the economic conditions of our country, knocked out from our brain the false ideas and sentiments as regards agriculture and handicrafts, understood the supreme necessity of improving the art of agriculture even before improving the mechanical arts and industries and pointed out to our young men the right way to earn an honest competency, independent of service or the learned professions, all of which have been crowded to overflowing.

II

I will now write a few words about agriculture with special reference to Bengal. And first of all, I will ask this question to all mediocre middle-class youngmen who are educating themselves with a view either to obtain a suitable employment under Government or elsewhere, or to join a learned profession: "What is your immediate object in trying to secure an employment, or to join a learned profession?" I know, as everybody does, what the usual reply would be: "To earn money, in order that we may maintain ourselves and our dependents in a manner befitting our position in life." If that be the object, I would thus speak to such of them as are neither brilliant nor talented students of the

University: "Secure a practical training in scientific agriculture. Select as many acres of good arable land as you can yourselves manage; take a permanent lease of them from the proprietor; invest some money in purchasing cattle, implements of agriculture and other necessary things, and settle yourselves as gentlemen-farmers. You will not only be above want, but will live more honorably, more peacefully, and more happily than the clean-shirted clerk driving his quill at the desk from morning till evening, or the pettifogging lawyer, plying his trade with all the legal acumen and dexterity that he can command. An occupation like this would be more honorable, more profitable, and more patriotic than either of the two occupations mentioned above."

Fancy your granaries. Stored with food grains, cereals, pulses, &c. in quantities larger than you and your family can consume in three years; your cow-sheds full of milch-cows, supplying you with an abundant quantity of pure, fresh and nourishing milk from which you also make butter and *ghee*; your farm-yards containing huge stacks of fodder and hay as provisions for your cows and plough-cattle; your orchards yielding delicious fruits in all the seasons; your kitchen-gardens producing a variety of vegetables throughout the year; your house built in a central commanding plot, with nicely laid-out grounds, flower-beds and pastures, and your children breathing the fresh breeze of the uplands, and romping about in the fields, like so many perfect pictures of health, vigour and cheerfulness, and you and your parents, wife and daughters, spending a life of alternate work and ease, performing household duties, superintending the various branches of your farm, wandering about freely in any part of your property, enjoying perfect health, feeling life and vigor in every limb, and spending your leisure hours in intellectual, moral and spiritual culture. Is this not an ideal of happiness, independence and honest competency? And yet it lies in our power to realise and live up to this ideal as we shall presently see.

III

What is the quantity of culturable waste lands other than fallow available in Bengal? Mind, when speaking of Bengal, I am not including in it Eastern Bengal and Assam,

Let us consult the latest agricultural statistics.* The quantity is therein stated to be 9,839,015 acres, scattered in all the several districts of this Province. If we allot an average of 25 acres to each farm, the number of farms springing up would be about 393,560. In other words, so many families, consisting of 10 members each would find an easy and honest means of livelihood by reclaiming these culturable waste lands. Calculating that 10 labourers on an average would find employment in each farm, the total number of labourers so employed would be 3,935,600. If each farmer keeps 10 plough-cattle, and 10 milch cows in his farm, the total number of cattle kept in all the farms would be double this number. It should be noted here that during the year 1908-1909, the quantity of current fallows was 9,186,733 acres. If this area could be cultivated by rotation and cropped, it would maintain nearly half of as many families, labourers and cattle as the quantity of culturable waste. It is probably defective rainfall, water-supply or irrigation, want of sufficient fund and labour, or any other untoward circumstance that contributes to keep a large quantity of arable land fallow and unproductive every year. It should be remembered that agriculture is now mainly in the hands of the illiterate poor cultivators who have neither any scientific training in agriculture, nor sufficient means to improve their lands and purchase good plough-cattle, labour and seeds, and who mainly depend upon the rains for producing their crops. Would not middle-class farmers, possessing the advantages of education and of technical and scientific knowledge, and having sufficient capital to invest in agricultural improvements, cause the face of the country to be changed in a short time, and their homes filled with plenty, if not riches, with the necessities, if not the luxuries of life? Would not such a noble occupation as agriculture be truly patriotic and find honorable careers for thousands of educated and half-educated youths whose idle brains have been the devil's workshop, and some of whom, for want of better work to do, employ their time in Sedition-mongering, political conspiracies and dacoities, and absurd chimerical projects that have been spelling ruin on themselves, their families and

* Agricultural Statistics of Bengal for 1908-1909.

innocent countrymen? Let all such persons, if they are at all animated by any genuine feeling of patriotism take to agriculture in right earnest.

The net area cropped during the year 1908-1909 was 32,532,300 acres. This is nearly half as much again as the areas of current fallows and culturable waste lands other than fallows, taken together. If these latter could be brought under cultivation, the produce would have increased by nearly half, and the country would have been richer and more prosperous than it is at present.

If the total area of culturable waste lands could be leased out to farmers say, at the rate of one rupee per acre on an average, the proprietors would be richer by an annual income of about one crore of rupees! This consideration alone should induce even those proprietors, who are not animated by any patriotic feelings, to lease out culturable waste lands to enterprising young men at moderate rates of rent. The leases should be made permanent, transferable and heritable, and no difficulties placed in the way of the lessees. The Legislature also should relax all stringencies in the existing landlaws of the country.

What the change in the general aspect of the country would be, if farms are set up in large numbers, it would not be idle and uninteresting to discuss here. In the first place, jungles, thickets and useless vegetation which grow luxuriantly on the soil, and breed the malarial miasma that commits havoc among the people and has depopulated vast tracts, would be cut down and cleared. In the second place the application of the method of drainage at once cheap, simple and effective,—which is regarded as “the foundation of all successful or arable agriculture”—would render the cultivation of a vast tract of wet land practicable, while it would permanently raise the productive power of the greater part of the arable surface soil of the country. In the third place, with the clearance of the jungles, and the laying out of the lands into sunny and smiling corn-fields, the health of the localities would vastly improve, and people would think of re-settling in the deserted villages and hamlets. The congestion in the large and small towns would thus be considerably relieved, and a marked improvement noticed in the general

health of the towns and the country. In the fourth place, an agreeable change would also be noticed in the economic conditions of the country. There would be plenty all around and with the out-turn of larger quantities of crops, the high prices of food-grains would considerably go down. With the increase in products and population in the country, bazars, marts and *hauls* would spring up, thereby increasing the income of the landlords and proprietors, finding markets for the surplus-products of the ryots, and employments for thousands of petty traders and shopkeepers. The reclamation of the culturable waste lands would thus bring on a world of good. All patriotic and enlightened proprietors should, therefore, encourage farming among the educated middle classes, and place every facility in their way.

IV

Agriculture is a comprehensive term, and includes many other things than the mere tillage of the soil, and the cultivation of the crops. "It includes" says a writer in the *New Popular Encyclopedia* "the rearing and feeding of all kinds of farm live stocks, and in some instances the manufacture of the products of the farm into such forms as may be more convenient or more valuable for use or sale. The manufacture of butter and that of cheese constitute recognized branches of the art of agriculture. The distinction between *arable* agriculture which includes the cultivation of the ground and the growth of crops, and *pastoral* agriculture which comprises merely the feeding and management of the flocks and herds of the farm, has been observed since the earliest times; 'Abel was a keeper of the sheep but Cain was the tiller of the ground'. In modern times, and probably in some degree at all times within the historical period, the practice of arable agriculture has been commonly associated in greater or less degree with the keeping and tending of live stock; but over immense tracts over the world's surface that are unfitted for arable cultivation, the practice of pastoral agriculture still prevails, as in the ancient days, wholly unmixed with the plodding labours of the husbandman." (*Vol. I, p. 86.*)

In India, arable agriculture and pastoral agriculture have

been kept apart since the earliest times. The cattle-keeper is a distinct caste from the cultivator who keeps and feeds only such draught cattle and milch-cows as he deems necessary for his own use and the cultivation of his lands. It is the cattle-keeper, the *Ghosh* or *Gowala* who rears up milch cattle with a view to sell milk and manufacture the products thereof, *viz.*, butter, *Ghee* and curd, from the daily extra supply of milk from his cows and buffaloes. It is very seldom, indeed, that the husbandman is also the cattle-keeper and dairy farmer. The two functions, however, might with profit and advantage be combined by those who have a large capital to invest in farming and possess large grazing grounds and pastures for their herds. Cattle-breeding as well as agriculture are now being carried on in Europe and America on approved scientific methods, and it is highly necessary that intending farmers should give themselves a sound scientific training in these subjects before launching on an enterprise. Fortunately for the country, our benign Government have been placing facilities in the way of our young men, and in fact, of all persons who have a mind to take to agriculture as a profitable occupation in life. A Central Agricultural College has been established at Pusa, and there are Provincial Colleges in the Provinces from which picked students are admitted into the Central College. The number of Agricultural Stations, and Experimental Farms, though small in the Provinces, is sure to increase as people begin to evince greater interest in agricultural matters. In addition, there is the Board of Agriculture, representative of the Provincial Departments of Agriculture and of the Colleges, which hitherto used to meet annually, but will henceforth meet biennially, and which provides an opportunity for an interchange of information and opinion respecting the working of the different colleges, and of everything, including agricultural education, which affects the Agricultural interest. Arrangements are being made in the High Schools for the preliminary training of boys who intend to prosecute their studies in an Agricultural College. "The requirements of the Agricultural Colleges" according to the Report of Committee (G), submitted at the Sixth meeting of the Board of Agriculture in India, "would best be met if the students before entering them had received

ed at School a good general education including nature study, drawing and manual training, and including also a grounding in the rudiments of some Science, preferably Botany and Chemistry, taught practically." So far as Bengal is concerned, it is really disappointing to learn from the recent Resolution of the Government of Bengal on the Report of the Department of Agriculture for the year ending the 30th June 1910, that "no progress has been made in the matter of Agricultural education in ordinary Schools" and that, on the recommendation of a Board of Examiners appointed to consider the question of improving the Agricultural classes opened in the Cuttack, Gaya, Dumraon, Hazaribagh and Burdwan Schools, Government has ordered the classes at Burdwan, Hazaribagh and Cuttack to be closed for the present. We are glad, however, to be assured that "the question of teaching agriculture in certain selected high schools is now under consideration." But, as the Government Resolution truly says, "the great difficulty is the want of suitably trained teachers, and no great progress in this direction can be expected till these are provided."

With due deference to the views of the Government, I am disposed to think that if there is an earnest demand for agricultural education on the part of the guardians and parents of the boys sent to schools, there would before long be an adequate supply of "Suitably trained teachers" to teach agriculture in the selected educational institutions. As matters stand at present, there unfortunately seems to be a good deal of misconception on the subject, and guardians and parents are generally disposed to be suspicious as to the motive of the Government in introducing agricultural teaching in the schools, which is usually interpreted as aiming a death-blow at higher education, and shutting out the middle classes from its benefit. If they could be thoroughly convinced that a scientific agricultural education would best equip their boys to develop the resources of the country and earn an honest and independent livelihood, the demand for such education would at once grow loud and louder every day. It is therefore extremely necessary that the end and aim of scientific agricultural education should first of all be very clearly explained to all persons interested in the education of

their children; and I venture to think that Government would do well to take early steps in the matter.

Now to return to the subject of my paper. In order to be a successful farmer, one must be well grounded in Agricultural Chemistry, which includes a knowledge of the composition of different kinds of soil and the effect of soil and manure on the composition of the crops, Economic Botany, Mycology or that branch of Botany which relates to mushrooms and other fungi, Entomology or a study and knowledge of injurious and beneficial insects and crop pests, Agricultural Bacteriology, Agricultural Engineering, the Science of Cattle-breeding and rearing, Dairy farming, a knowledge of the use of improved agricultural implements and so forth. It is not at all possible that every one who intends to set up as a farmer will have a thorough knowledge of these most useful branches of Agricultural Science, but it is necessary that he should at any rate have a sufficient acquaintance with them to enable him to take an intelligent interest in his work, and consult experts, if need be. A blind following of the empirical methods of agriculture as adopted by illiterate and ignorant cultivators would not make the occupation of agriculture successful from a pecuniary point of view. It is therefore highly necessary that gentlemen who want to set up their children as successful and respectable farmers should give them a sound training in scientific agriculture in an Agricultural College, which would furnish them with the best equipment for this most useful and profitable occupation. Besides this training in an Agricultural College, the intending young farmers should be taught the value and the dignity of labour above all things, and they should be prepared and able to drive the plough and manipulate the spade with their own hands, (should any necessity arise), to work with the labourers in the fields, and to exercise a strict supervision over every department of their farms.

V

As I have already said at the outset, it is not my object in this paper to suggest or discuss in detail any particular scheme of agriculture, my only object being to direct

the attention of our countrymen generally to scientific agriculture as a profitable occupation for middle-class young men who have got nothing better to do than seek employment in some office on mere subsistence allowance. The best thing for a young man of this class would be to select a few acres of good culturable land, and cultivate them according to scientific methods, by way of experiment, to begin with. Should the results of the experiment prove hopeful, he might add as many acres to his land as he can procure and successfully manage himself. It would always be to his advantage to have all his fields in one plot, and not scattered in small lots over a wide area, as is usually the case with the fields of ryots in many parts of Bengal. The farm should be hedged round, and fruit-bearing shrubs planted and grown on the hedges, after the manner of the Japanese and Italian peasants. The yield in fruit alone from these shrubs would go a great way in paying the rent of the farm. Provision should also be made within the farm for the irrigation of crops, by sinking wells and digging tanks. The fields should be well manured, and the soil uniformly tilled deep, to the extent of about two feet, so that even with a very scanty rain-fall, in years of drought, the farmer might expect to reap a moderate harvest. In a very interesting lecture, recently delivered to a Missionary Industrial Conference at Kodaikanal, Sir F. A. Nicholson drew attention to the lessons which India might learn from Japan in the matter of agriculture. Though the Japanese peasants are more disadvantageously placed than the Indian ryots in many important matters, *e. g.* the character of the soil, the supply of manure, and the land taxes, yet by dint of sheer labour, they have converted many arid tracts into fruitful gardens and smiling corn-fields. The difference in the result is so great that whereas, for instance, in Madras, it requires a little over one acre of land under actual cultivation to support each head of the population, in Japan the proportion is only $\frac{1}{4}$ acre of such land, per head. The drawback through scanty rain-fall is, according to Sir F. A. Nicholson, less serious than might be supposed, if proper care is taken to prepare the soil. The dry areas of America have hitherto been comparatively unproductive, but it has recently been shown in Nebraska that splendid

crops can be produced with a rain-fall of only 12 to 15 inches, if the soil is properly treated. At the Saidapet Government Farm, too, it was accidentally proved in the famine of 1877 that on a piece of light soil, well manured and deeply tilled, a moderate crop of straw with a little grain was obtained with less than half an inch of rain, and good to fair crops of grain and straw with less than five inches. Sir F. A. Nicholson is convinced that the Indian ryot has at his disposal all that is essential to secure success in his work. His labour is now idle for the greater part of the year, and if properly utilised, it could transform the conditions of life in India. At present, there are tens of millions of acres in India that get no manure at all for any crop in a decade, except usually from the cattle as they pick up the scanty herbage amidst the stones in the fields. The Japanese peasant, on the other hand, does not look upon his land as the source of his crop; it is merely an instrument for transforming his stock of manure into crop, and that is the reason why the soil is so continuously fertile. One result, too, of the utilisation of all available organic matter for fertilising the soil is that the villages are hygienically wholesome. Japan has also demonstrated the usefulness of trees to the farmer. Apart from the state forests, every dry land peasant has, as a matter of course, his own plot of wood, as he would not dream of doing without it. In one year, these private and village communal trees yield about 800 lacs of rupees worth of timber and firewood, as well as 23 lacs, worth of bamboos, and leaves used as manure. Sir F. A. Nicholson rightly urged the Indian ryot to follow in the footsteps of the Japanese peasant and profit by his example.*

A few years ago, the writer of this paper experimented, in his humble way, on a few acres of dry land, mainly composed of laterites and stones, over which scarcely a blade of grass grew. He caused the stones to be picked out, a well sunk, and the soil deeply tilled and well manured. In the course of a few years, it has been converted into a smiling garden of fruit-bearing and timber trees, yielding also a variety of vegetable crops throughout the seasons. This

* Condensed from a report of the speech as published by the *Statesman* of Calcutta.

successful experiment has led him to believe that the vast arid tracts in his district as well as other districts of Bengal can easily be covered with forests and parks of noble and valuable trees, and that this fact needs only be widely known in order to stimulate enterprise in this direction among our countrymen.

I would, therefore, strongly urge our young men to turn their attention to the art of agriculture, and equip themselves with a suitable scientific training for successful agricultural work. Let them set up as gentlemen farmers, and make the land yield a wealth of crops, which is far superior to ordinary wealth consisting of gold and silver. Let them earn an honest livelihood, and lead a life of independence, comparative ease and happiness by tilling the soil for crops, by keeping and breeding cattle, by dairy farming, by rearing up forests for fuel and wood on the dry uplands, by gardening and fruit-farming, and by a variety of ways. Let them turn to the naked land, the mother of us all, for succour and sustenance which they are sure to get in abundance, and by beautifying her person with a wealth of useful vegetation, be the true sons of the Mother-land.

VI

I cannot conclude this paper without referring to the question of finance in enterprises like this. It goes without saying that there must be sufficient capital for this purpose, without which nothing can be done. The difficulty is that middle-class gentlemen cannot, for various reasons, lay by sufficient money to give their boys a start in life. The earnings of a whole life-time are usually spent in giving a few daughters in marriage and performing the *Shradh* of parents. These expenses have to be curtailed and brought within reasonable limits. But there should be an earnest desire on the part of the people to effect these necessary social reforms, without which the economical conditions of the country cannot be improved. Habits of economy in domestic life have also to be cultivated. A slavish imitation of the European mode of living is not only not necessary but highly expensive. By all means adopt the habits of cleanliness and regularity, and the rules of health and sanitation as followed by Europeans; but why anglicise yourselves

and become non-descript *Kala Sahebs*? "Plain living and high-thinking" is the motto of the Hindu civilisation, and there should by no means be any deviation from this excellent standard. It cannot be doubted that the effecting of the necessary social reforms, the correction of the mode of our living, and the cultivation of the habits of economy will go a great way to enable us to lay by sufficient money to give our boys a start in agricultural and industrial pursuits. Besides all this, we must do our utmost to establish Co-operative Credit Societies, so happily inaugurated by Government and Rural Banks, throughout the length and breadth of the country, which are sure to effect an economic revolution. So far, the reports on the working of the Co-operative Credit Societies are very encouraging. The report of the Registrar of these societies in Bengal shows that during the last year the membership has increased from 14,640 to 22,871, and the capital from about 3½ lacs to nearly 7 lacs of rupees. Mr. J. M. Mitra, the Registrar, points out that the movement is tending to create a revolution in rural Bengal. The ryots have developed an extraordinary capacity for united action, and the Co-operative Credit Society is stimulating interest in education and sanitation. The villagers in certain Districts are beginning to submit their disputes to the Co-operative Committees, and as an indication of the growing confidence of the people in the movement, Mr. Mitra mentions instances where villagers literally unearthed their savings in order to deposit them with the Societies. Another most hopeful development is the discouragement by the local Committee of extravagant expenditure upon marriage and funeral ceremonies. As the members of the Societies may incur loss, if one of their number borrows more than he is able to repay many cases have arisen where the local Societies have cut down the amounts of loan for ceremonial purposes. This result is as happy as it is unexpected, and is calculated to bring about a healthy and desirable change in those baneful customs that usually lead to misery and poverty.

The report of the Co-operative Credit Societies in the Punjab for the year ending the 31st July 1910 is still more encouraging. During the year, the number of Societies has risen from 316 to 706, the working capital from 8 lacs

to nearly 16 lacs of rupees, and membership from 23,000 to over 38,000. There has not only been marked expansion of Co-operative Societies but vast possibilities of co-operation are being opened up. In the Chenab Colony, they have brought agricultural machinery, opened shops, and traded in wood and cattle. At Panjavar in Hoshiarpur, the local Society is taking combined action to protect the village from erosion, and in many places, Bank Committees act as Standing Panchayats and settle local disputes.

These are very encouraging signs, pointing as they do to the development of a manly spirit of self-help, and the dawn of a new era of general prosperity in the land. One deeply regrets, however, to learn that the educated classes are cold and apathetic towards this most useful movement. It cannot be too greatly impressed upon their mind that if they have the real good of the country at heart, they ought to do their utmost to improve the lot of the poor and down-trodden ryots and the impoverished middle classes of the country, by lending them a helping hand in their awful struggle for existence.

AGRICULTURAL IMPROVEMENTS ; A FEW SUGGESTIONS.

By M. B. SANT, Esq.

Assistant Secretary, Indian Industrial Conference Office, Amraoti.

I wish to say a few words in connection with Agricultural improvements, and to submit a few suggestions for favor of your acceptance. Within the limited time at my disposal, it is not possible, for me to do adequate justice to a vast and comprehensive subject like Indian Agriculture, which permeates the lowest strata of the Indian communities all over the country. I can only touch the fringe of some of the main issues involved in a general scheme of agricultural development. I take the term agriculture in its widest sense so as to include within its purview, not only the cultivation of food-crops but also horticulture and forestry. I do not wish to inflict upon you an elaborate speech or an array of dry and dull statistics. Out of the numerous educational problems

which demand immediate action on the part of the Imperial as well as Provincial Governments, agriculture is probably the only one which has come in for a somewhat large share of Government attention and pecuniary support. The Agricultural Colleges founded at various centres, the Research Institute at Pusa, experimental and demonstration farms are unmistakable evidences of this activity.

It is a matter of regret that the efforts of Government in this direction, however, well-intentioned they may be, have not yet fully succeeded in enlisting the active sympathy either of the farmers or of the educated classes in general. Instead of trying to diagnose the causes of their apathy, I shall at once proceed to make a few definite suggestions to Government which, if acted upon, will, in my humble opinion, bring about the agricultural revival of the country within a very short period and make the ryots contented and happy. The initial outlays involved in the proposals, will be more than covered by the subsequent gain in revenue attendant upon the increased production of the field, the forest and the garden.

As Government is actually desirous that the knowledge of scientific agriculture should reach the farmer and others engaged in raising the crops of food grains, it will be necessary for them to readjust and remodel their present ideas regarding agricultural education, as the present Agricultural Colleges, demonstration farms, &c., have to my mind failed to a certain extent in carrying out the objects for which they have been started. My first and foremost suggestion would be to utilize for this purpose the Circle Inspectors of the Revenue Department as known in the Bombay Presidency or officials holding the same position and entrusted with similar functions in other Provinces or Presidencies. These officials being constantly in touch with the ryot, know the temperament, the difficulties and the needs of each individual farmer. Hence their agency should be utilized by Government to its utmost capacity.

My scheme may be briefly stated thus :—

(I) Out of 4 or 5 Circle Inspectors allotted at present to each Taluka, at least one should be a graduate of agriculture

with knowledge of practical farming. He should guide the ryots in—

- (a) ploughing their fields,
- (b) manures suited to each soil,
- (c) method of irrigating the field (whether by wells, canals, artesian wells &c.),
- (d) small or big machinery suited to the requirements of the farmers,
- (e) prevention of waste of fodder, fertilizers &c.,
- (f) the supply of seed from the seed depot of the taluq where sound, selected and prepared seed should be kept in charge of the Mamledar or Tahsildar and replenished by the Directors of Land Records and Agriculture. This seed should be sold to the ryot at reasonable rates. This will largely serve as a preventive against insect pests.
- (g) He should read out to the cultivators portions from Agricultural Bulletins, Magazines and other literature on the subject,
- (h) he should give instructions in the improvement of farm cattle, and other live-stock,
- (i) The Circle Inspector in charge of this duty should be relieved from survey, and revenue collection duties so that he may exclusively devote his attention to agricultural improvements,
- (j) he should help the ryot in the chemical analysis of the soils,
- (k) and the holding of cattle and Agricultural Exhibitions at important fairs in the Taluka,
- (l) should report to Government how far the Forest Regulations affect the rearing of cattle and the agricultural operations generally,
- (m) should prevent the export of bones, cowdung cakes and other fertilizers from the village and take steps for the utilization of this material for agricultural purposes,
- (n) should ascertain with the aid of his expert knowledge and with experiments, as to what fodder crops are possible in and around the village,

(o) should direct the farmers in rotation crops.

(p) If possible, charts may be prepared by agricultural department showing the location of subterranean springs or other sources of water supply to guide the farmers in digging wells.

The principle involved in the above scheme has been approved by Mr. J. W. Mollison, Inspector-General of Agriculture in India, who advocated in his last year's address in the Deccan Agricultural Conference that "it is necessary to enlist the sympathy of the Revenue service to place before the people any-thing that was proved experimentally of value, in agriculture."

(II) The establishment of experimental farms at important centres in every District and the diffusion of primary education by making it first free and then compulsory would also serve to enlighten the farmers with regard to their duties to themselves and to the State and thus enable them to assimilate methods of scientific agriculture.

OTHER ECONOMICAL PRODUCTS

I shall now proceed to enumerate some of the economical products both of the field, the garden, and the forest, apart from the food grains, which are awaiting development. An impression appears to be lurking in the minds of some officers of the agricultural department, that Indian Agricultural Colleges and other institutions are quite perfect and have no lessons to learn from the phenomenal development of other countries. This view to say the least, is not warranted by facts. Some of the principal economic products may be given below :—

- (1) Sugarcane
- (2) Cotton
- (3) Ground nut
- (4) Oil-seeds
- (5) Fibre plants
- (6) Rubber
- (7) Honey and wax by Beeculture

- (8) Lac
- (9) Tanning materials
- (10) Silk
- (11) Medicinal plants
- (12) Timbers
- (13) Tea
- (14) Coffee
- (15) Jute, and other fibre plants
- (16) Garden products such as fruits, flowers
&c. (their preserving, canning processes, &c.)

If the cultivation or plantation of any of the products mentioned above, is to be done on a commercial basis, it is possible only with the aid of foreign experts, as any attempt to develop these industries without the help of modern methods and appliances is sure to meet with a disastrous failure. The industrial regeneration is more the work of the people than of the Government, whose co-operation should be sought after people have helped themselves, and Government is sure to respond to the call for help, by affording all available facilities for starting any new industry. It would be out of place to submit here any elaborate schemes for the regeneration of any of the industries mentioned above. I shall take only a few concrete instances, to indicate the directions along which attempts should be made. For instance, if the Government or the people of a province are anxious to revive sugar industry, let them secure experts from Java, Mauritius or Germany, where cane or beet sugar is actually being manufactured on a large scale, similarly to start oil seed factories, or Rubber plantations, cotton cultivation, and fruitgrowing or canning, American experts may be engaged, with advantage.

If Dairy Industry is to be brought to perfection, let the Danish farmers and experts be called and necessary machinery imported. The experts should enter into an agreement to train up a few Indian students in their respective branches within a specified period.

I may also take this opportunity of recording my views regarding the publications issued by the Agricultural

Research Institute, Pusa, (Entomological Section). These are very admirably compiled, the illustrations are quite life-like and beautifully executed. But there are a few important points to which it seems desirable to direct the attention of the authorities, compiling these publications.

- (a) The names of insect pests should be given in the Vernaculars of the different provinces; otherwise it will not be possible to translate these treatises or to disseminate the information contained therein, however useful it may be.
- (b) Vernacular equivalents of germicides, insect eating birds or other parasites having a natural antipathy to these pests should be ascertained and given to make the remedies more intelligible, to laymen and cultivators.
- (c) Short translations of these and similar publications should be prepared for wide distribution among farmers through the agency of the revenue officials, agricultural departments, and the agricultural and industrial associations, &c.
- (4) Chemicals and insecticides or germicides advocated should be such as to be within the easy reach of the villagers and obtainable in any desired quantity at a reasonable outlay per acre of land.

COW-KEEPING IN BENGAL

BY ANANDA PRASAD GHOSH, ESQ.

Commercial Intelligence Department, Calcutta.

INTRODUCTION.

Cow-keeping in the Province of Bengal is as ancient as the Province itself. In the eyes of a Hindu, *Gabhi* (cow) is not an ordinary animal that is found in the economy of Nature, but an *affectionate mother*. He looks upon her as Bhagavati (the Divine Mother) on earth. He not only feeds her properly, but even adores her as a goddess,

The reason of this heartfelt homage lies in the fact that it is her milk that feeds him in childhood, nourishes him in youth and supports him in old age. With these introductory words let us now see how cows may be properly tended in these days when cow-keeping is being neglected.

In tending cows three things should be carefully attended to. They are: (1) Housing, (2) Feeding, (3) Breeding.

HOUSING.

The shed erected for one cow should be 7 feet by 6 feet, while its height should be $8\frac{1}{2}$ feet. It should have several openings to admit sufficient light and air. The floor should be always kept clean and dry and should be provided with a shallow drain for carrying away urine quickly to a pit where dung is collected at some distance (say 50 feet) from the shed. During rains cows should be kept in their sheds, because wet is injurious.

FEEDING.

Cows should be allowed to graze from 5 to 10 A. M. in the morning, and again from 4 to 6 P. M., in the afternoon. In addition to grazing two daily feeds—each consisting of $\frac{1}{2}$ seer of oilcake mixed up with two basketfuls of straw (cut into pieces) and proportionate quantity of pure water should be given.

BREEDING.

Breeding should be given a careful consideration. Only healthy bulls should be allowed to take part in breeding. In respect of calving there are generally two kinds of cows, namely—(1) cows that calve every year, and (2) cows that calve once in two years. The former desire the company of the bull 3 months after calving and the latter 10 months after calving. The former give milk for 7 to 8 months, while the latter for 11 to 12 months. Bellowing attended with restlessness is the indication of cow's desire for the bull and absence of bellowing is the

mark of her pregnancy. The period of pregnancy of a cow is generally 290 days. Care should be taken that pregnant cows are properly fed and protected from heat and cold. After delivery, the cow should be given only dry food—for instance hay, straw, oilcake, &c. Such food should be given for 6 days, after which usual feed may be recommended. No milk should be drawn out for the first 21 days after delivery. During this period, the calf should be allowed to suck as much milk as it can. Throughout the milking period, it is advisable to give one-fourth seer of rice-bran or 2 seers of boiled *mashkalai* once a day to increase the quantity and to improve the quality of milk. Quick and thorough milking, rubbing the udder with mustard oil after milking and kind treatment are also helpful. In tending cows personal supervision of the owner is the one thing needful.

REARING OF CALVES.

Calves should be properly taken care of. They should not be tethered before they are two months old. When they are $1\frac{1}{2}$ months old one night-feed of slender tops of straw (cut into pieces), mixed with small quantity of oil-cake and water should be given.

COST OF COW-KEEPING.

The average monthly cost of keeping a cow may be calculated thus:—

						Rs.	A.	P.
Straw	...	...	...	...	...	1	8	0
Oilcake	...	...	...	...	...	3	0	0
Rice bran	...	...	...	...	...	0	8	0
Milking fee	...	...	...	...	...	0	8	0
Contingencies	...	...	...	...	...	0	8	0
Total	...	...	...	...	...	6	0	0

OUT-TURN OF MILK OF A COW THAT CALVES EVERY YEAR.

Supposing the daily yield during the eight months of milking period to be $2\frac{1}{2}$ seers, total outturn will

come to 600 seers. The average yield per month of a year will, therefore, be 50 seers which will fetch as much as 10 rupees. So the net income per month is 10 Rs. minus 6 Rs. i.e. to say 4 Rs., supposing the monthly cost of keeping remains the same throughout the year. This is not all. There is another source of income, means cow-dung daily collected in a pit. It will yield as much as 4 annas a month, whether it is sold as cakes for fuel or as manure at the close of a year. Hence, the total net income from keeping one cow comes to 4 Rs. 4 as. which can fairly support a member of a family.

POSSIBILITIES OF IMPROVED METHODS OF DAIRYING IN INDIA

(ESPECIALLY IN BOMBAY PRESIDENCY.)

BY RAO SAHEB G. K. KELKAR,

Assistant Professor of Agriculture, Agricultural College, Poona.

Cow-keeping is carried on in India from time immemorial. We read in the Puranas that the Rishis used to keep cows for milk, butter, ghee, gomutra (cow urine) and gomaya (cow-dung), all these products being used in performing sacrifices. They were, therefore, held in great esteem and the cow itself was regarded as a sacred animal. We also find the dedication of bulls to Gods in villages which served the purpose of covering the village cows and their offsprings supplying the bullocks required for cultivation of land.

Although we find that the cows are kept for other products, still we see that the primary object is her milk. Milk as we know is a perfect food. Man can live on milk alone, as it contains all the constituents required for the formation of flesh, bones and energy. Milk is not only easily digestible and assimilable but it is also palatable which is one of the highest requisites in food.

So long as men lived in isolated places, each used to

keep a cow for milk, but as population increased, people began to live in communities, villages and latterly as cities and towns were formed, the rearing and feeding of cows became expensive. The demand for milk increased and it is about this time that the professional men called Gowalis took up the business of keeping cows and supplying milk and its products to the community.

The same was the case in the Western countries; but during the latter half of the nineteenth century, the animal rearing has been developed to such an extent that it has become a separate industry by itself. By selection and breeding, special types of dairy cows have been developed. Special crops for feeding them are raised. Milk yield has been gradually increased by careful attention to feeding and cleanliness.

Quite apart from the naturally increasing demand for milk during the close of the last century, the factor which contributed in the greatest degree to revolutionise the dairy business was the invention of the Centrifugal cream Separator by Dr. de Laval. The result was to render most of the operations of the dairy simpler and speedier, while the art of butter making has been very much revolutionised.

Absolute cleanliness in every operation connected with the handling of milk is insisted upon. Now the byres are clean, the milker is taught to clean himself and his cow before beginning to milk and every vessel is scalded before and after use.

Nothing of this kind is found in India; our dairy industry has remained as it was. Though the milk and other dairy products are in use from time immemorial, it is undeniable that our knowledge alike of dairy practice and of dairy science is still far behind that of nearly the whole world.

In western countries, cattle are principally kept for milk and meat production, but in India cows are kept to produce work-cattle and milk is principally obtained from buffaloes. The supply of milk and milk products in India

is principally in the hands of Gowalis, Dhangars and Mahomedan Gowalis. All these men are professional dealers. Gowalis (Ahirs and Lingâyats) are the principal suppliers of milk in big cities and towns, the Dhangars inhabit the hills, where grazing is plentiful, they keep she-buffaloes—all the milk that is produced is turned *into* butter. Partly it is sold as such and partly it is turned *into* ghee and then taken for sale to long distances in populous centres. Mahomedan Gowalis are found in Kathiawar and Sindh. In cities, of course, all milch animals are stall-fed—but in the outskirts contributing the city supply, they are partly grazed and partly stall-fed. Villages which are situated within the radius of 12 to 13 miles from big cities and towns also supplement the city supply.

In villages which are situated far inland, the milk is either turned into butter, ghee or Khava (milk conglobated by boiling) all these products could be preserved for some time and transported to long distances. The farmers practise this business as a secondary occupation and not as a profession. Although this industry of milk production is carried on by so many different classes of people, still not a single Gowali or a Dhangar tries to grow his own fodder, feed his cattle and thus make it more paying. The cows and buffaloes are bought, they are fed on purchased foodstuff and kept so long as they are profitable. In big cities like Bombay, the milch animals no sooner do they go dry than they are sold for anything, because unprofitable feeding becomes prohibitive.

It is about the year 1889, Mr. H. A. Howman a well known dairy farmer from Warwickshire, England, came to India to introduce improved Dairy appliances. Mr. E. C. Ozanne, the then Director of Agriculture, Bombay, was the first man to introduce this kind of industry into India. Mr. Howman was given opportunities to show the working of his separator and churn at places where the Agricultural Shows were held. The separation of milk and making of butter untouched by hands was demonstrated

in Poona, Bombay, Nadiad, Bangalore and other parts of India. After these demonstrations, the Bombay Government sanctioned a grant for the purchase of necessary apparatus required for the working of the Dairy. They also engaged for a couple of years Mr. Keventer, a Swiss Dairy Expert, who had come to India with Mr. Howman. In this way the first dairy in India on an improved principle was started by the Bombay Agricultural Department and now there are about 1,000 dairies spread all over India.

Many of these dairies have been worked by the Military Department to supply the troops with a pure supply of milk and butter. It is only these dairies who may be properly designated as dairy farms. Again several private firms have opened Dairies in big cities and towns. But the proprietors of these have no cattle of their own. Several of them buy milk from Gowalis. Others hire buffaloes and cows and thus the milk required for separation is obtained; after separation, the separated milk is taken back by the Gowali and the Dairy-man keeps only the cream, which on ripening after 24 hours is churned *into* butter, the latter is then washed on the butter-worker to remove all the surplus water contained in it. In order to improve its keeping qualities about 3 to 5 per cent. of fine table salt is added to the butter while working on the butter worker.

Many of the Dairies opened by the private gentlemen in Gujarat and Southern Mahratta country are only dairies in name. These gentlemen keep only separators, buy milk from the neighbouring villages, separate it and then the cream is sent to Bombay, which reaches the destination in about 24 hours (the time required for ripening). In Bombay, there are several dairies where the only business is to churn the cream into butter, principally for export to Ceylon, Burma and Africa, in tins of various shapes and sizes. This export amounts to hundreds of tins every week.

Now let us consider for a moment as to how milk is

supplied to city consumers. In big cities like Poona and Bombay there are many professional milk-men, who keep buffaloes and cows. All the animals owned—by these men are stall-fed. They have no grazing ground close by. They are tied in ill-ventilated and unclean byres. The prices of food grains and fodder have considerably risen. The result has been the Gowalis are supplying milk which is very much adulterated with water, in most cases unclean. The following analysis will clearly show the percentage of adulteration in the Poona milk supply. The figures were kindly put at my disposal by Mr. N. V. Kanitkar, B. A. of the Agricultural College, Poona.

Milk lbs. per rupee	Source	Total solids %	Fat %	Probable percentage of adultera- ted water. %
10	Cows (Civil	13.00	4.50	
10	Buffaloes (Dairy	18.49	8.05	Pure milk
11	City supply	6.84	2.81	43
16	"	5.44	2.25	55
16	"	6.21	3.94	48
16	"	6.51	2.96	46
16	"	3.95	0.80	67

It is therefore quite clear from the above figures that adulteration is going on to a very great extent and in some cases the amount of water added is extremely large. It is no wonder that under these conditions evil results follow. Children only get one-third of the nourishments they are expected for receive and the result is the large infantine mortality.

The usual determinations made in milk analysis are those of fat and total solids. These two determinations together indicate for all practical purposes the richness or otherwise of milk.

Good buffalo's milk ought to contain from 15 to 18 per cent. of total solids and from 6 to 9 per cent. of fat.

The production of milk in cities is not enough to meet the local demand. Therefore milk from the surrounding villages is brought in every morning. There being no demand in villages the milk is as a rule pure; but the same brought to the city is found considerably adulterated as pointed out in the fore-going statement. Not only does this adulteration decrease the nutritive value of milk, but what is worse, it proves a fruitful source of many diseases such as tuberculosis, typhoid, cholera &c. Children are especially susceptible to catch disease as will be seen from studying the infant mortality, which is rising from year to year.

The exact motive that makes the Gowalis do this is not so easy to determine.

But this much is certain that the Gowalis cannot afford to sell their milk with their present methods of profession, at rates current in the cities. Most of the city population have no means to purchase pure milk at dearer rates and in fact most of them do not at all realise the effects of bad milk. They prefer a definite quantity of milk at cheaper rates, to a less quantity of the same value but of purer quality. When this is the case with the literate citizens far less can we expect of the illiterate ignorant Gowalis to understand, how by his dirty methods of keeping cattle, handling the dairy products and adulteration, has he been responsible for the death of so many human beings.

His desire of earning money as might be expected of any business man, unfettered by any legal binding, also accounts for a part of the adulteration.

I will now proceed to consider in brief how the improved and scientific methods of dairy industry can improve the supply of dairy products especially of cities.

In the first instance, the present Gowali purchases all the fodder for his milk cattle. Now a well managed fodder farm can produce the right type of fodder throughout the year at half the cost.

A trained dairy-man who understands the principles of contamination of milk and its products will take proper care to keep cleanliness throughout.

The upto-date improved appliances for handling the dairy products are speedier and cleaner and do away with the direct contact of hands which are likely to transmit infecting germs. On a dairy farm the dairy live-stock can be kept under close observation and by the upto-date methods of breeding, milch animal producing larger quantities of cheap pure milk can be developed. Thus the greater loss that is incurred in purchasing them every year at exorbitant prices and then disposing of them will be saved.

Cows and buffaloes are principally the dairy breeds of India. They contribute in many ways to the necessities and comforts of all people. Where the grass is plentiful, water supply sufficient and the climate suitable there is a great field for opening up dairy farms. In the Bombay Presidency, such localities are Gujarat in the north, Sangli, Miraj and Kolhapur in the centre and Dharwar and Belgaum in the south. Most of the dairy products imported into Bombay either for consumption or for export come from these localities. Mostly butter and cream come from the north and ghee from the south.

Cities like Bombay must depend and will always depend for their milk, butter and ghee supply to outside places. It is very expensive to keep milch animals in such places, where there is want of suitable accommodation and higher rates of food grains. The Bombay Agricultural Department exhibited at the Bombay Exhibition of 1904 Model Cattle byres. The byres recently constructed at Byculla and other localities in Bombay appear to have been built on the principles of the Model exhibited. This is an effort in the direction of Sanitary improvement; but the problem of supplying milk at cheaper rates remains unsolved all the same, and this can only be solved by establishing dairy Farms.

To start dairy farming and work it successfully a man

of intelligence and business capacity is required. The dairyman needs a special education suited to this particular business.

The next question is where to locate a dairy Farm. When the object is to sell milk and butter it must be situated somewhere near a big city or town. But the land is very dear near a city, so it is better to select a site nearer to a Railway station of some importance, where there is plenty of pure clean water with suitable soil to grow fodder crops. Cows pastured and well watered thrive and produce cheap milk.

Having settled about the site, the next thing of importance is to raise sufficient fodder. Then gradually increase the number of cows. The fodders suitable to be grown on the Dairy farms are most of the fodder jowars (such as sundia, nilva, utavali), maize, guinea-grass lucerne, peas and oats, val (*Dolichos lablab*) and chavali (*Vigna catieng*).

Having made perfect arrangements about feeding and location, the next item for consideration is the selection of milk breeds suitable to the soil, climate and locality where the dairy farm is intended to be started.

The yield of milk depends upon the breed of cattle, the food given and the care bestowed upon them. On the whole, the yield from milch animals in India is very poor as compared with English milk breeds. But in favourable localities good milch animals are found. As a dairy animal, the buffalo is more esteemed than a cow, as it yields richer and a larger supply of milk. An ordinary cow yields about two to four pounds of milk per day, but a buffalo yields upto 8 pounds. Under ordinary conditions the cow's milk contains three to four per cent. of butter-fat and twelve to fourteen per cent. of total solids and the buffalo's milk has six to eight per cent. of butter-fat and fourteen to eighteen per cent. of total solids. By the term total solids is understood all the constituents of milk except water.

The following are the principal milk breeds of India :—

Locality	Name of breed	Average yield of milk per annum including dry days.	Average number of dry days per annum.
	<i>Cows</i>	lbs.	
Punjab	Montgomery	4000	Not available
	Hansi	Not available	Not available
Sind	Karachi	3400-8	32
Kathiawar	Gir	2700-5	94
Madras	Nellore	3000 to 4000	...
	<i>Buffaloes</i>		
Rohtak	Delhi	4500 to 5000	80
Kathiawar	Jafferabadi	3000 to 3500	100
Nadiad	Surati	4300-3	115
Deccan	Deccani	1800-3½	160

All the above types of cattle give fairly large quantities of milk in the localities to which they belong. However, the Karachi and Gir cows and Surati and Delhi buffaloes are found to be more suitable to the Bombay Presidency.

It is quite possible to develop the production of good wholesome milk, butter and ghee. In order to produce wholesome milk, good milk breeds, suitable and selected bulls (one for every fifty cows) for service, good fodder and concentrated food, comfortable byres, pure water-supply, and better transportation facilities are needed.

About 150 years ago, the English cows gave scarcely more milk than the Indian cows, but the development of science and skill of the breeders has brought about the change, which we see in Jersey, Guernsey and Holstein Friesian cows, which have been bred to the highest standard in milk production.

If some of these forces were brought to bear upon the Indian breeds there is not the slightest reason why a like result may not be obtained.

The questions about the suitable milk breeds, locality and raising of fodder crops for feeding cattle have been discussed above ; now the item for consideration is shelter. Each animal requires a space 10 feet in length and 5 ft. in

breadth. Comfort, convenience, and cleanliness are the points to be aimed at. This does not require expensive buildings, but it requires a byre that is kept clean, well lighted and ventilated. To avoid fighting between animals arrangement should be made for easy entrance. Such a cattle byre as this makes dairying more attractive and if the consumer is given all opportunity to know the conditions under which the milk is produced there is little trouble in obtaining a good price for milk. There should be regularity in feeding, milking, and removing bedding. Cow-dung etc., should be removed daily as often as is needed. Above all things arrangements for cleanliness must be made at every point. Without this, it is impossible to get the best results. Milk absorbs smells and microbes very readily. The cows must be clean, the byres must be clean, the vessels must be clean, and the milker must be clean.

Whether the milk products are delivered by hand or by a cart, they must be neatly bottled or put into tins in such a way that they must show, they have received care and attention.

We now come to the most important problem of feeding the animals. Those feeders are successful who have love for the animals and who have acquired the knowledge of feeding by their power of observation and long experience.

In the preparation of rations, the age and weight of the animal, its individual peculiarities, the character of feeds and their cost, the palatability and the object of feeding should be considered.

Cows require a diet that is somewhat laxative. It should not be monotonous, occasional change is necessary and should be introduced gradually. Mixtures of two or more concentrated foods are more serviceable and ~~more economical than single feeds.~~ Cows should get salt daily, which serves as a preventive against diseases, and also gives better taste to the food.

The following ration may be given :—

Kind and condition of animal.	Details of ration.							
	Green fodder.	Kadbi.	Oilcake.	Wheat bran.	Chuni *	Cotton seed.	Phol †	Total cost of ration.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Annas.
To Sindhi and Gir cows weighing from 500 to 750 pounds and giving from 12 to 16 lbs. of milk daily.	13	13	1	2	2	2	4	7½
To a buffalo weighing 1,000 lbs. giving 12 to 16 lbs of milk daily.	15	15	1	2	2	2	4	8
To a Stud bull weighing 1,000 lbs.	15	15	1	2½	2½	2½	5	9½

ECONOMIC ENTOMOLOGY IN INDIA.

BY CHOTABHAI U. PATEL, Esq.

Entomologist, Boroda State.

The term "Entomology" signifies the science which deals with insects. Economic Entomology is a branch of this science which deals with its practical application. Mr. Lefroy defines it as an endeavour to control all insect activities that affect the welfare of man either beneficially or harmfully; it is an applied science, an adaptation of pure Entomology to the needs of Agriculture and Commerce.

Before dilating upon the ways and means of controlling the insect activities and the scope for it, it is essential to have clearly in mind the economic importance of insects. A short account of their relation to the ordinary human activities will fairly serve the purpose. They live on and around us;

* Mixture of broken Tur (Cajanus Indicus) pulse with a slight amount of inter-husk.

† The inter-husk of Tur pulse.

we find them in our food, on our clothes, on our furniture, in our houses and everywhere. Let us consider the different ways in which they affect us. What are the ants doing in our sugar jars, what would be the condition of our flour if kept in an open vessel, what would be the result if our grain and pulses are not well cared for from time to time? One or the other insect will cause a considerable damage. The culprit who bores holes into the cheroots is well known to the smokers. Again the part which different insects play in transmitting different diseases such as malaria, enteric, typhoid, yellow fever, plague, elephantiasis, sleeping sickness, &c., is perhaps wellknown to you. Even our domestic animals are not exempt from the troubles of lice fleas, bots, horse flies and other parasites.

I will take now another and the most important aspect, viz : its bearing on Agriculture on which nearly 85 per cent. of the whole population of our country is dependant for livelihood. Think of a cultivator and his foes; of the locusts which make a distressing scene worse than the famine due to scarcity of rain, of the white ants, of the hairy caterpillars, of the boll worm that takes its 'dasunda' (tenth) from the cotton crop in ordinary years and much more in exceptional ones; of the moth borer in sugarcane; of the rice hispa and rice grasshopper that cause famine. Think again of its bearing on the failures in introducing new and promising crops. A number of pages can be filled up on this point. I regret I cannot give you the precise figures of damage done to various crops, as they are not available, because no Entomological survey has yet been made; but the above information noted from personal experience is quite sufficient for the purpose.

Now come those insects which cause annoyance to us in our daily life. Think of the cockroaches, of the bugs emitting offensive odour, of the blister flies (beetles), of wasps and hornets, of mosquitoes and sand flies, of bed bugs and fleas and finally those which hover around the lamp at night.

If I were to close the account of their relations to man at this stage, then perhaps the silk worms, the lac insects, the honey bees, the predacious and parasitic insects, the scavengers and such others may unite in a body and lodge

a complaint against me before this Conference, for depicting their race in but a baneful light, without the consideration of the other side.

We eat honey, use bees-wax, wear silken clothes and require lac for preparing lacquers, varnishes, etc. Where do they all come from? They are the products derived from insects and I doubt if the progressing science will ever be successful in finding out artificial substitutes to replace these genuine products. The following statement showing the exports of lac, wax, and silk during the year 1909-10 is worth studying :

Serial No.	Provinces.	Export of lac.		Export of wax.		Export of silk.		Remarks.
		Quantity	Value.	Quantity	Value.	Quantity.	Value.	
1	2	3	4	5	6	7	8	9
		cwts.	Rs.	cwts.	Rs.	cwts.	Rs.	
1	Bengal.	5,16,555	2,73,53,045	4,645	3,89,625	10,82,017	27,26,389	
2	Bombay	46	3,575	1,016	91,737	59,441	53,703	
3	Sind ...	565	35,860	...	...	2,90,734	18,51,460	
4	Madras.	405	11,219	751	62,910	5,50,300	3,51,451	
5	Burma.	410	17,519	586	43,954	4,191	4,018	
	Total ...	5,17,981	2,74,21,218	6,998	5,88,226	19,86,683	49,87,021	

Besides the exports, large quantities of each were consumed in India.

Finally there is a very large class of insects which are distinctly advantageous. They are the predaceous and parasitic insects and the scavengers. The former keep harmful insects in check by feeding on them and the latter help us by way of fertilizing the flowers, scavenging and cleansing the earth and by rendering waste matter available as plant food.

These are in fact the different ways in which they affect us. Before proceeding further let us sum up their ways.

Mr. Lefroy has very accurately classified them and I should like to follow him.

1. They cause damage to growing plants.
2. They cause damage to stored products.
3. They cause damage to domestic animals.
4. They transmit diseases to man.
5. They assist Agriculture.
6. They yield useful products.

The above information is, in my view, sufficient to emphasise the importance of controlling the insect activities to our advantage. The next question that naturally arises is, about the ways and means to attain the object of obtaining good results both in the reduction of damage done to the crops, etc., and in the increase of commercially valuable products derived from insects. This, as I have already said, is the primary aim of "Economic Entomology." Its secondary aim is, therefore, to acquire such knowledge as may lead us to practical methods. This aim can be attained by a careful study of the subject, the investigation of the laws that govern the conditions under which they thrive. The knowledge of their habits, their methods of attack, where they live, when they may be expected to appear, what they live upon, when their natural food crops are harvested, and of similar points is of first rate importance in dealing with them successfully. The knowledge of the cultivators' habits and their economic condition together with the existing system of cultivation is equally important.

I think it will not be out of place, if I give some general features of the life of an insect, which would serve us as a guide to the above study. To the people in general, excepting those who know the elements of Entomology or Zoology, the word 'insects' gives the idea of small living creatures of any description. In fact it is a very loose definition of an insect. Excepting birds and bats, insects alone can fly. For distinguishing the non-flying insects, three pairs of jointed legs (exclusive of non-jointed sucker feet as those found in a caterpillar), is a better guide. On the other hand, there are insects, for instance fly maggots, which have neither wings nor legs. These can either be distinguished by ex-

perience or by rearing them till they reach a flying stage. For an amateur observer, it would be quite simple to distinguish between an insect and some other living creature and so I need not trouble you with a complicate, though more exact definition.

All insects pass through various changes during their life, changes of form, habits, structure and the like ; in some cases they are gradual just as a wingless leaping grasshopper gradually becomes a winged locust and yet maintains its original form, and habits of feeding by means of jaws throughout; in others they are sudden and marked, just as a crawling caterpillar with jaws and sucker feet, transforms into a quiescent and smoothly oval-shaped pupa, and that into a winged butterfly with a long proboscis, thus changing its form and habits of feeding in different stages of the same life. It must be clearly understood that there can never be a difference in habits of life and in the process of changes between the two individuals of the same species. The process of changes in the latter (butterfly) is known as "Metamorphosis". Accordingly the insects are divided into two groups, *viz.*, those having metamorphosis and those without it. The insects of the first group pass through four stages in their life. They are :—

No.	Stage.	Function performed.
1.	Egg	Developing.
2.	Larva	Feeding and growing.
3.	Pupa	Maturing.
4.	Imago	Reproducing.

In the second group the third stage is absent and its function is performed in the larval stage. The duration of life of various insects varies from a week to ten years, though actually it does not exceed 3 years, excepting in rare cases. Out of this period, the active life is limited to less than three months in the larger number of insects. It is during this period that they multiply enormously in successive broods and make mischief. It must be remembered that the reproductive organs develop only when they reach the imago stage. According to their food, they may be classified into two divisions, herbivorous and carnivorous. The different species of the former obtain

their food from different kinds of vegetable matter fresh and decayed, and in diverse ways, *viz.*, by boring in, by sucking the sap of or by chewing the various parts, of it, such as roots, stems, branches, leaves, flowers, seeds, fruits etc. The latter get it from animal matter either living or dead. With all this the natural food and habit of feeding of any one species will not alter under ordinary circumstances. When the food-stuffs get exhausted by harvest, etc., they manage to hibernate in one or the other stage till the next season. It is in this period that a very great number of them is destroyed by their natural enemies, and had it not been for this balance, preserved by nature, they would multiply to such a great extent as to starve us.

The knowledge of several details underlying these and similar features gives a clue to the suitable and effective methods of treatment. For instance, if I know that a particular insect feeds upon a particular weed when the cultivated crop is harvested, I would try to eradicate that weed to starve the insect, or would try to use that weed as a trap around the main crop to collect the insect easily. Again, if I know that it pupates at a particular place, I would try to expose it in that stage when it has no locomotion to hide itself from enemies; if I know that it bites a particular part of a plant, I would try to poison that part; if I know that it can be easily collected by hand-picking at a particular time during the day, I would do it and destroy the lot ; if I know that it obtains its food by suction of sap, I would try to spray something which would kill it if brought in contact with its body; if I know that it lives inside its food-stuff by boring, I would try a wholesale destruction of such parts in the case of plants to prevent multiplication, or a fumigation with some vapour poison in the case of warehouses; if I know that the imago is attracted to the lamp at night, I would trap it by a lamp and prevent its attack ; and so on. In order, however, to understand this more clearly, I should instance a few definite cases of pests and describe how they are studied by an economic Entomologist, and how the weak spot is looked for with a view to find out suitable remedies.

Take the spotted boll worm of cotton. While going round a cotton field, the Entomologist finds some bolls

having holes and excreta on them. He collects such bolls, splits them open and finds the spotted boll worm inside. He also finds that some of the tender seeds are eaten up by the insect. He brings the collection in the laboratory and rears the insect in captivity, supplying the natural facilities as far as he can, to observe the habits of its life. He makes a layer of earth two or three inches deep in the rearing pot, to represent the soil of the field. He then places some fresh bolls on this layer of earth to supply its natural food, and then the insects are placed in the pot which, though closed on all sides, is of such a type as to admit the necessary air and light. Every day he has to take notes of the changes if any and to add fresh food. After a few days he finds the caterpillars coming out of the bolls. Now it seems to be full fed, and restless in search of a place to pupate. It then prepares a cocoon of tough grey silk, within which it transforms to pupa. It passes some 8 to 10 days or even more in cold weather, in this state. Eventually they transform into moths and come out, pair, and lay eggs, each moth laying about 60 in number. These notes help him in observing the life history in the field. There he finds that the eggs are laid by the moth singly on the bracts, bolls and terminal leaves of the plant. Within a few days it is found hatched to a small caterpillar which feeds first on the bracts or eats straight into the rind of the boll. The pupa is found either on the bolls or on the bracts and in the black cotton soil of Western India, it is found in the cracks of the soil. The moths that emerge are found flying in the dusk, hiding themselves in the ground or on the plants during the day. They are not attracted to light. He then tries to find out what it lives upon when the plants are not in bolls and comes to know by field observations that the top shoots of the cotton plant and the Bhinda (*Hibiscus esculentus*) pods as well as the succulent stems of the same, supply its food. Finally he tries to learn whether it has any parasite to check its multiplication. For this he segregates the sickly looking caterpillars and if there is any in the body, it comes out after it is full fed with the fat of the host. Now he will judge which is the weak spot in its life where it can be attacked, and at

once concludes that either it can be trapped by sowing Bhinda round the cotton area and then destroying all the pods that harbour the insect, or can be destroyed by regularly cutting out the infested top shoots of the cotton plants before the bolls are formed. Besides these artificial remedies, if he finds that nature does not co-operate with him in his work by way of a parasitic check on the growth of the pest, he makes an attempt to import some from a district where available. In this connection Mr. Lefroy's work in the Punjab is a living instance. In 1905 the Cotton crop of the Punjab was a total failure and it was mainly due to the attack of boll worm. On investigating the reasons why it should be so numerous, he found that the most important parasite which generally checks the boll worm was entirely absent from the majority of the cotton districts. Next year, he managed to import this parasite from Gujarat and distributed it all over the Punjab. He had made every arrangement to facilitate the establishment of the insect, with the result that it did so and consequently up to now the boll worm has never become so harmful as in 1905.

Take again the case of hairy caterpillars of Gujarat and Madras, locally known as Katra and Kamblipuchi respectively. The process of rearing this insect in captivity is the same as in the boll worm with a difference of food-stuffs. It has been observed that by the first rain of monsoon the moth lays about 700 to 1000 eggs. Caterpillars hatch out in 2 to 3 days and feed themselves voraciously for about three weeks, during which they cause a considerable damage. They then run down towards the hedges and trees, and pupate under ground about 3 to 4 inches deep. There they remain in that state till the next monsoon; and moths come out by the first fall of rain, pair, and lay eggs as stated above. The moth hides itself during the day in hedges and flies in the dusk and during the night. It is attracted to light at night. From this history, the Entomologist can judge that the eggs and caterpillars cannot be easily collected and destroyed, the pupæ are difficult to be found. His easiest method of eradicating the insect is therefore the destruction of moths by trapping them by light.

In the case of the stem borer of sesamum, the Entomologist finds that in July or August, the eggs are laid singly on the midrib of a leaf, the emerging larva tunnels into the midrib and feeds inside making a gradual progress onward. After 3 or 4 days, its existence is detected by the stunted growth of the leaf. In about 10 to 15 days, it reaches the stem through the petiole of the leaf, and then goes downwards till it reaches the downmost end of the root. After the crop is harvested, the larva hibernates till next July when it pupates and in a few days beetles come out, pair and lay eggs. In this case one can judge that the insect can be conveniently attacked after it has begun to tunnel into the petiole of the leaf, but before it reaches the stem.

I believe this will give an insight into the work which the Entomologist has to do to find out the suitable remedies to combat the pests. Gentlemen, the insects can neither be eradicated by any magic, nor has modern science yet been able to discover any method of altering the composition of plant sap, so as to render it distasteful or poisonous to them, and so we shall have to depend upon the commonsense measures similar to those suggested above.

With this information, if I were to request you to prosecute further study of several details of insects, and promulgate the knowledge, thereby acquired, among the people concerned, it will be said that I am putting the cart before the horse. But that is not so. Much has been done in that direction. Let us take a review of the past work and of the present day activities. The study of insect pests in India dates back quarter of a century to the formation of the Entomological section of the Indian Museum, and the commencement of Indian Museum Notes. The work of classifying insects injurious to crops was the main item of the duties of the Entomologist, and that was being done; that of studying the life histories of various insects had also been done, but not to the extent of suggesting any practical methods of dealing with them. Though the Museum possesses good collections of insects, very little progress had been made in the practical side of the science. The Provincial Museums have got very inconsiderable collections. The Bombay Natural History Society is one

of the centres of Entomological activities. The active work of practical utility can fairly be said to have commenced with the appointment of an Entomologist, in the Imperial Department of Agriculture in 1908. It is during the last 7 years' tenure of his office, that the life histories of almost all the pests of major importance, have been worked out. Various methods of treatment have been found out and tested on a field scale. Experiments for finding the value of Eri silk culture as a cottage industry in India are in progress, and of late it is being pushed among the people of Behar. The Baroda State has organized a department for pushing this industry among the ryots. The Provincial Governments are also making the preliminary preparations. The experiments of domesticating the honey-bees and of cultivating 'lac' on the unproductive trees in Agricultural areas, receive due attention. The latter has already proved successful, and efforts are being made to attract the attention of the cultivators. Gentlemen, I cannot afford to give details of working and estimates of expenses and profits, of these cultivations in a paper like this, but if any of you feel drawn to introduce these cultivations, in your respective districts, the Imperial Entomologist will be glad to supply all the necessary details, on being requested to do so. The biting flies and similar insects which transmit diseases to man are being studied carefully and we can hope for visible results of these many-sided strenuous efforts. Besides his office staff, the Imperial Entomologist is assisted in his work of investigation of various details, by Provincial Assistants, previously trained by him, whose business is to carry on field observations of insect pests, as well as to accumulate the knowledge of local conditions. The work of diffusing the knowledge of insect pests, and the methods of dealing with them, among the cultivators is a part and parcel of their duties. As a result of his efforts a hand-book of "Indian Insect Pests" dealing with practical methods has been published, and it has been translated into Bengali by one of his assistants; a standard work on "Indian Insect Life" has recently come out. The Agricultural Journal of India published by the Imperial Agricultural Department contains articles relating both to

the harmful and useful insects. The more scientific information is issued in the form of Memoirs, whenever material is available, and purely popular and useful information is published in the form of leaflets. The Mysore State has recently engaged the services of an Entomologist with qualifications of English University, who is engaged in organizing his work. These are the present day activities of Economic Entomology in India. This is quite encouraging and we are sure that the store of our knowledge will be great at this rate of work, within a few years. But unless we manage to apply that knowledge to practical purposes, it is of very little use.

Let us then consider the ways and means of applying it. Unlike the treatment of human diseases, no experts are required on the spot to diagnose the ordinary insect pests of crops, nor any pharmacy is necessary in dealing with them. The knowledge of some salient points of the pest, together with some suggestions of mechanical methods of dealing with it, is at present a sufficient equipment for the farmer to protect his crops. Similarly the knowledge of rearing useful insects which yield silk, lac, honey and wax, &c., suggests to him an idea of utilizing them in the best possible way. But this aim can only be attained if he is once personally convinced of the adequate return of his efforts. Though the difficulties arising from the great area to be worked over, the isolation of the cultivators and the crops, the ignorance and lack both of knowledge and desire to alter the natural state of things, are very great, it must not be supposed that the cultivator himself is not at all alive to the importance of dealing with crop pests. Many keep their seed beds and other valuable crops free from insects by hand-picking, some find it to their advantage to treat their important crops like rice, sugarcane, tobacco, &c. Others particularly give attention to fight the hairy caterpillars, white ants, and the like. A great number of most common pests can be advantageously controlled with simple contrivances by any individual farmer, and a few require an organized effort to control them. In America they have legislations to enforce this kind of work, but I am not prepared to recommend it here, nor am I able to prescribe a precise form of efforts to be made to meet the local needs,

I can however suggest a few ways of promulgating the necessary knowledge of economic entomology among the cultivators.

1. Demonstration of the methods of dealing with crop pests, comparing the result with non-treated area.
2. Competition prizes for the best work done in fighting out a particular pest.
3. Encouragement to those who exert themselves in combating the pests according to directions.
4. Exhibition of magic lantern slides dealing with the life histories of insects in villages.
5. Wide distribution of leaflets in Vernacular among the cultivators and school boys.

This is a very delicate work and should be entrusted to reliable trained men. For the purpose of controlling a pest which requires an organized effort, the insurance of crops against such a pest and then its treatment, is likely to make an impressive demonstration. The Baroda Government has of late provided every facility to carry out the above suggestions of systematically educating the cultivators, and to make the work impressive and attractive. Last year 16 cultivators of 8 villages of two talukas (tehsils) in Baroda, had entered into competition of fighting out the stem borer of sesamum, according to the instructions imparted by the Entomological Assistant. In the beginning meetings were held at the headquarters of those talukas to raise the competitors. The aims and objects of such competition were explained to them, after pointing out the damage done by the insect and the simplest method of dealing with it. When the insect attacked the plants in the fields of the competitors, the method of combating it was shown to all the competitors in their respective fields. They had to repeat the work thrice at intervals of 10 days, and on being reminded of the due date, every one did it enthusiastically. Other enthusiastic cultivators of those villages had the chance of seeing the result of the work in the fields of their brother cultivators (competitors), and it had made a better impression than a demonstration done in a Government farm could. During the same year some cultivators of cotton-growing talukas were called upon to see the effects of the work done at

the state farm for combating the boll worm of cotton. They were invited to witness each operation effected at regular intervals and their travelling expenses were borne by the Government, with the result that not only they are doing the work in their fields this year, but their neighbours have also taken it up. From this, it will be seen that the efforts seem to be on their way to success.

It is true that the progress is very slow, and it will remain so, partly because this is a fight *against* nature, partly because the officers charged with these duties meet with difficulties in obtaining genuine information regarding the pests, &c., from the cultivators, who are accustomed to look at the movements of Government with an eye of suspicion, partly because the work is not adequately financed, and partly due to the lack of desire on the part of cultivators to alter the existing practice. It is by the hearty co-operation of all these *viz.* the Government, the scientific experts, the educated classes and the Agriculturists, that the best result is to be arrived at. It behoves Government to come with a more liberal hand and finance the work better than it does now, spending a little less than a rupee per 2,500 acres of cultivated land. The scientific men also should spare no pains in the careful study of the important pests, which trouble the Agriculture of India, and be cautious as not to publish immature information, so that the confidence of the people might not be lost. It is the duty of the educated classes and the Journalism of India, to popularize the knowledge thus acquired, and bring it within the reach of the Agriculturists, who, should be ready to utilize the knowledge and to furnish the experts with necessary information. So long as all these four elements do not harmonize, there is little hope of achieving desired success in the efforts for improving Agriculture. Government may do much, but the main impetus to remedy the evils must come from outside its machinery ; it must, as it has been in almost every other part of the world, be unofficial in character. I cannot claim to dictate the duties and the responsibilities of the educated classes of India for removing those difficulties as far as possible, to better the condition of Agriculturists

who form the main bulk of our Indian population. This is a question for the solution of which larger minds and greater intellects are required than mine. I am fortunate to see before me a large number of educated people—the cream of Indian society—before whom I trust, my words will not be thrown away, because we all love our country and its peoples, and wish to see the betterment of their condition so far as Agricultural improvements are concerned. In conclusion, you all know that one who makes two blades of grass grow where only one grew before, is a true benefactor of mankind.

Gentlemen, the subject of this paper is such that I may be tempted to give immediately useful and technical details of various pests and the methods of treatment, but before an audience like this, I desist from doing so, lest it may appear dry and uninteresting. However, if any one feels specially interested in this subject I have shown in the body of the paper where to refer to, and therefore content myself by giving a general outline of the subject.

WOOD-DISTILLATION.

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India has been proverbially known to be a land of gold, but the gold that lay on the surface is evanescent. It is the latent capacity for unlimited production that enriches a country, and India in this respect is unsurpassed if only her sons know how to utilize her resources. Very few people properly realize how much wealth lies hidden in what we usually consider to be mere waste or things of little value. Indian agriculture is handicapped owing to lack of knowledge, means and enterprise on the part of the cultivating classes. Indian forest is still an unexplored region except for its timber, while mining is at present taken up only for foreign exploitation. Educated Indians must devote their energies to discover this

hidden wealth and utilize it for the industrial advancement of their country.

I intend here to give a few details about one of such industries that has hitherto attracted very few workers, but promises to open up unlimited possibilities, if properly organized. I refer to wood-distillation, including manufacture on a commercial scale of all the products obtainable by dry distillation of wood, and other similar vegetable substances. Wood charcoal, acetic acid, lime-acetate, acetone, methylalcohol, wood-naphtha and tar are only some of the articles produced by wood-distillation that are largely used in various industries and consequently have a considerable demand in the market. All these products are obtainable from common jungle wood that is either wasted away or at the most burnt for fuel. A cart-load of such fuel can be had ordinarily in the jungle for 4 to 8 annas, and in many places it can be had merely for the cost of cutting and transport; and yet the products when made marketable are worth hundreds and thousands of rupees. Nor is the apparatus very costly or the process of manufacture so difficult as to be beyond the capacity of ordinary workmen. With a little training and a small capital such as any man of average means can command, the industry can be started in the midst of a jungle. It is in fact essentially a forest industry, and given the facilities for transport, it can be most profitably carried on under the very trees of the forest.

Dry or destructive distillation does not require any elaborate or costly apparatus. A cast-iron or earthenware retort or still, with a metal condensing pipe and a wooden tub to act as a receptacle, all costing together not more than Rs. 150, are quite sufficient to start manufacture.

A brick furnace ought not to cost more than Rs. 50, and can be put up in any temporary shed constructed of non-combustible materials. Any kind of dry wood, vegetable shell, or bark is serviceable, but timber useful for building purposes should be avoided as being too

costly to be wasted for its charcoal. Soft wood is preferable while roots, trees, thick barks and such other hard wood are less valuable as they contain more tar and yield lesser proportion of acids and spirits. Wood containing a high proportion of tanning substances, such as acacia or tanning bark is also too valuable, and in fact every kind of wood which has some other use in commerce or industries should as a rule be avoided. The best kinds are those which are sufficiently hard and thick so as to yield good charcoal. Air-dried forest refuse or small splinters are preferable, as sun-drying injures the sap and lessens the spirit yielding property. Given an abundant supply of good material and cheap fuel for the furnace, both of which are always available in or near any common forest, the manufacture can be started by any man with small capital and possessing ordinary training and scientific knowledge.

Charcoal manufacture is practised almost in every part of the country where there is considerable forest, and is likely to increase as there is in recent times a tendency towards a larger use of charcoal for domestic purposes, for small furnaces in cities like Bombay and Calcutta. Charcoal being purer, is less bulky and gives less smoke and more heat for the same quantity. It is therefore more convenient for use, and is cheaper in the long run as compared with coal or wood. But the native method of manufacturing charcoal is rather wasteful and does not yield as much outturn as we ought to get. The process hitherto in vogue in the Deccan and several other parts of the country is to dig a round trench of about 8 or 10 ft. diameter and about 4 ft. deep which is filled with dry pieces of wood up to the level of the ground. An inlet is kept on one side just enough for a man to pass down, fire the stack at the bottom and then close the aperture. When the whole stack is sufficiently heated, and the wood pieces are just charred but not actually burnt, mud and earth are profusely thrown over the trench to smother the heat, and

then the charcoal is taken out. One ton of wood costing 1 to 2 rupees in the jungle will in this way yield 244 lbs. or about 9 Bombay maunds of charcoal worth 5 to 6 rupees. Taking into account labour, transport and trade profits, the manufacture can hardly be said to be paying. The method besides has the great disadvantage of losing altogether wood-spirits and tar which are given away in the form of gases and which in fact form the most valuable ingredients in wood. Dry distillation if carried on according to improved scientific process gives the following results per one ton or 4 khandies of wood equal to 2,240 lbs. :—

653 lbs. Charcoal of the best quality,	
at 10 annas per maund	Rs. 15 0 0
210 lbs. Tar $\frac{1}{2}$ anna per lb.	„ 6 9 0
560 lbs. Crude Acetic Acid at 5 s. or	
Rs. 3-12-0 Per 100 lbs.	„ 21 0 0
817 lbs. minor products, combustible	
gases and loss which are not taken	
into account.	
2,240 lbs.	Total Rs. 42 9 0

Cost of manufacture per one ton is approximately Rs. 11, while interest on capital required will not exceed one rupee per ton. Deducting this from the above income, we get Rs. 30 net profit per ton, which leaves sufficient margin for further processes of second distillation, purification, liming and other trade operations, so as to yield a good dividend on the capital invested.

The above results have been obtained by actual experiments, and the products also have been found to be highly satisfactory. The results of one such experiment by Mr. D. S. Shaligram of Kolhapur were submitted to a leading firm of Chemists in Germany and were found to yield 8 per cent. tolerably pure acetic acid which sells at 3 annas per lb. in the Bombay market. Acetic Acid

when neutralized with lime or chalk forms lime acetate, which is largely used in dyeing and bleaching works. Pyroligneous Acid is always in demand as a mordant and is largely imported in Bombay from foreign countries. If it can be manufactured and supplied locally, what an amount of saving can be made and how many people will find a profitable occupation and ready source of income? Every one of the products of distillation mentioned above is an article of trade. The charcoal by itself would be a paying concern. Then the acetic acid and their acetone compounds would be another source of income. The tar though often thrown away as waste would yield, if properly handled, good many products which by themselves would form a separate industry. Among the minor products, we get methylalcohol, wood-naphtha and paraffin which also are of sufficient importance in the industrial world to form the basis of separate manufactures. Of course the processes and apparatus used for the acquisition of these by-products vary considerably in elaborateness and cost, but if properly managed they will amply repay any labour spent on them.

Less ambitious men may in the beginning confine themselves to the main products of charcoal, acetic compounds and tar. The following description of the process, taken from the *Bulletin* of the Imperial Institute will give a good idea :—

“ In the destructive distillation of wood the blocks or refuse are heated in a suitable vessel provided with a small aperture fitted with a pipe. In modern practice the carbonising vessel is generally a cylindrical wrought-iron retort built into brick work in a horizontal position. The retorts are of an average size of 3 meters long by 1 metre in diameter, and are made to hold anything up to about 4 tons of wood (a quarter or a “ cord ”). They are generally set up in “ batteries ” of two, and heated by the same fire from below. The naked flame is not allowed to impinge directly on the retorts which are heated

only by the hot furnace gases, this result being obtained by utilizing iron or brick shields or arches. Before the application of heat all the orifices and connections are plugged with clay. The batteries of retorts are set up in rows, and the exit of each retort is connected with a warm condenser made of copper and cooled externally by means of running water."

A cheap and serviceable apparatus would consist of a Cast-iron cylindrical retort of 18 ins. inside diameter screwed with a cap having an opening on the top connected with the condensing pipe. The condenser is of Liebig type and may be made of copper, brass or earthenware straight pipe or coil inserted in a larger pipe or horizontal cylinder containing running water. The vapours when cooled are collected in a tub or receptacle, while the remaining gases are again carried to the furnace for combustion so as to economize fuel. The liquid collected in the tub is then treated according to the kind of product we wish to get, while the retort is opened thrice a day and emptied of its contents of charcoal. The condenser has to be cleaned frequently to prevent its being choked with accumulations of tar. As all the substances are inflammable, great precaution must of course be taken to avoid the danger of fire, and the building therefore should be entirely of non-combustible material.

Another branch of wood distillation is the carbonisation of cocoanut shells which are so abundant in the palm-growing parts of the Western Coast of the Bombay Presidency, as well as in Bengal. At present these shells are mostly burnt as fuel except a small quantity used for Hooka-pots, buttons and such other small articles. Cocoanut shells can be had for 10 or 12 annas a thousand, and give a very superior kind of charcoal largely used for water-filters and by goldsmiths and other metal-workers for small furnaces. The oil is also sometimes extracted from the shell for medicinal purposes, but no other industrial use appears to have been thought of. Dry distillation from cocoanut shell

appears to give even better results than those from ordinary wood. Experiments made by a leading German Chemist with ordinary shells give the following results:—

One ton = 100 Kg. = 2,240 lbs.

420 Kg. cocoanut coal with 3 to 3.5% ashes.

45 Kg. Acetate of lime of 80/82%.

9 Kg. crude wood spirit calculated as product of 100 per cent.

42 Kg. Cocoanut tar and Cocoanut tar oils to be used as fuel.

Acetate of Lime 80 per cent obtained from Cocoanut shell when treated with Sulphuric Acid gives for every 100 Kg. of Acetate, 73 Kg. of crude acetic acid which when rectified will give 29 Kg. of technical acetic acid of 30 per cent and 48 Kg. Acetic Acid of 90 to 99 per cent. Samples of crude acid and the residue of hard pitch obtained from shells by distillation in ordinary earthen pots were recently sent by me to Mr. F. H. Meyer, the well-known chemist and manufacturer of distillery apparatus of Hanover-Hainholz, were analysed by him and were found to be 15.8 per cent acetic acid and 7.5 per cent pitch obtainable from 1000 lbs. of shells. Distillation with a more scientific apparatus would in addition have given good charcoal (above 65 per cent) methylalcohol and tar. These are very encouraging results and ought to convince everybody of the profits to be made by utilizing an article that is at present either thrown away or burnt as fuel only. A plant of the most improved type of 2 tons daily capacity would cost about Rs. 15,000 and the whole outlay including engine, boiler and shed need not go beyond 20,000 rupees. It is wonderful that educated Indians and merchants dealing largely in cocoanuts and cocoanut oil have not yet thought of this very profitable industry.

The Charcoal industry has a great future before it. From air-dried wood, about one-third of its weight of charcoal

can as a rule be obtained and it always fetches a higher price than the refuse itself. Charcoal is always utilized for many purposes and new uses are now discovered every day. Besides being largely employed in the manufacture of iron and steel and in the extraction of other metals such as copper and tin it can be used in sugar refineries for filtration and for various domestic purposes. Small charcoal obtained by distilling wood refuse or cocoanut shells is specially useful in the manufacture of smokeless fuel, calcium carbide and packing for cold storage chambers. In India wood charcoal is particularly suitable for sugar-refining, owing to the religious objections of the people to the use of bone ashes. The charcoal of cocoanut possesses according to Rutherford the property of absorbing at ordinary temperature and retaining for a long time the gaseous emanations of radium thorium, and actinium. Dr. Shober of Philadelphia (*vide* "Scientific American" of 4th December 1909) has utilized this property of charcoal for internal application of radio-activity. The charcoal is entirely neutral and permanent and can be administered internally with perfect safety.

The other products of wood distillation are similarly finding extended uses. The acetate of lime is converted into acetone and calcium carbonate (chalk). Acetone is a useful solvent of varnish resins and is largely used in the manufacture of celluloid and other articles; while the acetone "oils" are good paint-removers. Similarly wood alcohol is a useful solvent and is largely used in the coal-tar dye industry. Special kinds of wood yield special products such as turpentine from pine for which steam or electrical distillation has been recently tried with great advantage.

ESSENTIAL OILS.

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Out of the five physical faculties of man, *viz.*, the senses of hearing, sight, smelling, taste and touch, that of smelling is the least valued and, therefore, the least tutored and in consequence least developed, in man. Man through his born pride, considers himself to be perfect in every respect but there are many things in the world which man does not possess but which are the common possession of the lower animals. Out of these, the sense of smelling is one which is developed to a very high degree in lower animals. Man may think that he need not develop this sense, it being a possession of the lower animals, but he will have to admit that it is not insignificant to our welfare and happiness. It is only with the help of the sense of smelling that man can avoid breathing impure air or know the approach of wild beasts whose bodies generally give stinking smell, or enjoy a sense of pleasure by smelling a Rose or Jasmine.

It is of matters pertaining to this sense of smelling that this paper will treat. The essential oils, the subject of this paper, are so to speak refined objects of this sense (of smelling).

The words "Essential Oils" at once suggest that the substance called essential oil is the essence of an oleaceous character derived from some vegetable or animal matters. But the term "essence" itself is of a very indefinite nature. Quinine and the other allied alkaloids are the essence of cinchona bark, in the common sense of the word. But technically, they are not called essences. On account of this indefinite and vague sense that the term "essence" carries, it used to be applied only to the volatile essences distilled from other products. As such distilled essences were generally of an oily nature, they were called essential oils and as they were volatile, they were also known as Volatile Oils. This term "Volatile" also served the purpose of distinguishing these essential oils from oils like the Castor

oil or Coconut oil which are not volatile and which decompose when distilled and which are therefore called Fixed Oils.

In spite of these distinguishing attributes "Fixed" and "Volatile", as applied to oils, the term oil is mis-construed. It is surely not a very good principle to give any class of substances the same significations as those belonging to another. There are enough distinguishing qualities in their composition, their physical characters and chemical reactions, to warrant the application of a significant name to that large class of substances known as Essential Oils.

Essential Oils may therefore be described as the simple-odours consisting of many distinct chemical bodies extracted generally from vegetable products of a volatile nature, giving a decided smell, pleasing or otherwise. They can be distilled without appreciable decomposition, are soluble in alcohol and all fixed oils of vegetable origin, and are immiscible with water.

The use of Essential oils was known to the ancients and the art of extracting them was highly developed, especially the art of extracting those, used as perfumes, which are of a superior grade in the whole class. In those times, the perfumes were used in religious ceremonies, which practice survives even to-day principally in India among the Hindoos, Parsis and Mahomedans. They were also used by the rich and their use was considered a sign of high birth. The people who were frequent users of perfumery articles were considered the most civilized and refined people in the world, and this idea continues to this day.

The art was developed in the ancient times chiefly in India and Egypt, the cradles of all human knowledge of old. From Egypt it slowly spread up to Arabia and Turkey and thence to Greece and Rome and gradually to other western countries. This art, although much forgotten in India still retains its own characteristics in the United Provinces, Punjab, Kashmir and Mysore.

The principal seats of this art in the present world are Southern France, Germany, England, Italy and United States of America and Northern India.

The essential oils are extracted from different parts, of

different plants, from the roots like Khus, from woods as of sandal, from plants like patchouly, and from leaves and bark like those of Mint and Cinnamon, from grasses like Rosa or Lemon-grass, from unflowered buds like those of cloves, from flowers of Rose and Jasmine and from seeds and fruits like caraway or Anisi or coriander or from rinds of fruits as in the case of orange fruits.

Some plants yield more than one odour, which are quite distinct and characteristic. The orange tree, for instance, gives three—from the leaves the oil called petit-grain, from the flowers, the oil of Neroli, from the rind of fruit, the oil of orange.

The fragrance or odour of plants owes its origin, in nearly all cases, to a perfectly volatile oil, either contained in small vessels or sacs, within them, or generated from time to time, during their life, as when in blossom; some few exude by incision, like odoriferous gumresins, as Benzoin. Others give by incision what are called Balsams, which appear to be mixtures of an odorous oil and an inodorous gum. The odours of flowers and plants are more generally secreted during the sun-shine or at least in the day time. Experiments have revealed the fact that the odour depends upon some physiological cause and not the evaporation or accumulation of particles in the parts of the plants where they have their origin. It has been observed that some flowers give out odour only in the sun-shine and refuse to give any when the sun light is even artificially cut off, and also that some flowers lost their odour after pollination and that the unfertilised flowers retained their odour the longest time. White flowers have been found to give the most fragrant and pleasing smell and that orange and brown coloured flowers do not give any appreciable smell and those growing in the warm latitudes are the most prolific in their odour while those from the colder climates are the sweetest. The monocotyledons were found to contain a larger percentage of odoriferous species than the Dicotyledons.

The formation of the Essential oils in some plants is attributed to some kinds of disease which produce these products by decomposition, and the fact that the constituents of essential oils, are simple bodies, as will be explained

hereafter, is brought forward as proof in support of this theory. But this theory is unable to explain the formation of essential oils in plants which are in a healthy condition, or in those which continue to give it through its life or in those which give the essential oil at certain regular intervals, which necessitate a healthy condition of the plant.

Another theory explains the formation of these oils through the agency of Tannic Acid. This is said to be supported by some actual experiments with plants. Those giving the greatest amount of essential oils were found to contain the greatest amount of Tannic Acid and those giving a small amount of oil, a small amount of Tannic Acid. But this does not support the theory at all. The Tannic Acid can be an accompaniment to the essential oil, both being formed at the same time, as products of the same reaction. From this we can say only that the presence of essential oil in vegetable substance indicates the presence of Tannic Acid, although this is not always the case, nor the contrary true at all.

A third theory says that the essential oils are the waste materials in the physiology of plants, being products formed during their life processes but not assimilable by them, and that these kinds of waste products are formed only at a certain stage of their life, namely, at the time of maturity. This seems to be a pretty good theory satisfying many of the conditions, more than the first two theories do.

Although there are so many theories propounded, none can satisfy all cases and conditions; the subject has not been fully investigated.

Now let us turn to the methods of isolating these oils from vegetable products.

There are in all seven methods of separating the essential oils.

1. Distillation.
2. Expression.
3. Infusion or Maceration.
4. Enfleurage.
5. Extraction.
6. Combined Enfleurage and Distillation.
7. Extraction by air-current.

Distillation is the most common of all. It is resorted to in the case of woods, plants, roots, seeds, fruits, grasses, and in the case of some flowers, or in short, whenever the oil in the raw material cannot be easily disengaged, at a low temperature. The Distillation is carried on in an apparatus called still. The process consists of placing the material to be extracted, and water, together in a large vessel, the top of which ends in a long coiled bent tube placed in cold water. The water in the vessel is boiled and the steam carries with it, the oil from the material to be extracted and both are condensed and refrigerated in the coiled tube cooled by water. The mixture of water and oil are collected in a reservoir where they separate in two layers, being immiscible. The oil is then removed by means of a pipette or a separatory funnel or in a special apparatus called florentine receivers.

Stills are generally of three types, those heated by fire, those worked by live-steam and the others heated by steam. The first two types are common, while the third type is used only in special cases.

The still that was mentioned in the detailed process given above is a fire still. The still worked by live steam is a very simple apparatus. It is a vessel exactly like the fire still with the same arrangement of the head and the ending coiled tube, which is called the condenser cooled by water, but instead of a common bottom, the former has a steam tube or pipe coiled round in the same plane like a (Jilebi) fixed at the bottom. This is perforated all over and is connected to a boiler by means of a pipe outside the vessel. The steam escapes through the holes in the pipe into the vessel charged with the material, and takes with it the essential oil.

The third type consists of a vessel like that of a fire still, but the bottom is jacketed *i. e.*, it has got two bottoms making a hollow between the two. Water and the material to be extracted are placed in the vessel, and steam is passed into the hollow between the two bottoms. This steam heats the water inside the vessel, and thus the still differs from the fire still only in the source of heat.

The steam-heated and live-steam stills are better than

the fire still, as in the latter there is possibility of water being exhausted in the still, the material in the still being charred producing decomposition products.

As a general rule Distillation is effected by steam: but there are cases in which actual contact with water is indispensable, as in the case of bitter Almonds, in which case the raw materials require to be steeped in water for some time, before Distillation.

Out of the flowers it is only Rose and a few others that are distilled for their oil. Generally Essential oils are separated from flowers by the other process of infusion, Enfleurage, or extraction. The seeds, barks or woods or roots require to be distilled for their essential oils. These substances are bruised or powdered to facilitate disengagement of the oils.

The selection of waters for distillation is of some importance. Those which are perfectly neutral are chosen and which are rich in salts are as much as possible avoided, except in certain cases, *e. g.* in the distillation of Clove or Cinnamon where the essential oil has a specific gravity higher than that of water for the purpose of raising its boiling point, whereby the separation of the volatile oil is facilitated; further when the products of distillation are capable of being solidified at a low temperature, the worm is not allowed to become very cool.

The process of expression is adopted only where the plant is very rich in the essential oil; such as is found in the outer peel of the orange or lemon, or citron. In these cases the parts of the plant containing the odoriferous principle are placed, sometimes in a bag, and at others, by themselves into a press, and by mere mechanical force it is squeezed out. The press may be worked by hand, if a small one, or worked by Hydraulic pressure if considerably bulky and heavy. The bottom of the press has one small aperture or many according to circumstances to allow the expressed oil to run for collection. Above the aperture, there is placed a false bottom and on this the substance to be expressed. There is placed an iron plate on the substance fitting the interior, this plate is connected with a powerful screw, which being turned, forces the substance so closely together, that

the little vessels containing the essential oil are burst and the oils escape. The oils thus collected are contaminated with watery extract which exudes at the same time. The mixed expressed Liquids are allowed to stand for some time in a quiet place after which the impurities and water subside, when the oil is poured off and filtered.

In this way the oils of Lemon, Orange, bergamot, and lime fruits are expressed from the peels.

The processes of Maceration or infusion and Enfleurage depend upon the peculiar property of vegetable or animal oils and fats; that of their having a particular affinity for the otto of flowers. It may be noted here, it is only flowers that are treated in this way for their essential oils. On account of the affinity, that fatty oils possess drawing the otto out of the flowers and become themselves, by their aid, highly perfumed.

The fat or the fatty oils are gently warmed by means of steam or fire in a metal or enamel pan. The oil being sufficiently warm, the kind of flowers required for the odour, are carefully picked out and put into the oil and allowed to remain there from 12 to 24 hours. After sufficient maceration, the flowers are robbed of all their essential oils which remain dissolved in the fatty oil. The spent flowers are removed, and fresh flowers added until the fatty oil attains the required saturation. These saturated oils are next extracted by means of alcohol. The alcohol takes up the essential oils from the fixed oil in which it had been dissolved and which now becomes in its turn robbed of its essential oil. The alcohol and the perfumed fatty oil are taken together for a long time and allowed to rest when the oil separates out. The perfumed alcohol is then decanted off. This depends upon the fact that a substance which is soluble in two solvents which are themselves immiscible, but having different solubilities always prefers the more potent solvent to the weaker, subject to a certain law. In the case under consideration, essential oil prefers the alcohol to the fixed oil, and gets dissolved in the alcohol. The alcoholic solution which is called essence of the particular flower is then used as such, or the alcohol is evaporated at a very low temperature

and reduced pressure, and thus the dissolved odoriferous principle isolated.

When neither of the foregoing processes gives satisfactory results, the method of procedure adopted is that of absorption or enfleurage. Of all the processes this is the most delicate to manipulate and the most important to the perfumer. This process gives the most exquisite essences from the most delicate flowers. The odoriferous principles of some flowers are so delicate and volatile that even the small amount of heat employed in the maceration processes would greatly modify, if not entirely spoil them. This process is therefore conducted in cold. Square frames about three inches deep with a glass pane set in exactly like a window sash, about two or three feet of breadth and length are used. A thin layer of fat is spread over the glass pane about a quarter of an inch thick on both sides. On this the unstalked flower buds are strewn over. They are then piled one over the other. In this way the flowers are imprisoned as it were in chambers, the floor and roof of which are covered with a layer of fat. The fat takes up all the perfumed essence from the flowers, and from them essential oil is extracted by means of alcohol exactly in the same way as was described, in the case of maceration.

In India there are various processes for extraction, chief of them being distillation and infusion in hot as well as cold, latter being a modified enfleurage. But there is one curious method not employed anywhere else, which is employed in the case of very delicate flowers. This consists of a combined enfleurage and distillation.

The enfleurage is carried on by means of sandal wood dust instead of fat. The flowers and the sandal dust are spread in alternate layers in a box, for about 24 hours after which the spent flowers are thrown away and new flowers used with the same sandal dust. In this way the sandal dust becomes saturated, when it is distilled in a common still. The distillate is separated into fractions, the first few fractions being the most delicate of perfume, the last ones of a very low grade. This process faithfully reproduces the original odour of the flower in all its delicacy and sweetness but the drawback is that the

essential oil is contaminated with santal oil from the sandal dust. There are some other equally ingenious methods employed in India which are kept secret. By one of these secret processes, it is said, concentrated essences or what are called in India *Rooh* essences are extracted. These are said to be fifty times, hundred times and one thousand times more concentrated than the essential oils extracted by other processes. The penetrating and spreading power of these has been found to be so great that a drop of it could perfume a large hall 40 × 25 feet in 1/4 of a minute while a drop of an oil from same source, but extracted by distillation, required nine minutes to spread through the same space.

The method of extraction by solvents came in vogue only a few years since. The process is a very simple one. The material to be extracted, generally flowers, woods or roots, is placed in a percolator, a conical vessel with its conical end downwards with a cock at the conical end, and the solvent, fluid ether, chloroform, carbon disulphide or petroleum ether is passed over it: The liquid that comes out through the stop-cock contains that essential oil together with other soluble matters. The liquid is distilled at a very low temperature and reduced pressure when the solvent evaporates leaving the essential oil behind. The last traces of the solvent are removed by passing a rapid current of air through the essential oil. These products are interesting to a chemist on account of their containing nearly all the original odoriferous constituents of the substance extracted.

There are some substances, the odoriferous constituents of which are neither volatile to be isolated by Enfleurage, nor do they distil with steam. They cannot easily be dissolved out by oils and fats; while solvents like Carbon Disulphide or Ether dissolve too large a quantity of other inert substances with the odoriferous ones. In consequence such odoriferous bodies are dissolved by means of alcohol and the resulting sol.,—the tincture is used like an essence.

Another ingenious process has been devised as a means of isolating the odoriferous constituents from very delicate flowers like *Tubereuse*. It is a pneumatic process of extraction, which although not much used, is sure to be a very

useful method in time to come. It consists in forcing a current of air over flowers and then to force the saturated air through grease or a fatty oil, to which it gives up its oil. The apparatus is contrived in such a way that the same air repeatedly passes through the same vessel. There are some constituents which the oil cannot absorb and are therefore left in the air, but which can be condensed to a liquid by artificially cooling the air. The saturated oil or grease is dealt with in the same way as in the case of Enfleurage.

We may now take a review of these processes before we pass on to the consideration of their nature. The distillation is the method used in most cases. But it has some disadvantages; the high temperature required for distillation brings about the oxidation of the constituents of the oil, deteriorates the smell, and gives an opportunity to the constituents to polymerise, that is, change into bodies of higher molecular weight by the association of molecules. Again, during the process of distillation, the different constituents separate out in fractions, some of which are more volatile coming over first, and those which are less volatile coming over last.

In the case of infusion or maceration, the constituents which are soluble in the fatty solvents at the temperature used are isolated, while there may be other bodies for which the conditions are not favourable enough to be isolated. So the oils prepared by this process may not contain all the constituents.

In the Enfleurage and the Pneumatic processes, only the volatile constituents are separated while the others remain in the flowers.

The extraction gives besides the essential oil, other products soluble in the solvents used, but which do not form a constituent of the essential oil.

It is only the expression method which gives pretty pure essential oils with all the constituents, without an appreciable quantity of foreign substances. Unfortunately this process cannot be employed with many of the substances.

Essential oils isolated by one method or the other, consist of a mixture of two or more of the following constituents:—**Terpenes**, compounds of the nature of turpentine, Hydro-

carbons, alcohols or organic Hydroxy compounds, aldehydes and ketones or oxidation products of alcohols, organic acids, Esters or organic compounds corresponding to salts of Inorganic Chemistry, Phenols or compounds of the nature of carboic acid and other complex bodies including some natural waxes, camphors, etc.

The essential oils being only mixtures of a number of chemical compounds, are never constant in composition. The nature of the constituents, and their proportions in the oils depend upon whether the raw material comes from the same season, and from the same soil and climate.

The different constituents have different functions to perform in the essential oil and the general properties of the oil are the average, and are made up of the properties of all the constituents taken together.

The aldehydes give the oils their diffusing power; the alcohols and esters are so to say the usual constituents and determine the behaviour of the oil as a whole. The waxes and camphors reduce the volatility of the oil; there are others which modify the odour. Nearly all of them are odoriferous except the waxes and camphors which are inert and have no smell as a general rule.

When an essential oil is to be examined chemically, the procedure is to first distill it under reduced pressure, and collect fractions of distillate at different temperatures. Those constituents which are very volatile distill first, and these are generally terpenes. In this way, fractions distilling within certain narrow limits of temperature are collected separately and are then chemically examined, for alcohols, esters, aldehydes, etc.

Sometimes the chemical examination is proceeded with directly before distillation.

When the free alcohols are to be estimated anhydrous, CaCl_2 is added to the oil when the CaCl_2 forms a loose molecular compound with the alcohols. This compound being solid, can easily be separated, mixed with water, which decomposes it and then distilled under reduced pressure. The alcohol, set free, distils and is collected.

For the aldehyde and ketone estimation, advantage is taken of their characteristic reaction with NaHSO_3 Sodium

Bisulphite. An additive compound is formed which forms crystals which are separated and decomposed with sodium carbonate. The mixture is distilled in steam and the aldehyde or ketone separated.

The esters are estimated by saponification or decomposition by an alkali when the acid present in the ester combines with the alkali, and if a weighed quantity of the alkali is taken for the experiment, the amount of esters can be very easily calculated.

The camphors, resins and waxes are estimated together, by evaporation of the oil. If they are to be examined separately, it is done by the help of their solubilities in the different solvents.

Almost all the important essential oils have been chemically examined, and limits of the percentage of the different constituents have been determined by examination of a number of samples of the same oil.

Following are some of the chemical constituents :—*Limone*, *Dipentene*, *Citronellol*, *Citrinellal*, *Citral aldehyde*, *Geraniol*, *Geranyl aldehyde*, *Benzyl alcohol*, *Benzaldehyde*, *Linalol*, *Linalyl acetate*, *Benzyl acetate*, *Geranyl acetate*, *Menthol*, *Menthyl acetate*, *Terpenyl acetate*, *Chinnamyl alcohol*, *Chinnamic aldehyde*, *Methyl salicylate*, *Methyl anthranilate*, *Eugenol*, *Cumene*, *Cymene*, *Thymol* etc.

The essential oils are soluble in alcohol, ether, chloroform, carbon disulphide and other organic solvents, including vegetable fats and oils and animal fats. They are insoluble in water and give an emulsion with it when shaken. They are comparatively volatile and leave a stain on paper which disappears on account of the evaporation of the oil when the paper is slightly warmed. This serves as a ready test against adulteration with fixed oils, which permanently stain the paper.

They are very readily acted upon by Nitric acid, even in dilute condition, giving oxidation products, and sometimes resins of a very complex character. This is due to the essential oils being very energetic reducing agents. The sulphuric and the hydrochloric acids have not a very marked action on them. The alkalis have a solvent action on some oils which are of an acid or phenolic nature; the acids or the phenol

form salts with the alkalis, soluble in water. When heated in presence of alkalis, the essential oils are first oxidised and then turn slowly into resins insoluble in alcohol.

The essential oils possess some characteristic physical properties which serve to group all the essential oils together as a group distinct from similar substances. Out of these most important are the Index of refraction, and rotation or circular polarisation.

Specific gravity of the oils is also a characteristic property but there is hardly any perceptible variation, the limits between which it varies for the different oils, being .85 and .95. The Index of Refraction for the greater number of them falls between 1.46 and 1.5. This does not help much in distinguishing the different oils although it can help to know whether an essential oil has been adulterated with a substance other than an essential oil. Solubility in alcohol of different strengths also gives a clue about the purity or adulteration of oils. It is a characteristic property when referred to 70 per cent. alcohol which is the strength much used for this test.

The circular polarisation however reveals the greatest differences among the essential oils in degree and direction of Rotation. But it is doubtful whether this characteristic can be much relied upon for distinguishing essential oils; for it is found that the rotation of different samples of the same essential oil varies considerably and this is not only in the crude state, but even when the operation is conducted on pure specimens.

Nevertheless, it may be possible to avail ourselves of some of these physical characters for detecting the fraudulent mixture of essences. Thus by the addition of the turpentine, a common and cheap adulterant, specific gravity would, in almost all cases, be diminished, and the spectrum shortened, and solubility in alcohol decreased.

The principle of identity of odour and of physical bodies agreeing in chemical composition is far from being absolute. Numerous examples to the contrary could be cited, perhaps the most striking being the group of turpens, which includes, among many, the oils of turpentine, orange, Lemon and Lime. These bodies are isomeric (i.e. have the

same chemical composition, but differ in the arrangements of atoms in the molecule) and possess many physical properties in common, their characteristic difference being in their odour.

The price and the demand for the essential oils either for the use in medicine or for luxury, had degraded the art so much that a manufacturer did not care so much to manufacture a superior type of article as to adulterate the oil in such a way as to be able to pass it as genuine. With this goal, the art went down to such depths of degradation that science had to come for its help. The physical and chemical examination did much in detecting adulteration with the smallest quantities of adulterants having nearly the same properties as the article to be adulterated. The tests applied were the following :—

Physical tests. Specific gravity, solubility in 90 per cent. and 70 per cent. alcohol, Specific Rotation, Index of Refraction.

Chemical Examination. Estimation of the principal constituents, of free alcohols, of total alcohols, of the ester contents and of aldehydes and ketones.

The scientific examination made the adulteration of essential oils difficult at the outset, but gradually the practice of adulteration got a stronger hold by the help of the Science itself. This will look very anomalous at the first sight. An adulteration, practised without any knowledge of the constituents of the article to be adulterated as well as of the adulterant could very easily be detected. But adulteration practised on scientific principles was impossible of detection. This is one of the evils that science brings about along with its triumphs.

The knowledge of chemical composition laid the foundation of the art of manufacture of artificial essential oils. This class includes, truly artificial as well as the so-called artificial oils which are natural oils from which some of the constituents are removed or to which some artificial substances are added. This class may be subdivided into—

1. Truly artificial oils like Jasmine,
2. Those prepared from the Natural Oils by addition of some extraneous constituents,

3. Concentrated Oils.

The oils of the first class *viz* ;—Truly artificial oils are prepared by admixtures of chemical compounds in the proportion in which they are present in the natural oil. The chemical compounds are prepared in the Laboratory and may be from sources other than the essential oils.

The second class consists of natural oils to which some artificial products have been added to make them cheaper and marketable.

The third class of bodies consists of natural oils from which certain constituents have been removed which had neither odoriferous nor any medicinal value.

These oils of the three classes are cheap articles, of uniform strength and composition which latter give the artificial oils an advantage over the natural ones especially in medicine. But there are very few medicinal oils which can be made artificially. We can mention in this category only a very few oils like oils of Cinnamon and Wintergreen.

But when the oils are referred to their odoriferous principles, the artificial oils become absolutely useless to a perfumer. The freshness, delicacy and sweetness of the odour of the flowers which are present in the natural oils are altogether absent in the artificial substitutes.

These coarse artificial oils have displaced the more delicate natural oils, in the same way as the phonograph has driven the finer musical instruments out of use.

In connection with the subject of artificial oils it may be noted here that the difference in the aroma of the natural and artificial oils is due to the absence, in the artificial ones of some unknown and uninvestigated products present in the natural oils. These products are present in such minute quantities that they are not very easily isolated. These products were ignored by the scientists as not being very important as they did not constitute the main aromatic principle in an oil. These products, although not forming the principal aroma, still modify the aroma of the other constituents in such a way as to make it sweet and delicate. This is a case parallel with the case of artificial Indigo which does not contain the other substances present in minute quantities in natural indigo and which impart the brightness and

freshness of color to the natural Indigo. If the scientists had been less presumptuous, there would have been a more rapid progress in the onward march of science.

With all its rapid strides, this art of imitation, the art of manufacturing artificial essential oils is not yet perfect and is not likely to be, until the nature of the substances in the minute quantity is properly investigated.

Now let us ask ourselves the question what is this odour of oils? Is it an imponderable substance or does it imply materiality? It seems that in numerous instances, odour acts as an imponderable agent, rather than physical matter. It is clear that certain oils produce certain odours, but it is not equally definite that the oil in question is itself the odour. We may best understand by viewing the odours as imponderable agents, affecting the nervous system by special vibrations, as colours affect the eye and sound the ear.

We may consider that such vibrations are caused by the chemical action set up by the contact of essences and perfumes with the oxygen of air. It has been possible, indeed, to reduce them to an odourless state by excluding oxygen and volatilising them. The essences thus deprived of their odour, recover it instantaneously on contact with air. Therefore we may conclude that as certain chemical combinations produce electric vibrations, and certain others produce luminous vibrations which affect the optic nerves, the case in question produces some vibrations which affect the olfactory nerve.

If this be the possible explanation how should one account for the fact that some liquids are completely odourless? We may try to explain, that the force of volatility of essences or the rapidity with which they evaporate, would always be in proportion to the velocity of the vibrations produced, or the rapidity with which the odorous waves are propagated. If this velocity were not high enough, there would be no perceptible odour just as twelve vibrations per second will not produce a perceptible sound.

In connection with this, it is needful to note the distinction existing between substances which irritate the nerves of the sense of touch and those which convey the impression of odours to the olfactory nerves. For certain solid substances like snuff and some of the gases like chlorine

or ammonia stimulate the pituitary membrane. The effects produced by these substances are those of a body touched, not of a body smelt. We must not confound the local mechanical action more or less irritating of certain bodies on the pituitary membrane with that of the odours, properly so called, on the nerves of smell.

If we carry the analogy of the vibrations of the sound and colour, we can arrange the different odours in a scale like that of music. Such a scale of odours has been made out by the late Dr. Piesse. It will not be possible to say much on the two theories as the subjects were not investigated further.

The next thing for our consideration is the colour of essential oils. There is not much to be said on this subject too except that the purest essential oils are all more or less colorless, but become colored owing to oxidation or some other changes wrought by the atmosphere.

We may close this part of the subject with a mention of the important uses of the essential oils in the arts, perfumery and medicine. The properties which make them so useful in the arts, and medicine, are their volatility, their slow oxidation in the air, and their power of preventing mouldiness, their solvent action on various resins and gum resins. The number of essential oils that are used in the arts is not very large. Out of them one is oil of Turpentine, which is so largely used in varnishes and paints. It is also used in many other industries.

The principal use of the essential oils is in medicine and perfumery. In the latter, are included practically all the oils having a more or less pleasing smell. The art of perfumery is an art by itself and it will be out of place to go into its details here.

If we just look to the various uses of the essential oils in medicine in the modern times, it will show that the ancients were by no means following merely imaginative or superstitious speculations in their practice of using essential oils or substances yielding essential oils to guard against infection. This property of essential oils as disinfectants is due to the oxidation of the essences which produces a large quantity of ozone, at least as much as is generated by

electricity or phosphorus, the ozone being developed by the direct action of the Sun's rays, and in some cases, whilst this commences in sunlight it continues in the dark. The plants or essential oils which give most ozone are clove and lavender, hyacinth and bergamot.

The oils are administered internally as medicines; some are said to have the action of stimulating the gastric action, and the others have the power to drive off gases from the intestine, and a number of others stop fomentation of food in the stomach and the intestine. This is the province of the Physiologist and may be left for him to investigate.

Professor Tyndall in his investigations states that the absorption of radiant heat by small quantities of Perfumes, when diffused through common air, increases its power of arresting heat to an extraordinary degree; thus the absorptive power of air charged with the perfume of patchouly is 80 times greater than that of pure air; Lavender increases the power to 60 times and the aniseed 372 times the natural amount. Hence the perfume arising from a bed of flowers increases the temperature of the air around them by rendering it more absorptive of radiant solar heat.

When we consider the subject with special reference to India, it will not but rouse the interest of the Indian to think that it was India which fostered this industry in its infancy and that it was India which taught it to other nations. But let us leave the past to itself and see how far it is flourishing in this country at the present time.

The chief centres where the manufacture is carried on on an industrial scale are the United Provinces, Punjab, Khandesh District, Mysore Province and Southern part of Travancore state.

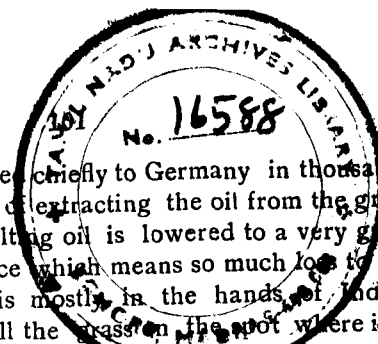
The first two provinces—the U. P. and the Punjab have taken up one branch of the industry, viz. the manufacture chiefly of the essential oils used as perfumes. The climate and the soil of the districts are very congenial for the growth of flowers of which there are extensive gardens. The industry is owned by hereditary families who have kept some of their processes secret. The industry is flourishing satisfactorily in the two provinces and very little needs be said about it here.

The Khandesh District manufactures practically all the

Rosa Oil which is exported chiefly to Germany in thousands of pounds. The method of extracting the oil from the grass is so crude that the resulting oil is lowered to a very great extent in quality and price which means so much loss to the country. The industry is mostly in the hands of Indian Mahommadans who distill the grass on the spot where it is grown, near a place where there is plenty of running water, in small country stills of a very crude type. The grass comes in contact with the heated parts of the stills which are worked by fire, and is consequently charred, and imparts a dirty brown color, and a burnt smell to the naturally fragrant oil. If experienced distillers would form an association to undertake to systematically grow and collect the grass from all parts of the District and to distill it in steam stills of improved type, the industry is sure to take a better turn, and form one of the stable industries of the District as well as of India. The importance of developing the cultivation of the grass by scientific means and improving the distilling processes, will be evident if one cares to know how much of the oil is annually exported to European countries, for being used as such after purification and also for being transformed into other artificial products by chemical means.

Next we come to Mysore Provinces where sandal-wood is distilled for its precious oil. In spite of attempts to improve the industry, the processes are as crude as can be imagined. The distillers purchase the sandal-wood in the auction and proceed to distil it in stills even before the logs are cut into smallest chips. The small logs of wood being distilled directly, (1) one single operation of a charge of wood takes a longer time for distillation, (2) all the available oil is not disengaged and therefore lost with the distilled log-pieces, and (3) the longer time required for each continuous operation necessitates a drying up of water in the still (there being no arrangement to introduce fresh water in the still, the stills being of a crude type), and consequently the oil is deteriorated in quality, the charged wood being charred in contact with the heated parts of the still.

Sandal oil is a commodity useful in arts and medicine, the latter demanding a high purity. The Indian oil, on



account of its low quality, cannot be exported and a large fraction of the total production is consumed in India. The European market imports the raw wood which is distilled in improved steam-stills for better grades of oils.

The improvements therefore in the distilling processes in Mysore and an attempt to take out a superior grade of sandal oil will give an immense advantage to the Indian market and it is the concern of the Indian distillers to see that not a log of Sandal wood is exported and that an oil of a superior quality as required by the Foreign markets is sent out instead.

The manufacture of citronella and Lemongrass oil has been the monopoly of the southern-most provinces of India, chiefly Travancore and Ceylon. In past years the demand for the oil slowly increased, and the decent margin of profit in the industry induced farmers to grow the grasses on cultivated-lands, and gradually the Lemongrass distillation became a home-industry. As the industry thrived, demand for the oil too increased, the oil being used for the manufacture of artificial perfumery products. But the excessive supply brought on a fall in price of the oil. The present low price ruling in the market has practically strangled the industry and the extensive Lemongrass fields and the little stills are fast disappearing, and the Travancorians have already lost their hold on the industry which has wholly passed into the hands of the Ceylonese.

These are not the only essential oils possible of being manufactured in India. There are other substances grown in India and imported from other countries, from which India has every facility and advantage to extract oil. Instances may be given of anethi seeds aniseed, caraway fruit, clove, cubel, Patchonly plant, Rind (from fruits) of the orange family. All these can be profitably worked in India for their essential oils, which will save to India, freight to England on the Raw material and freight back to India on the manufactured oil, and the profit of the manufacturer. The distillation of the above mentioned products does not require even superior manipulative skill, and it will be for their own benefit and the benefit of the motherland that capitalists should come forward and work

out schemes in co-operation with men possessing technical knowledge. This industry has not become so popular as it was expected to be probably owing to the impression that it requires an elaborate type of machinery, while on the other hand, the apparatus is so simple that it can be worked in homes with decent margin of profit.

The essential oils from flowers manufactured in India maintained their superiority as regards the delicacy and sweetness, of their perfume, till recently. But they are slowly giving way to the cheap artificial imitations of the European make, which are freely being imported into India, and for which the demand is increasing every day. The aesthetic nature of the Indians is fast degenerating into the coarse nature of the Westerner. It is to be hoped that every Indian will guard against this in-rush of cheap imitations.

To a chemist, the study of essential oils opens a book as yet unread ; for the industrial chemist, the whole of the vegetable kingdom from which he can hope to separate unknown oils ; for the practical perfumer, an unexplored region of harmony of the odours. To the physicist, the study of essential oils will show that some hypothesis must yet be founded on which he can hope to build up the laws by which different odours act upon the human sensorium, in unison with its other faculties ; but the botanist and the physiologist have the grandest task to perform, that of interpreting the language of flowers and know from them the way in which the perfumes are manufactured in the Laboratories of Nature by the higher Wisdom.

COMMERCIAL POSSIBILITIES OF ERI SILK

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THE NATURE OF THE SILK.

Eri Silk like all other kinds of natural silk is the product of an insect. As the worms which produce mulberry silk or the silk of commerce, feed upon the leaves of mulberry plants, so the worms which produce Eri silk feed

upon the leaves of castor plants. The silk produced by them is called after the vernacular name of the plant, *viz.*, Eri, Arundi or Endi silk. It has been produced practically only in Assam from very ancient times and is therefore commonly known as Assam Silk. A few words about silk generally will give a better idea about the nature of this silk.

For commercial purposes, silk may very conveniently be divided into two classes, *viz.* (1) reeled silk which is known as raw silk and (2) spun or *schappe* silk known as waste in commerce. The insects produce the silk as a fine thread as we see it and arrange it in such a way as to make a case, commonly known as cocoon, for the protection of their future dormant state. Both spun and reeled silks are derived from these cocoons. From some cocoons the silk can be unravelled into a long, continuous, unbroken thread. Such cocoons yield the reeled silk; the process of taking it out is called reeling and the cocoons are styled reelable. When the insects attain the adult state, they burst through the cocoon and thus break the continuity of the thread. Such cocoons are called pierced cocoons. They cannot be reeled. Therefore it is absolutely necessary in the case of all reelable cocoons to stifle the insects inside before they burst through, if it is intended to reel the silk out of them. Sericulture has not therefore been popular amongst Hindus who are averse to taking of life; it is practised by some of the lower classes of the community.

From the other kind of cocoons an unbroken continuous thread cannot be taken out. These are unreelable and if at all any thread is to be got out of them, it is by carding and spinning them on the same principle as cotton. Also such reelable cocoons or such portions of them as cannot be reeled and all pierced cocoons have to be similarly carded and spun. The silk thus obtained is known as spun silk. Before the discovery in Europe of machinery for carding and spinning silk more than half a century ago, all cocoons or portions of cocoons which could not be reeled were looked upon as waste and were called waste silk. In reeling cocoons, their flossy unreelable outer portions are taken out separately and are called silk waste or *chassam*. Although with the

discovery of carding and spinning machinery, waste silk is now utilised in various ways and for various purposes, so that there has been a great demand for this kind of silk, the name of waste silk has still been retained. In India from very ancient times all unreelable silk has been utilised by carding and spinning, like all her ancient industries, in a simple homely way by means of the country spindle known variously as Taku, Takur or Takuri. Eri Silk belongs to this second class of spun silk and has been utilised in this way in Assam from time immemorial. As the cocoons are not reelable and must be carded and then spun, the presence of the insects inside would be a hindrance. They are to be allowed to come out in every case. Therefore there is no taking of life and the most serious objection of Hindus to take to sericulture is thus removed in the case of Eri silk. As there is no life taken in any of the operations for its production, the religious scruples of even the Jains do not forbid its use. Actually by allowing the insects to come out, not the least damage is done to the cocoons. Because the worms when they spin the cocoon leave an opening at one end through which they may emerge when they attain the adult state. There are some kinds of silkworms which have been domesticated from very ancient times, *i. e.*, they are bred, fed and made to spin silk entirely indoors under the control of man. The worms which yield the principal silk of commerce, the mulberry silkworms, fall under this head. On the other hand there are many kinds of silk-producing insects which have defied up to this time all attempts at domestication. These are known as wild silkworms and their silk as wild silk. Eri silk is classed as wild silk, although the worms producing it have been domesticated for centuries to the same extent as the mulberry silkworms. India is specially rich in wild silkworms, some of which yield reeled silk of a superior kind. The most notable are the Tassar and Muga. These are partly domesticated; the moths are hatched and egg-laying controlled in house, the worms being fed in open condition on forest trees. Most of the other wild silk cocoons, some of which are reelable and others unreelable, are gathered from jungle, mostly in the pierced condition. They are utilised as spun silk and a demand has been created for

them with the discovery of carding and spinning machinery. This general description of silk has been considered necessary in order to explain the terms which one meets with in the trade returns.

QUALITIES OF THE SILK.

Eri silk therefore is an unreelable spun silk produced under conditions of complete domestication by worms which feed on castor leaves. It is the best of all kinds of silk obtained from unreelable cocoons, being extremely durable, white, soft, and entirely unaffected by washing or boiling. Its reputation is well established under the name of "Assam Silk" among Europeans and under that of Eri or Endi or Arundi among Indians in all the Provinces. In India two other kinds of waste silk are used in the same way as Eri, *i. e.*, they are spun with hands by means of the Taku into a kind of thick thread and a thick cloth made, the cloth being used as *Dhotis*, *Chadars* or winter wrappers or made into suits. Of mulberry silk, the chassam is almost entirely exported to Europe for use in Carderies there; the inner unreelable remnants of the cocoons and all the pierced cocoons obtained in breeding operations are spun into a thick thread known as *Matka*. Of Tassar, the Chassam and pierced cocoons are exported to a great extent and a portion of them is spun into a thick coarse thread known as *Kethe*. The use of matka is extensive as it is easily procurable; that of eri is less as it is not easily procurable and that of kethe is much less as its dull copperish-brown colour is against it and also because so much skill is not brought to bear on its production as on matka. Much skill is not noticeable in the production of eri too. But eri is stronger, softer, more durable and more silky-looking than either of the other two and it improves with use, assuming a not very glossy cream colour which is very much liked. It is very much in demand for use in the hot weather and the supply has not been equal to the demand. Consequently a kind of thick cloth made of matka threads which was placed in the market sometime back as imitation Eri found a ready sale. More recently it was found that a kind of cloth made with thick cotton warp and eri weft and

placed in the market in Behar as Eri cloth also secured a ready sale. What testifies to the popularity and demand for eri cloth more strikingly is a fact which came under the notice of the writer only lately that pure mulberry silk cloth is offered for sale and bought by people as *arundi* cloth. A gentleman at Calcutta showed two pieces of chadar which he had purchased as Arundi chadars in Ghatal in the Midnapur District in Bengal. They proved to be white reeled mulberry silk cloths woven as twill. The silk was apparently the production of a mulberry feeding silkworm known locally as *Bulu*. Besides its consumption in this way in India, Eri cocoons are much in demand for use in silk-spinning mills in European countries as well as in India. But as they are not procurable in large quantities practically no spinning of eri is done in mills even in India. All mills would gladly purchase eri cocoons if offered in large quantities and this is a case in which the supply will create and enhance the demand. Messrs. Lister & Co., the famous silk spinning establishment in England, made several attempts to procure Eri cocoons in large quantities from Assam but were not successful. According to the late Mr. N. G. Mukerji, the proprietors of a big Carderie of Milan in Italy are anxious to purchase white eri cocoons. In India the silk spinning mills do not use eri cocoons because they do not get sufficient quantities to engage them. One mill which was approached is willing to purchase any amount of them if offered in lots of 300—500 lbs. Sir George Watt while visiting a silk-mill in Bombay noticed that it was spinning waste cocoons imported from China which proved to be those of Chinese Tassar and another worm which is said to be the wild form of the Eri of Assam. This wild eri occurs throughout the base of the Himalayas. No attempts are made to rear it. It produces a brown silk which cannot compare with white eri cocoons in the market. Thus it would seem that for want of a proper supply of waste silk from India, the mills in India are compelled to import foreign inferior cocoons and spin them.

Any one interested will find in the silk section of the present exhibition, the beautiful kind of yarn which can be

produced in mills in India from eri cocoons and also the cloth woven on handlooms from that yarn. In this connection one incident may be quoted as interesting. At present the idea associated with eri cloth is that of coarseness and thickness. The beautiful finish of the mill yarn and cloth is new to it. Therefore in a recent silk exhibition in Berhampore which is the centre of silk in Bengal, the judges refused to believe the mill-spun eri yarn as endi thread or the cloth from that as endi cloth. This yarn was produced by the Chhoi Silk Mills Co., Bombay, from eri cocoons supplied from Pusa.

As mentioned above, eri cloth is produced in Assam for certain purposes in ways prevalent for centuries. With more skill employed in its production and with all its peculiar natural qualities to recommend it, eri silk promises to come into use for various purposes, e. g., ladies' dress, table cloths, purdahs, etc. The yarn and the cloth require to be altered in their make in order to suit the different purposes.

AS A HOME INDUSTRY.

Eri silk is pre-eminently suited for a home or cottage industry in all its operations and is within the means of even the very poor man. It is not difficult to grow castor and the homestead lands can be utilised for growing it. For feeding the worms, one can use the leaves which would either fall away and be wasted or be fed to cattle. The plants are not generally injured and yield about the usual quantity of seeds. The silk can therefore be produced with spare leaves and with some attention paid to it in the leisure hours. The cocoons thus produced can be spun at home by the female members of the family on the ordinary Indian spinning wheel or spindle, viz., the charka or taku. The thread can be had woven by the ordinary village weavers on their ordinary looms. The resultant cloth is the famous Assam Silk or Endi Silk, absolutely pure. It can either be sold or used by the family. In Assam all the operations from rearing the silk to weaving are performed by the female members of the family in their leisure hours. The time devoted to it is by all means remunerative, if not profitable. It must be remembered that sometimes the

members of a cultivator's family do not know how to engage their time which they pass idly. They can devote their time to this silk and it does not involve a prohibitive initial outlay.

CONDITIONS UNDER WHICH IT IS CARRIED ON IN ASSAM.

Assam is the home of Eri silk which has been carried on there as a home industry for centuries. The silk is also produced in some of the eastern districts of Eastern Bengal. The rearing and production of cocoons is done only by low class people, the higher caste Hindus considering the work unclean. Each family rears a small lot of worms, in most cases sufficient only for what it may require to use. When a quantity of cocoons accumulates, they are boiled, spun into thread and woven into cloth by the female members of the house in their leisure hours. There are professional spinners also who are usually very old women unable to do any other work. They spin for payment, the raw stuff being supplied by the family. One may see the male members of the family going about on business and spinning thread while walking. The weaving is done always by the female members. As regards the remuneration, I may better quote the late Mr. N. G. Mukerji: He says "Women of the cultivating class do the rearing of Eri worms, spinning of thread or weaving of cloth in their leisure hours, with the main idea of paying off the Mahajan's debts. This kind of work as it goes on with ordinary domestic duties, is never felt hard by the women and whatever they get in return for it, they look upon as pure profit. After a whole year, a woman produces only about Rs. 10 or Rs. 12 worth of cocoons, thread or cloth, but they do not look upon this as loss."

LOCAL TRADE IN THE PRODUCING AREA.

As each family supplies its own wants, there is no local demand. A small local trade both in yarn and cloth exists with the hill tribes, Bhutias and others. The Mahajans who are usually Marwari traders and shopkeepers, secure a quantity of cloth which is exported to the Calcutta market. There is a small trade in cocoons with Calcutta whence they are exported to England. As regards its position in the place of

production, it is reported that the cheap Manchester goods are supplanting it as it is very costly. It is also reported that eri cloth is more difficult to be procured locally than at Calcutta, evidently because the major portion of what is produced and spared finds its way to Calcutta and other places. The writer knows from experience that the people of the interior places in Bengal procure endi cloths only through friends and acquaintances in Assam.

EARLY ATTEMPTS AT PRODUCING ERI COCOONS ON COMMERCIAL SCALE.

When carding and spinning machines came into use in Europe about the middle of the last century, all sources which promised a supply of the raw material attracted attention. One merchant engaged in the manufacture of spun silk stated that "wild silk cocoons should be found somewhere in India in the pierced condition, i.e., from which the moths have cut out. This is what I want. I do not wish to wind such silk but spin it into fine thread." "Eri I like best for its whiteness." At this time eri silk received its share of attention and several attempts were made in Assam mainly at the instance of Messrs. Lister & Co., to produce eri cocoons in large quantities by paid labour. In 1873, Messrs. Lister & Co.'s agent visited Assam specially for the purpose but he desisted from any actual attempt on account of the difficulty and expense of procuring labour. In 1884, the same company gave £300 to the then Director of Agriculture, Assam, to purchase cocoons, but the price offered, viz., Rs. 50 per maund of empty cocoons was found too low. Between 1885 and 1888, several attempts were made at rearing cocoons on a large scale by private tea-planters and by the Deputy Commissioner of Kamrup. But they were either not successful or the attempt had to be given up on account of accidental causes; thus for instance one plantation of castor was washed away; the leaves in another plantation were wholly eaten and destroyed by a horde of insects from the contiguous jungles. The last of the attempts was made in 1888 and since then none other has been made although it has been held by some who devoted much attention to the subject, that there

was money to be made out of it. The experiments did not definitely prove anything. The remarks made by Mr. A. C. Campbell, the Deputy Commissioner of Kamrup, after two experimental rearings are worth some consideration; they show that he understood how the rearing of silkworms should be done and what the causes of failure of those experiments were. He said that the only way of developing the industry was by getting the villagers over large tracts of country to undertake the cultivation in small patches so as to avoid epidemics. He advocated a system by which the capitalist would cultivate castor and allow the leaves to be used by the villagers for rearing the worms and then purchase the cocoons at a certain price.

EARLY ATTEMPTS TO INTRODUCE IT INTO SOME OTHER PARTS OF INDIA.

The only attempts to introduce Eri silk into other parts of India were made in the United Provinces. In 1894, the Department of Land Records and Agriculture introduced eri worms and reared them in the Government Farm at Cawnpore. At first the worms thrived well but the hot weather of 1895 brought disaster and the worms perished. A fresh supply was obtained but was found unhealthy and the experiment was given up in 1896. Contemporaneously with this experiment, the Educational Department of the same Province tried to introduce the culture of eri silk in the village schools. The object stated was this. "The care of silkworms will be to village school-boys, an interesting occupation outside school-work, an object lesson for the education of the faculty of observation, a training in thoughtfulness and in punctual attention to daily recurring details, and it may be in the end remunerative, if not lucrative, as a village industry." This attempt was also given up evidently for the same reason. It would have been a very good thing if the experiment had been continued. In the same Province, Eri silk was tried in the Hon. Raja Rampal Singh's estate in Pertabgarh District and a very hopeful view was taken of this trial by the late Mr. N. G. Mukerji in 1898. Eri silk cloths were being woven which it was computed by Mr. Mukerji, would fetch as much as

Rs. 15 per piece and this was considered by him to be a decent price. He then stated that eri silk rearing was beyond the experimental stage and advocated attempts to get worms reared and silk spun by tenants. Mr. Yusuf Ali wrote in 1900 that the experiment was still being tried ; but nothing has been heard of it of late.

EXPERIMENTS AT PUSA AND THE RESULT.

Next we come to the attempts made in Pusa. It was in March 1907 that about a dozen cocoons were brought from Kamrup in Assam. A number of worms was bred from the moths which came out of those cocoons and as the breeding proved successful, it was intended to give the silk a trial in Behar. The experiment has been continued at Pusa up to this time and has been instrumental in introducing this silk almost into every part of India. It has been proved that eri silk can be grown well in all places where the temperature ranges between 60° and 90° F. and the humidity from 70 per cent. to 90 per cent. or more. A temperature going down below 60° F. up to 50° F. or going up beyond 90° F. up to 100° F. is not forbidding. In Assam, the silk is grown principally from October to March; in the rains castor does not thrive there, rendering rearing on a large scale impossible ; the climate however is no bar. In Lower Bengal, it can be grown throughout the year. In Behar, the worms thrive from June to November, are slow in winter and can hardly stand the hot winds in March, April and May except through care and artificial moisture. In the United Provinces, the worms will grow from July to November and will be very slow in winter, and it is better to stop rearing in the hot weather months. In most parts of the Punjab and Rajputana, the periods of the cold and hot weathers are prolonged and eri silk cultivation will not be satisfactory. A great portion of the Central Provinces will be suitable. In the Deccan, it is possible except in the hot period. Gujarat, the West Coast and Malabar and most of Southern India generally are suitable almost throughout the year.

The experiment at Pusa has been fruitful in other ways. A machine has been invented for cleaning the cocoons

after the adult insects are allowed to go out of them. Therefore it is possible to get cocoons entirely free from dirt and dead insects and it saves waste in spinning. Also the cleaned cocoons are more readily saleable, as the purchasers are then sure of getting the pure silk. Another machine has been worked out for spinning the cocoons with hand into thread. It is a great improvement over the old method of spinning with taku and is of great use besides, in spinning matka and kethe and such other fibres as flax, etc. Both the above machines are shown at work in the present exhibition (Allahabad). Another notable result of the efforts made at Pusa is the trial of this silk for the first time in India in the spinning mills and the trial has been highly satisfactory. One has only to examine the millspun yarn and the cloth to realise this. It will be of immense help in bringing out clearly the possible uses of this silk. One fact in connection with the Pusa experiment which demands a special notice is the rapidity with which the cultivation of Eri silk spread in the interior of Behar. In the remote villages small cultivators, jolhas and other small professional men such as shoemakers and even day labourers took it up on a small scale. This was evidently due to the reason that eggs were procurable without any difficulty. It demonstrated one very important aspect of this silk, *viz.*, that the cocoons can be reared without any difficulty by men who never have seen any rearing before.

At present the diseases to which the Eri silkworms are liable are engaging the attention of the Imperial Experts at Pusa. Help has all along been and will be given to all who want to try this silk. At the same time efforts are being directed towards finding out the full possibilities of the silk which will help the trade and also the best market for it so that the producer may get the best value.

PRESENT CONDITION.

At the present time Eri silk is being produced through the instrumentality of Pusa, in almost all the Provinces, but mostly in the form of experiments. Still some have produced cocoons in large quantities. All who have taken to rearing this silk have done so with the idea of producing it on a

large scale with paid labour. These are however not the right lines in which to proceed not only in Eri silk but all silks generally. Sericulture is essentially a home industry and is best practised as a subsidiary pursuit of a family. In India, those members of the cultivators' family who do not help in the agricultural field-operations, can do the tending of the silkworms in the midst of the household duties. This is specially suitable where the purdah system prevails and does not allow the female members to work out of doors. Each family can rear a small lot of worms and the result is most successful, when sericulture is based on such small rearings. In the case of rearing on a big scale by paid labour, the worms do not get as much care and hence the result is almost always unsatisfactory. As a result of the spread of eri silk in almost all the parts of India, eggs are now procurable at all times without any difficulty. This is specially of value as all places are not suitable for rearing the silk throughout the year. It may be necessary to stop rearing for some time owing to unfavourable climatic conditions and commence again in the proper season. In such cases the ready availability of the seed is specially desirable.

The question of the cultivation of this silk is now beyond the experimental stage and it should be taken up whenever practicable. The question now is how it can be best produced. The following methods of production suggest themselves :

I. As already pointed out, eri silk is best suited for a home or cottage industry. The members of a cultivator's family can in their leisure hours produce the silk, spin it into thread and prepare cloth. The work is quite easy when once understood. But practically at present it is possible only in Assam where the industry has been practised for centuries and where all the operations for production are matters of common knowledge among the people. In Behar, it has been seen that out of curiosity people began to rear the worms without being asked, as they had castor ready grown and obtained eggs without difficulty. They continued to rear for sometime and when a quantity of cocoons accumulated, they did not know what to do with the cocoons and therefore gave up rearing, as they could neither sell the

cocoons for want of ready customers nor utilise them for want of proper knowledge. In Assam, on the other hand, the industry is established and cocoons, thread, eggs or cloth are sold in the local *hats* or market places. Many families who do not rear the worms, purchase cocoons and then do the spinning and weaving. The processes of rearing, spinning and weaving are demonstrated in the Silk Section of the present (Allahabad) exhibition and are fully described in a pamphlet. Any one interested will do well to visit that section and read the pamphlet.

II. In the absence of the facilities which exist in Assam, the people in other Provinces can simply rear the cocoons and get sufficient remuneration by selling them. The best method would be for the small producers of cocoons to join together and offer their produce in lots of 400 or 500 lbs. to the mills. Such big lots will find a ready sale and will save unnecessary expenditure incurred for the carriage of small lots, while the producers themselves will be able to keep the profits which would go to the middleman. It may be questioned whether such organisation is possible among the people. But the idea of joining together either to make purchases or effect sales is not new to the people, although such transactions are seen to be resorted to but rarely and only in small affairs. If one goes to the village market-places or *hats*, he will notice groups of customers buying up vegetables by basketfuls and then distributing them according to the shares then and there. The seller lets his things go on easier terms as he disposes of them at once and can go away and mind other affairs. In villages it is not an uncommon thing to see several joining together and purchasing a property which would be beyond the means of a single individual. It is true that such combination is noticeable more for making purchases than for sales ; but this latter too is not entirely rare. Therefore wherever it is intended to introduce the cultivation of this silk, the idea and usefulness of such combination should be infused into the minds of the rearers at the same time. They can jointly purchase a cocoon-cleaning machine and use it for cleaning their small lots of cocoons as they are produced. When a sufficient quantity accumulates they can be packed and sent

to the mills. At the present time the price of clean cocoons in India is annas 14 per lb., and a French firm is offering to purchase any quantity at Re.1 per lb.; and it is hoped that the price in India may be raised and fixed at Rs. 1 per lb. If the production of cocoons can be organised in this method, it will not only be remunerative but profitable.

III. The third method of production counts upon centralised combination in the person of the capitalist. A landowner with some capital and influence can get cocoons reared by the families of his ryots or others for remuneration and can sell them in big lots to the mills thus making a profit for himself. He need not keep any establishment of his own. He can purchase some eggs in the first instance and get them reared in a family. In the next generation he will have plenty of eggs from his own moths and can distribute them to a number of families who will rear the worms. He will then purchase the cocoons for a certain price. He can himself have some cheap cleaning machines and ask the rearers to clean their cocoons on his own machines before he purchases them. The rearers will be satisfied at their cocoons being instantly sold and the remuneration will be looked upon as a gain, as the work will be done in spare time for which there is no occupation; also the worms will be fed with leaves which are ordinarily wasted. Many families will soon begin to rear when they will find that they can dispose of their cocoons quickly. This seems to be the only method by which the cultivation of Eri silk can be made popular. Wherever practicable, trials on this method should be made.

IV. The fourth method of production is only a step further than the third. Instead of selling the cocoons, the capitalist can get them spun into thread, not by engaging paid labour but by the families of his ryots and others for payment. Then the thread can be got woven by local weavers also for payment. By this means he will provide engagement to many people for the time which is wasted for want of an occupation. When one takes up this method of production, he should study the market for which he will produce the cloth. Because the same kind of cloth is not in demand in different places. He will have no difficulty in disposing of his produce

if he can accommodate himself to the particular demands; because pure eri silk is rather a rarity in most places. The price obtained leaves a good margin of profit after paying for the expenses of production.

KASSI SILKS.

Lately a rival of eri silk has come into the market in the name of Kassi Silks. Most people think that this silk is produced in Kassi, *i. e.*, Benares, and is therefore a purely indigenous article. They do not know that the finished yarn or the thread is imported from European countries, mainly Italy and Germany and only woven into cloth in Benares. It is usually not a pure silk but is either vegetable fibre or artificial silk. It has come into extensive use for purposes for which eri silk is most suitable; while in durability, softness and wear, eri silk is far superior. The popularity of kassi silks is another proof that the possibilities of eri silk are very great. Eri silk requires being worked up.

THE PROBABLE ULTIMATE RESULT OF THE INTRODUCTION OF ERI SILK.

As has been already pointed out, the cultivation of eri silk is much easier than that of the mulberry silk; but it affords a valuable practical training in sericulture. Therefore it is quite possible that it will pave the way for the introduction of the mulberry silk. The efforts made in the past, mainly at the expense of Government, for introducing sericulture in the various Provinces ended in failures and one of the reasons was a want of knowledge on the part of the people in the delicate art. Eri silk will supply that knowledge.

A GLANCE AT THE SILK TRADE OF INDIA.

Every well-wisher of India who comes to consider any of the silks capable of being produced in India deplors the low condition of her silk industry. There is considerable difference of opinion as to whether this industry is going down or progressing. Leaving this question aside, if one looks at the bare facts of trade, he comes to a conclusion which is anything but promising. At the present time, India

exports every year raw silk to the value of about Rs. 55 lacs and silk goods of the value of about Rs. 12 lacs ; while the yearly import of the former amounts in value to more than one crore of rupees and of the latter to more than Rs. 2½ crores. In India, the raw material can be produced in sufficient quantities not only to meet her own demand but for export, if only organised efforts are made. But the import of the raw material is increasing year by year, while the export is decreasing. The first export of the reeled silk from India was made in the year 1772 and it flourished till the end of the 18th century. Then a better silk began to be produced in European countries and also the help of the East India Company which contributed largely to improving the prospects, was withdrawn. But still the demand for reeled silk rose considerably ; but that for the Indian stuff declined. In 1867-68 the value of the export of raw silk was Rs. 155 lacs ; but by 1880-81 it came down to Rs. 55 lacs and it has stood at that figure more or less. Thus it is seen that a great deal more raw silk is imported than exported and there is ample scope for producing it simply in order to meet the home demand. At present as has always been the case, Bengal is the chief producing centre. But the many brooded varieties, which are reared there, yield a very inferior kind of silk. If any efforts are made at producing the raw material in extended localities the brooded varieties of Europe and Japan should always be given preference. These varieties pass about ten months of the year as eggs which can therefore by means of the application of cold, be made to hatch either in early or late winter and the worms reared in many parts of the country. Then again there is no want of skilled labour and the saris and cloths produced by the Indian weavers are in no way inferior to the finished productions of Europe or Japan. But at present silk piece goods from Europe and lately specially from Japan have flooded the market.

Lately, as in many other things, Japan has made wonderful progress in sericulture. Sericulture there, as it is in all places wherever it flourishes and as it ought to be, is only a subsidiary occupation of the farmer. The farmers there are possessors of only small areas of land like the majority of

the peasants of India ; 55 per cent. of the agricultural families cultivate less than 2 acres each, 30 per cent. cultivate from 2 to a little less than 3¼ acres and the remaining 15 per cent. 3¼ acres or more. The vast silk trade of Japan which is making rapid progress, is therefore based on the efforts of these small farmers, directed to what is only a secondary pursuit of the family. The secret of her success is organisation. It is true that the Government encourages the industry in every possible way by providing sericultural Institutes and instruction at State expense and grant of subsidies for mulberry cultivation etc. But the people themselves make considerable efforts. There are hundreds of associations for the improvement of the industry. The Sericultural Association of Japan has got 60,000 members and branches in every part of the country. Its functions are :

1. Making investigations and researches regarding sericulture.
2. Making in case of necessity petitions to the Government on behalf of the sericulturists.
3. Giving answers to queries concerning sericulture propounded by the Government officers in charge.
4. Giving answers to queries concerning sericulture from the general public.
5. Making efforts for the expansion of the market for Japan silk.
6. Forming connections with Sericultural Associations abroad.
7. Investigations of the services rendered by sericulturists and their recognition.
8. Opening competitive exhibitions of sericultural products, implements and apparatus.
9. Giving lectures and instructions in sericulture.
10. The compiling and translation of books on sericulture to be distributed among the members.
11. The publication of monthly reports to be distributed among the members.

12. The publication of a series of lectures on sericulture for the benefit of those interested in the industry.

13. Making efforts for the development of the co-operative work concerning sericulture.

14. Introduction and supply of teachers and experts in sericulture.

15. Giving encouragement to the growth of this industry by every possible means.

There is a second association with 40,000 members and 2400 trained men ; a third with 36,000 members and 8200 trained men. There are egg-producers' Guilds, rearers' Guilds, raw silk Guilds, Sericultural, Co-operative Societies and numerous other Societies, all for the improvement of the industry. As a result of the organised efforts of all these, the industry is progressing in immense proportions.

At the present time what is specially wanted in India is organisation among rearers, reelers and weavers, *i. e.*, among all engaged in the different branches of the industry. All should try to improve the means and methods of production ; sericultural knowledge should be spread. In the absence of intelligent combination among the illiterate rearers, reelers and weavers, there is enough scope for work for educated men who can command some capital, who can study the progress of the industry in other countries and who can imitate and introduce better and improved methods. In their efforts the Government can be reasonably expected to help them. In fact the Government has always taken and still takes a great interest in the silk industry of the country.

Volumes can be written on this subject. Every patriotic man should think of it seriously. It will go a great way to solve the problem of the poverty of the people or at least to ameliorate them to a great extent. At the same time it may provide occupation to many who have received some education and who only look forward to service to maintain themselves.

PROGRESS IN IRRIGATION BY PUMPING IN MADRAS.

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Although I have brought the subject of Lift Irrigation before this Industrial Conference on two previous occasions, I hardly think that any apology is necessary for referring to it again as, to the agricultural classes, it is a matter of supreme importance. There are over 16,000,000 acres under well irrigation and the total amount of power employed in lifting the water is very large. Moreover wells are not the only source of water-supply which can be utilised in this way. Evidence of this may best be seen in the Kistna district of the Madras Presidency where 50,000 acres of the island of Divi are irrigated by pumping from the Kistna river, between three and four thousand acres are irrigated in a similar way round the margin of the Koliar lake and finally nearly two thousand acres are irrigated by lifting water from the delta canals to lands situated above the levels commanded by direct flow. It was only in 1892 that I started lift irrigation in this district with a small portable engine and a centrifugal pump and, though at first it did not make much progress, yet chiefly through the efforts of Mr. R. N. H. Reid of the Public Works Department it has ultimately caught on and, large as the area is that is already supplied by lift, it is likely to be greatly extended in the future. Elsewhere in India there is no similar development although in certain other districts of Madras, such as South Arcot and Chingleput, the oil engine and pump is quite a familiar adjunct to cultivation. In these matters we are still in the infantile stage and progress is slow, but there has been no set-back, and the record of the past two years is satisfactory enough to justify confidence in future development at a more rapid pace.

The object of the present paper is to put on record what has actually been done and to suggest the directions in which progress on the engineering side of the question is likely to facilitate extensions.

Apart from the experiments in the Kistna in 1892-93 and

subsequent years, in which steam engines were employed, the first attempt to use oil engines was made in 1902, and the following statement shows the progress that has been made since that date :—

STATEMENT NO. 1 *

Number of oil engine pumping plants erected

Year.	Government Installations.	Private Installations with Government aid.	Private Installations without Government aid.
1902-03	1	...	...
1904-05	7	3	...
1905-06	3	18	7
1906-07	...	21	...
1907-08	2	38	9
1908-09	...	51	11
1909-10	..	33	28
1910-11 (April to November, seven months.) ...	...	14	Not available.
Total ...	13	178	55
246			

This statement is complete so far as the work undertaken with Government assistance is concerned, but it is certain that we have not a complete record of the private pumping installations erected without any such assistance, and it may be taken as practically certain that, at the present time, there are more than 250 engines and pumps lifting water from wells, channels, canals, tanks, lakes and rivers for the irrigation of dry lands.

Statement No. 2 furnishes information as to the size of

* The Divi Island irrigation is not included as that is a Major Irrigation Work constructed by the Madras Public Works Department.

the pumps in the case of 211 installations, from which it will be seen that half of them are centrifugal pumps with the suction pipe 4" in diameter. This statement also gives the normal lifting capacity of each size of pump, and from this it is easy to calculate that the 211 pumps are capable of lifting nearly 8,000,000 gallons of water per hour. Applying this average to the whole 250 pumps, the total capacity will be 9.25 million gallons per hour, equivalent to a flow of 411 c. ft. per second.

STATEMENT NO. 2.

Centrifugal Pumps

Year.	Diameter of suction pipe of pump in inches.									
	2"	3"	4"	5"	6"	8"	10"	12"	16"	22"
Discharge of pumps in gallons per minute	80	184	325	510	730	1,300	2,000	2,930	5,200	7,500
Average area irrigated by each pump in acres.	5	15	20	36	40	100	230	300	...	...
1902-03	1	9	9	3	1	...	1	1	...	...
1905-06	...	10	4	...	4	1	1	...	...	...
1906-07	...	6	20	5	2	...	3	0	...	...
1907-08	...	10	39	8	...	4	...	2	2	1
1908-09	1	11	26	2	2	...	2	1	...	...
1909-10	...	8	6	2	...	...	2	...	...	...
1910-11	...	...	...	...	...	...	...	...	...	...
Total number of pumps.	2	49	104	20	9	5	9	4	2	1
Total area irrigated.	10	735	2,080	720	360	500	2,070	1,200	600	350

It will be noticed that the areas irrigated by the larger pumps are smaller than the capacity of the pumps would seem to warrant and the reason is chiefly due to bad engineering, as these larger pumps were all put up by firms with no previous experience of the work and in most cases such plant was supplied as happened to be in stock in the country. It will be also noticed that the duty of water under

the pumps is comparatively small chiefly because many of them are only run for a few hours in the course of the day ; in some cases because there is not a sufficient supply of water, in others because the owner of the pump has not enough land to fully utilise his water-supply. The sale of surplus water by the owners of pumping installations to neighbouring cultivators is becoming a common practice and will probably greatly extend in the future. This practice will greatly increase the duty obtained from the pumps.

From the data given in the above table, I estimate that the probable area under irrigation at the present time is about 12,000 acres and from the accounts available for a large number of installations that the capital outlay expended on the same amounts to approximately 7,00,000 of rupees. The actual cost of irrigation depends on a large number of factors which vary with almost every installation. It has been carefully worked out for a number of typical installations, and applying the figures obtained to the whole area under cultivation, we find that it amounts to approximately Rs. 30 per acre per annum or about Rs. 3,60,000 for the whole area.

In 223 cases, the total horse-power of the engines is 2,138 and the great majority of these are worked with liquid fuel, of which the monthly consumption is now about 45,000 gallons.

The publication of the results of our work in Southern India has drawn the attention of engineers in England to the immense possibilities of the development of this method of irrigation and most of the large firms engaged in the manufacture of oil and gas engines and pumping machinery are anxious to do what they can to meet our requirements. The Allahabad Exhibition will to some extent show what steps have been taken to open up the Indian market. Up to the present time, we have mainly employed oil engine working with liquid fuel, which is the residue left after the distillation of the crude petroleum is complete, but quite recently, we have employed suction gas plants and gas engines which can be worked very satisfactorily with charcoal, and we are now able to obtain plants of about 80 h.-p. and upwards which

will work extremely well with dry wood. It is of considerable importance to develop as far as possible suction gas plants working with the supply of fuel which can be obtained locally rather than be dependent on kerosine oil or liquid fuel which can only be obtained from a distance. There is not a single case of a steam engine lifting water for irrigation in the South of India, partly because the price of coal is so high that it cannot compete when used in steam engines with liquid fuel or suction gas in internal combustion engines, and partly because internal combustion engines do not come under the Steam Boilers Act and they can be safely left in charge of comparatively unskilled men. It is only when coal is very cheap, as is the case in some parts of Northern India, that steam engines can hope to compete with oil or gas engines for small power stations. In the case of large installations the possibilities of using coal and steam are somewhat greater, but even that is not likely to be so far long as the future belongs wholly to the internal combustion engine.

It should be remembered that irrigation by pumping has made enormous progress in many parts of the world, notably in the Western and Southern States of America, in Egypt and in Palestine, and competition among the engineering firms to supply the machinery employed has led to material improvements in the efficiency of pumps. At the same time, equal or even greater strides have been made in reducing the fuel consumption of the prime-movers whether worked by steam, gas or oil. Finally, it seems likely that pumping, at any rate, on a large scale will be entirely revolutionised by the recent inventions of Mr. H. A. Humphrey who, in what may be termed a gas pump, has successfully combined both engine and pump and practically eliminated the moving parts with their wear and tear and necessity for lubrication. In a recent paper which Mr. Humphrey read before the Manchester Association of Engineers, he defines his system of pumping as follows :—"A method of raising or forcing liquid which consists in applying the energy of expansion of an ignited combustible mixture to one end of a column of liquid so as to propel the column along a discharge pipe, and to cause it to oscillate in the pipe under such conditions of energy of the

moving liquid, that everything necessary for the next ignition is performed during one or more oscillations and wholly or partly owing to it or them." This is highly technical language and savours somewhat of a patent specification. I do not however propose to describe the pump in any detail, as I understand there will be one working in the exhibition and the extreme simplicity of the machine itself can be best appreciated by a personal inspection of its working. Some-time must necessarily elapse before it can be adapted to the very varied conditions under which pumps are working in India, but it seems to me certain that it will eventually come into general use. The construction of the pump itself is quite simple and the work can easily be undertaken in this country. This is a matter of very great importance, as the development of lift irrigation will in course of time create a demand for a very large number of pumps and it is well that the construction of these should be within the mechanical resources of the country. It seems to me that we are now within sight of a power driven water lift which will involve so small an initial outlay and be so economical in working that it will almost entirely supersede cattle power. Whether the solution will come from a development of the gas pump or whether by improvements of older methods of lifting water remains to be seen.

In the latter direction, we have recently made some progress in Madras by modifying the construction of the common lift pump so as to permit it to be worked with a loose fitting tubular piston. This pump was in the first instance designed for lifting water from bore holes and in that form consists simply of lengths of gas piping screwed together to reach to any required depth. At the lower end is fixed a valve which opens upwards. The piston consists of a length of gas piping which may be from 1' to 10' long depending upon the height to which water has to be lifted. At either the top or the bottom end of this gas pipe a valve opening upward is fixed. The piston is worked by a wire rope, power being used to draw it up, whilst the downward strokes are made by gravity acting on its own weight. The results obtained on tests with bore holes were very satisfactory and larger pumps have now been constructed which can be

worked either by men applying their weight to set in motion an oscillating platform or by a small oil engine driving through a reducing gear, a crank arm to which the end of the rope can be attached. It is recognised that the pump is only suitable for dealing with comparatively small quantities of water, generally less than that which can be lifted by a 3-inch centrifugal pump.

A single piston pump made of gas pipes 6 inches in diameter and fitted with a loose piston 18 inches long worked easily at 50 strokes a minute, the length of the stroke being 18 inches and delivered 75 gallons of water on a lift of 15 feet. This is equivalent to about one-third of a horse-power in the water lifted. The power absorbed could not be measured but it was probably not much more than half a horse-power. That the efficiency is very high is evident from the following experiments:—A pump made out of a 4-inch gas pipe was worked by a man weighing 110 lb. treading on an oscillating platform. The stroke of the pump was about $2\frac{1}{2}$ feet and he was able to make 20 strokes a minute lifting a gallon at each stroke to a height of 15 feet. This is equivalent to 180,000 foot lb. of effective work per hour. This figure divided by the weight of the man, 110 lb., gives a "co-efficient of utility" of 1,636. Similar experiments * with a picottah on a lift of $14\frac{1}{2}$ feet yielded a co-efficient of 1,191.

When an engine is employed to drive the lift it is conveniently made of two pipes and the pistons are thus connected by wire ropes to two crank pins on the same shaft separated by an angle of 180 degrees. The pistons may then be made heavy so as to descend rapidly and as one piston is descending whilst the other is ascending any excess weight in the descending piston over that required to cause the down stroke is utilised to assist the rising piston. That is to say the double lift is completely balanced. The same result is obtained with the platform lift by adjusting the balance weight at the outer end of the platform to cause it to rise at a convenient speed to the man or men employed in working it. The pump is extremely simple in construction the only working parts being the two valves

*Vide "Lift Irrigation" By A. Chatterton, Madras Natesan & Co., 1906.

and the pulley over which the wire rope passes into the pipe. This pulley is the only part of the pump requiring lubrication and as it only moves at a slow speed the wear and tear is negligible and it should last for many years. The valves employed are leather flap valves which will doubtless wear but they can be repaired by any country blacksmith and experiments are in progress to ascertain how long they will last and whether there is any advantage in adopting metal hinged valves or valves of the poppet type. The latter will be more expensive and it seems hardly likely that it will be worth while to fit them.

An oil engine or electro-motor of two horse-power will suffice to drive a double 6-inch pump on a lift of 25 feet discharging about 150 gallons of water per minute. Our experience with centrifugal pumps is that anything smaller than a 3-inch pump is very uneconomical and our present practice is to provide a 5 horse-power oil engine to drive the pump on a 25-foot lift, the discharge being 180—190 gallons per minute. The efficiency of the pump is generally slightly over 40 per cent. and the brake horse-power actually generated in the engine is slightly over three horse-power. Such a plant installed costs seldom less than Rs. 1,800, whilst a double 6-inch pump driven by a 2 horse-power oil engine will cost not more than Rs. 1,000.

The development of mechanical methods of lift irrigation depends upon our ability to provide a machine capable of dealing with the quantity of water available and in by far the great majority of sources of water-supply the quantity that can be obtained is very much less than can be dealt with by a 3-inch pump. This new water-lift provides a very efficient means of dealing with smaller quantities. By manual labour from 500 to 2,000 gallons per hour can be raised by a single man, the quantity depending on the height to which the water is raised, whilst with a small engine of two horse-power, about the smallest size that can be recommended for regular work, from six to twelve thousand gallons per hour can be raised. The pump possesses the great advantage that it can be used in a small bore-hole and can be worked at any length of stroke

that is convenient. The same pump has been worked on a 20-foot stroke and then, much more rapidly, on a 2-foot stroke, the quantity of water lifted being approximately the same. The pump has a very great range of utility and adjusts itself to any change in the water level provided only that the foot valve is not uncovered.

Within the ordinary ranges of irrigation lifts gas pipes of the commonest quality will be found good enough but, where more than one length of pipe is required to get down to the full depth from which the water has to be lifted, it will be found convenient to use a pipe of slightly larger diameter than the lower one, in which the piston works. The reason for this is that common commercial gas pipes are frequently dented or bent and, when this happens, the piston pipe will only work freely in them with a large clearance. It will be obvious that the piston pipe should be as close a fit to the discharge pipe as possible so that the slip may not be too great. When the lift is high, the piston pipe must be long and this means that it can only work freely in a straight length of pipe which should be of circular section throughout. Before concluding these notes on the tubular piston pump allusion may be made to the possibility of employing one engine to drive a number of pumps in wells situated some distance apart. The wire rope transmission can be safely used up to distances of several hundred yards and, where the local conditions of water-supply are such that only small quantities can be obtained at any one point, a large number of wells, each of small capacity, can be sunk and the water lifted from them by wire rope transmission from a single station. I have seen this method employed on the oil fields of California working deep well pumps of the ordinary type.

The popularity in the Madras Presidency of mechanical methods of pumping has led to much exploratory work for water, and boring tools are now largely employed for this purpose. The use of comparatively powerful pumping appliances has led to the discovery that over large tracts of country the coarse water bearing sands will yield, in

moderate sized wells, sufficient water to keep a 4-inch centrifugal pump employed. Such beds of sand are often only a few feet below the surface but still more often they are at a considerable depth, and the sinking of bore holes is a convenient and cheap method of locating them. By the mechanical analysis of sand a good deal can be learned regarding its capacity to yield water and from empirical data which have gradually accumulated a very fair estimate can now be made as to the quantity of water which can be obtained if a well be sunk at any particular place.

The results obtained from borings have proved of extreme value. In the alluvial tracts near the coast, a considerable area of land has been discovered under which sub-artesian water supplies of large volume can be obtained, and even in the hard crystalline rocks, borings have proved extremely useful as they frequently open up fissures containing water under pressure. This work may be regarded as still in its infancy, although the department of Industries have now in use 30 sets of boring tools and have put down more than 700 borings, of which slightly more than half have proved successful. In addition to this, a large number of borings has been made by private individuals who have employed well drillers from the French Settlement at Pondicherry where a very extensive development of artesian water exists.

Where the holes have been drilled in hard rock a few experiments in torpedoing have been made. The process employed is as follows:—A charge of dynamite of from 5 to 7 lb. is fitted in a water-tight tin case and lowered to the bottom of the bore hole. It is then fired electrically and the resulting explosion shatters the rock at the bottom of the bore hole and opens up fissures, which in some instances very materially increase the supply of water. In the absence of a suitable bore hole pump, the results with these experiments have not been properly determined, as only those have been classed as successful which have yielded an increased supply of water under pressure. It is considered possible that many of these bore holes would yield a good deal of water if means were provided to pump it out, and now that we have

a simple means of doing this, further experiments will be made during the next hot weather. The demand for exploratory bore holes is great and the landowners are in many instances reluctant to give up at a depth of 100 feet which is usually that to which our boring sets can work. In a few cases, by providing extra boring rods, borings have been continued to a depth 200 feet, but with hand-tools this is expensive, and we are now trying power drills with which we expect to reach as much as 500 feet.

At the outset, 3-inch boring tools were mainly employed but experience has shown that 4-inch tools, although much heavier, are more convenient when the depths to be bored exceed 50 feet.

It will be obvious from these brief notes that in no direction does finality appear to have been reached. In the beginning, when the work was first started the prospects of attaining any marked degree of success were by no means assured. Now it is certain that the use of mechanical methods of lifting water will year by year extend, and at no distant date, we shall have thousands of mechanically driven water lifts at work. In every direction progress has been made. It is now possible to obtain much better appliances than was the case five years ago. Then, we were not certain that underground water could be obtained in sufficient volume in any great number of cases, now, we know that over large areas and in many places it is well worth while to instal mechanical arrangements to lift water. Progress has been much greater than was anticipated owing to the rise in value of agricultural products and the large profits that have consequently been made by the land-owning classes. This has, at the same time, increased the cost of cattle labour and compelled the intelligent landowners to turn to engines and pumps as a means of reducing the expense of lifting water and at the same time of bringing a larger area of dry land under wet cultivation. Each advance prepares the way for further improvements and indicates that the efforts now being made will in time be productive of great results.

PAPER AND PAPER-PULP INDUSTRY IN INDIA

BY WILLIAM RAITT, Esq.

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Few people realise the extent to which the use of paper has become one of the necessities of modern civilisation. We use it in extremely small amounts at a time : it is so cheap that its cost does not impress us with any idea as to quantity : we neglect the cumulative result of using it,—and wasting it, every day, and some of us all day, we seldom or never have any occasion to think of the vast number of uses to which it is put other than for writing or printing upon. Consequently, it may come as a surprise to some of you to learn that the latest statistics put the world's annual consumption at eight million tons, with a normal rate of growth equal to 25 % in ten years.

India's share of this vast amount is, in comparison with her population, very small. In the United Kingdom, the annual consumption is about one million tons. In India, with seven times the population, it is probably under 40,000 tons. Every thing, however, points to a rapid growth in the future, the spread of education being of course the governing factor. No truer or more statesman-like phrase was ever uttered than that of Gladstone, "the consumption of paper is the measure of a people's culture," and in the steady growth in numbers of the reading and writing public of India, we can safely foresee a ratio of increase considerably in excess of the normal estimates of the statisticians.

At first glance, it may seem an extraordinary thing that India should be unable to supply even the limited quantity she now uses,—that more than half of it should be imported from Europe. Here we have a country teeming with the raw materials from which paper can be made, and containing also fuel, lime, water and cheap labour all important factors—requiring only a few chemicals to be imported, and yet the paper mills now at work are not by any means making fortunes and their extension and development has been practically at a standstill for many years. In explaining the causes of such a condition of things, I will divide my remarks into two heads, the first being

considerations purely Indian, and the second, considerations purely European.

(1) Paper must be cheap. Cheapness is the one essential factor to its extensive use, and, I might add, waste. You will realise what this means if you can imagine paper suddenly becoming as costly as the parchment of the middle ages. All waste would at once cease and we should probably use, for most purposes, ink which would fade out and permit the paper to be used over and over again. Our cheap newspapers would, perforce, go out of existence, and we should never dream of using paper as a wrapper. Considerations like these enable us to understand the very large share that cheapness has in contributing to the total result—how a very large proportion of the price of paper—a larger share than in most other manufactures, is represented by the costs of the manufacture. Consequently the raw material must be very inexpensive, and to arrive at this necessary cheapness, the papermaker's raw material market is confined to such materials as are of little or no use for any other purpose whatever. So soon as any materials in which the papermaker is interested become of interest to say, the textile manufacturer, the papermaker's concern with it at once ceases, for the spinner can afford to pay much more for it than he can. Further, and for the same reason, the papermaker cannot use anything which requires cultivation and has therefore cost something to produce. He is, in fact, in the same position he occupied a hundred years ago when rags and textile wastes were his staple materials. He is a "snapper-up of unconsidered trifles," a user of other people's rejections, a gatherer of the waste and,—to other people—the worthless of the fibre world. You will see at once that limitations like these greatly circumscribe the area of his operations. Then, we have to remember that a ton of raw material by no means represents a ton of paper. Taking an all round average of the class of fibres represented by Bhabar and Munj grasses, it requires about $2\frac{1}{2}$ tons of such to produce a ton of paper. Therefore the cost, *in paper*, for cutting, collection and freight to the mill must be multiplied by $2\frac{1}{2}$. Now India is a country of great distances and long railway halts, and it will

be readily understood that every existing mill has, surrounding it, an economic circle beyond which it does not pay to collect,—from beyond which it ceases to be profitable to pay the freight on raw material when multiplied by $2\frac{1}{2}$. This economic limit has long since been reached by all the existing mills and no better proof of it can be given than the fact that they actually import wood pulp from Europe to supplement their local supplies, finding it cheaper to do so than to go further a field to tap the large supplies which undoubtedly exist in many parts of the country.

(2) The mention of wood pulp brings me to the second division of this part of my subject, *viz.*, *considerations purely European*. These may be summed up in the one word, wood pulp. I may explain in passing, that wood pulp is simply half made paper—hence technically known as 'halfstuff'—produced from the Spruce and Fir trees of northern Europe and America. It consists of the nearly pure cellulose or wood fibre, all the waste, amounting to 55 or 60 % being eliminated at the wood pulp factory which is invariably situated as close as possible to the forests from which it draws its supplies. This division of the papermaker's labours into pulpmaking and papermaking proper, largely explains the low cost of this material, for the papermaker, instead of paying freight and handling charges on $2\frac{1}{2}$ tons wherewith to produce a ton of paper, can now obtain almost a ton of paper from a ton of pulp.

The extraordinarily rapid growth of the wood pulp industry is one of the marvels of modern enterprise. Introduced about 30 years ago to supplement the supply of Esparto grass (then the leading staple of English paper-makers) it has gone on growing by leaps and bounds until now $6\frac{1}{2}$ million tons of paper are made from it annually—more than 80 % of the whole world's consumption. Its remarkable cheapness gave the greatest stimulus to the newspaper and publishing trades they have ever received. It has made the halfpenny newspaper possible in England and the anna one in India, and has had now to do with checking the development of the Indian paper industry than anything else, for it has introduced into the

country a grade of paper exactly suited to its requirements, at a price with which the local mills cannot compete. Thus is accounted for, the import into India of European-made paper to an amount of more than half the total consumption.

Its wonderful success, however, threatens to prove its destruction, for the drain on the forests of northern Europe and America, coming on top of the ordinary consumption for building and other purposes, has now nearly reached its limits. Any single one of the great London daily papers, eats its way through the produce of 5000 acres in a year, and this under climatic and other conditions which do not permit of natural reproduction except in exceptional circumstances, nor is it conceivably possible to cultivate, at a cost within the limits of the papermaker, a tree which takes from 30 to 50 years to reach the size required. Whole districts once clothed with virgin forest—nay, whole provinces—have gone galloping down the ever open maw of a hungry press, until now a condition of things has been reached in which the pulp-wood resources of the United States of America are admittedly exhausted and those of Europe considerably curtailed, not only by the recession of the remaining forest areas into remote and difficult districts, but also by the reduction in the amount of waterpower for manufacturing purposes, that being itself, one of the results of the forest clearances.

No doubt, in Canada and the remoter regions of northern Europe and Siberia, there are still vast timber areas practically untapped, but the Governments of these countries, warned by what has occurred in the United States, are now fully alive to the dangers of permitting such wholesale clearances and are introducing checks and restrictions, which, in conjunction with the greater distances of these areas from the centres of consumption must have, and already has had a serious effect upon the future expansion of the industry. No better proof of this can be had than in the fact that the continuously downward trend of prices of both pulp and paper reached its bottom limit about five years ago, and, while it is probable that for many years to come wood-pulp will hold its place as the leading staple, it is now recognised that it will be unable to overtake the continuous growth of

consumption and to provide for this a new source of supply must be found. So strongly has this impressed itself on the circles best fitted to judge that, at the present moment, there is in several parts of the world, an active search being prosecuted both by Government and individuals, for suitable sources of such material. The Director of the Forestry Court of our Exhibition here (P. H. Clutterbuck, Esq.) has not been behind hand in contributing his quota to the enquiry, and in the Cellulose Laboratory he has fitted up we hope to take a by no means inconsiderable share in this investigation.

We come now to the practical question of upon what lines the extension of the Indian paper industry should proceed. What can be done to render this country, not only independent of foreign importations, but to transform it into an exporter? Let it be said at once that we need not trouble in the least about paper-making,—that is paper-making proper as distinct from pulp-making. The Indian paper trade has shown no want of enterprise in the past and the best proof of that is in the fact that it has now expanded up to the full economic limits of its present raw material supply. Provide new-sources of *that*, and the paper-maker will do the rest. In suitable localities erect pulping mills to reduce the local raw material to half-stuff, eliminating on the spot the 60% of waste and reducing the freight and handling charges in the proportion of $2\frac{1}{2}$ to 1. Briefly and simply, in *that* lies the future of the Indian paper industry. Nor do we need to confine our energies to what India can use. In the export of pulp to Japan and China there is a market not only already open to us, but which may eventually exceed in volumes that required for our own consumption. The import of European pulp into those countries already totals 40,000 tons per annum and is rapidly increasing. This pulp incurs freight charges amounting to from Rs. 35 to Rs. 40 per ton—a very considerable item on a commodity worth Rs. 130 to Rs. 150. From India the freight charges would not exceed Rs. 15 to Rs. 20 so that there is an actual profit visible in freight alone—a bonus in fact—of Rs. 20 per ton.

It is, of course, necessary that a considerable amount of experience and caution be used in the selection of localities for

such an industry as I have indicated. Although our Indian forests and waste lands teem with fibrous materials suitable for the manufacture of paper, yet comparatively few of them will make both paper and money. But though the individuals are few, their distribution is of the widest and their aggregate quantity enormous. It is above all things necessary to keep in view the cost of collection and the obtaining of a sufficient quantity within economic range to keep a mill going. This quantity is by no means small. For a grass-pulp mill of, say, 100 tons output per week, 12,500 tons of grass per annum will be required. Still there are many districts where such a quantity, or twice that quantity, would present no difficulty, and in the case of bamboo the supply is literally inexhaustible.

The indigenous materials suitable have by no means yet been fully investigated, but among those known to be satisfactory, I will cite, among annuals, Bhabar or Sabui, and mounj grasses, both of which are largely used by our Indian mills. Among woods, the Himalayan spruce and fir, both being, from the paper-making point of view, exactly similar to the woods now being used for the purpose in Europe and America; and there is of course the already mentioned bamboo, which, I venture to prophesy, will ultimately become the leading staple and hold the position now occupied by wood-pulp. In the districts in which it is most luxuriant cheap water transport can usually be found. It yields a pulp of similar qualities, and by similar chemical treatment, to that now obtained from European spruce. It reproduces itself naturally so that by a judicious system of cutting, a mill placed in a suitable district can depend upon a perpetual supply from the area surrounding it,—a very different state of affairs from those prevailing in the wood-pulp industry, where a mill in a few years cuts out all the timber within economic range and has then either to shut down or remove its plant to a fresh locality.

I have thus briefly, and, I hope, plainly, outlined a possibility in Industrial enterprise which even the most seasoned and preternaturally cautious capitalist must admit contains the chief elements of ultimate success. An assured local market of, say, 25,000 tons per annum, an equally

assured export one of 40,000 tons, both of them continually expanding and the latter carrying with it what practically amounts to a bonus of Rs. 20 per ton. A country producing not only the raw material in abundance, but which also provides the important manufacturing factors of fuel, lime and cheap labour, requiring no imports except a comparatively small amount of chemicals:—In these, I venture to say, you have the foundations and essentials of success to a degree paralleled by few, if by any other, industries.

THE PRODUCTION AND IMPORT OF TOYS AND GAMES IN INDIA.

BY SIRDAR MADHAO RAO VENAYEK KIBE SAHEO, M. A.,
Indore.

One of the most prominent features of any sort of congregation of men in India, whether religious or social, is the presence of stalls for the sale of toys. Apart from fairs, shops for their sale, generally, do not exist. Fairs of the religious kind are very common in India. Every village, or at least a village among a group of villages, has its annual fair. In towns, fairs are more frequently held and in cities they are held in large numbers. In cities, which have been capitals of kingdoms, there exist some secular fairs, such as those held for the flying of kites. Even the Mahomedans have their fairs in honour of their saints. In the matter of fairs, the two great Indian communities, the Hindus and Musulmans, freely mix with each other. Fairs are attended by all classes and grades of the people; they served the purpose, which is now sought to be accomplished by means of exhibitions.

There are different motives which take people of sorts to fairs. To children and boys, toys are the chief attraction. The majority of them are made of clay; others are made of wood, iron, brass or other minerals, stones, cloth or similar other things. They generally repre-

sent animals, conveyances or miniatures of things in life. At religious fairs images of gods predominate. Some of the toys are but rude imitations, while others exhibit a remarkable workmanship. They are priced according to the cost of the material, the time and skill required in making them and the attractiveness of the article. The profession of making toys is followed by common people to supplement their earnings from other sources. It is a home industry and manual labour is mostly employed in it. Mechanical methods are sometimes used in making toys. They vary in quality according to the place of their origin and exhibition. Toys in towns are of a better description than those in villages and those in city fairs are superior to those in towns. There are some centres which are famous for toys of particular make. Jeypore produces toys of stones, Benares of brass. Some of the toys made in places like these are purchased by foreigners and taken to their homes. But there does not appear to exist any regular export trade in Indian toys.

Besides some notable indoor games, Indian games do not require manufactured or costly requisites. Some of the things required for indoor games were made highly artistic and costly. For instance at the famous old city of Ujjain, there still remain with a ruined family, some figures for the game of chess, which are most attractive to look at and which must have cost a good deal. At Savantvadi, on the Western coast, cards for playing the game of *ganjifa* a pack of which consisting of 120 cards varies in value between Rs. 1 and 15 or 20 are perhaps still made.

Toys of foreign make first began to come to India, as works of art and mechanical skill. They were bought by rich people and kept in their houses for others to see. Before the toys from western countries began to come in India, those made in China were imported. They were gradually replaced by the machine-made toys from the West. Perhaps those made in great Britain were the first to be imported. In papers relating to the Court of the

Peshwas in the last quarter of the 18th century, references are made to the English Envoy's having presented toys for the edification of the young Peshwa and to his nobles becoming increasingly fond of similar articles. It seems that the native artisans too tried to produce imitations of them: a carpenter is reported to have exhibited a model of a conveyance on one wheel. Toys of foreign make first became available in Presidency and other seaport cities. There they were bought by the foreigners and the higher and middle classes of the indigenous population. They were carried in the mofussil by the European officers and rich Indians. Since the advent of the cheaper toys of German and American manufacture, they have penetrated into towns and even villages. Japan too has begun to take a part in the export of toys.

Among Western countries Germany holds the foremost place in the manufacture of toys. Not unlike India, it is a cottage industry there and in Japan. Germany produces over 75 million rupees worth of toys per annum. In the United States of America, they have organised this like other industries. There toys worth nearly 21 million rupees are turned out annually. In these countries, generally by-products of other industries are utilised in making toys.

With the introduction of foreign out-door games of various kinds, the demand for the things required to play them with, has been created. Most of the new games require manufactured and costly things. By the introduction of the former in schools and colleges and their taking up by the rich, the demand for their requisites is increasing. It is only in the Punjab that some manufactories have been started for them. The things turned out by these manufactories have won the approval of critics. But the demand for them is not met by the existing workshops.

It is indicative of some radical defect in the circumstances that in spite of the industry of making toys being an universal one in India and notwithstanding the fact, in the words of the excellent Review of the trade of India in

1909-10 by Mr. C. W. E. Cotton, that "the several firms in the Punjab specializing in these lines (the manufacture of requisites for games) are doing large business," the import of toys and requisites for games is annually increasing. In the year under review, these things worth over Rs. 34 lakhs were imported. During the same year, there was an advance of more than 3 lakhs over the preceding. A few years ago, the value of their imports was considerably less than 30 lakhs.

Compared with value of other imports, the sum of five and thirty lakhs of rupees looks insignificant. But even by meeting several such small demands, India would be able to lessen her costly imports and retain the money. The example of the Punjab firms shows that requisites for the foreign games of the quality equal to that of the imported articles can be made in India. What is there to prevent manufactories similar to those in the Punjab being multiplied there and established in other Provinces? If there are any impediments, they should be inquired into and means devised for removing them. The Himalayas in the north and the Nilgiris and the lower Suhyadri in the south can supply as much raw material as can be required. Perseverance and closer application are required not only to meet the increasing demand in the requisites for games, but in order to export manufactured goods of the kind, if not to western countries themselves, then at least to Asiatic and African countries, where in the wake of the occidental civilisation its games will follow, as they have done in India.

In the matter of toys India offers a vast field. She produces kinds of toys which are calculated to meet the tastes of people in various stages of evolution. The choice lies between the rude village productions at the one extremity and the exquisite inlaid marble work of Agra or the beautiful ivory work of Delhi, at the other. Even the idea of utilising by-products is not absent. The cuttings left by tailors are utilised in making cloth dolls.

One of the main causes of the languishing of the industry of toys is the want of an organisation. Two things are required to make it flourishing: (1) Even the worst productions should be made neater, and (2) the best brought to the notice of the people. The Japanese know best how to utilise by-products to their utmost capacity. The Germans know best how to make cheap imitations of railways, motor-cars and such other things, which satisfy the curiosity not only of boys, but of the common people, who cannot afford to have the real thing. It may be possible to establish a museum of Japanese and German toys, along with examples of tools and processes employed in making them at different suitable centres. It would not be very costly and it would be the means of teaching men or rather women, a new and paying industry. Unless an improvement is made in the kind of toys, people will be fascinated by the attractive toys imported from abroad.

The better kind of toys, which appeal to rather advanced young men, should be brought to the notice of outsiders by the same means by which goods of that kind were introduced into India. An attempt should be made to induce some of the shops in England and other foreign countries to keep them on sale. They should be allowed a liberal commission on the sale of those goods. Once a taste is created for them, the shopkeepers will themselves cease to demand the commission. Even now chiefly owing to the desire exhibited by tourists to purchase these things, shops with respectable premises are arising in places like Delhi, Agra and Benares. But such centres are very few. Therefore those things should be kept for sale with European merchants in the Presidency and other big cities; they would also require to be paid liberal commission. It would not do to keep these things in Swadeshi stores or in Indian Bazaars, because foreigners and the better class of Indians do not frequent them. A preliminary loss may have to be suffered, but it will be made up in a few years' time. The Provincial and

District Industrial Associations should take up the matter and make good the loss to the manufacturers. The Government cannot be expected to conduct its Art Schools on commercial lines. Moreover, the schools are devoted to propagating the art on foreign lines. It may be that through their influence a better school of Indian art may develop. The intrinsic excellence of the indigenous things will cause a demand for them; what is wanted is simply to bring them and the customers face to face, with one another.

In the proportion in which the suggestions made in this paper will be given effect to, the import trade in toys and games will diminish and their export may be assured. The matter should not be looked from a mere commercial point of view. It will increase the self-respect of boys and young men, if they find that the things with which they have to deal are the productions of their own country. It is through negligence that other countries have stolen a march over India in this matter. In her struggle for industrial superiority she cannot afford to overlook even small matters, in which she can easily succeed, and by making money in which she will be able to meet on equal terms the other countries in other industrial concerns, in which having gained a priority they have become strong, aggressive and predominant.

LINES OF INDIAN INDUSTRIAL ADVANCE (WITH SUGGESTED OPENINGS FOR NEW INDUSTRIES)

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Those who have devoted themselves to the study of Indian economic problems and to the advancement of the material welfare of the country cannot fail to recognise that

there has been a practical deadlock in the present industrial situation of India. Considering the present state of our labour, capital and enterprise, the three principal factors of production, we are greatly at odds in the keen industrial struggle into which we have been thrown, and to compete with Europe, or the west generally, seems almost a hopeless task. Our labour is mostly unskilled and inefficient, and, where skilled, it lacks inventiveness and the knowledge of the use of improved tools and machinery. Secondly, our capital is proverbially small and shy and what may be called '*individualistic*,' i.e., shrinking from joint stock concerns. Thirdly, there is a remarkable lack of enterprise or business ability which is almost *nil* in the literate classes due to the prevailing system of an over-literary education coupled with the absence of an organised system of technical and commercial training. Such being the present state of our resources, it is no wonder that the prospects before us appear to be gloomy, and the chances of success uncertain.

The situation, however, has to be faced and ways out of the difficulties have to be found out. In the present paper an attempt will be made to indicate broadly the lines of possible advance that are open to us and the way in which India can play her part in the fierce industrial struggle to which she is exposed.

It will be first necessary to indicate the principles governing Indian industrial progress in all possible directions and then we shall proceed to discuss their applications.

Our main problem is to determine how India, the country of small productions, and as yet not fitted for the huge combinations and organisations of the west, will stand against the increased efficiency of large scale production. Before the time is ripe in India for the growth of large production in all forms with the gradual development of capital and introduction of machinery; how shall we, in the meanwhile utilise our present resources in capital, labour etc. and hold our own in the period of transition?

The answer has to be sought in a careful study of the history of the evolution of industry. That study will reveal the fact not sufficiently recognised that *pari passu* with the development of scientific

industries on a large scale, there is always a corresponding development of subsidiary, as well as independent smaller industries, including handicrafts, art-industries and home-industries. This is well illustrated in the modern industrial history of European countries, specially those on the continent. In fact it is a fallacy to suppose that natural selection in industrial evolution is only a process of larger organisation surviving and weeding out the smaller : in the struggle for existence in the industrial world, '*fitness*' does not depend on size alone but is determined to a large extent by adaptability to environment and by the conjuncture of circumstances which the organisation has to utilise. In this way there is always a place for small industries in the course of industrial development, a place which can never be abolished but will always grow, simply because it cannot be filled by large industries. The employment of machinery, on a large scale production, for instance, requires certain conditions regarding capital, division of labour and demand which are by no means universally realised. Fine arts, decorative industries, etc. again are more suitable to hand labour than machine. There is thus a monopoly in favour of smaller industries as there is in favour of larger ones. Among monopoly advantages on which smaller industries will live and thrive may be mentioned abundance of raw produce, proximity to market and cheap labour which are, as we all know, the characteristic economic features of India. To these we may also add the utilisation of subsidiary and surplus labour where available, as in Indian homes and rural areas. Armed with these advantages, small industries have a chance of holding out against the improved efficiency of large scale production.

It is therefore quite clear as to what our line of action should be at present. We should utilise our present resources in labour, capital and enterprise with a view to equipping ourselves fully for the industrial struggle of the age and seek to build up and organise the thousand and one smaller industries for which there is ample scope and opening in the modern industrial world and for which India will be seen to present a special field, offering special opportunities and advantages.

Let us now proceed to consider how, along the lines indicated, we should utilise our resources in labour, capital and enterprise and turn to account our present productive forces so as to achieve the best possible results.

Firstly,—as regards the methods of utilising labour.—Here we must clearly recognise the fact that owing to the absence of popular technical education in the country, there is a great want of technical or manual skill specially in the literate classes. Until therefore technical skill is more generally diffused among both the classes and the masses and a fund of mechanical ability and inventiveness is created, we have no other alternative but to fall back upon and organise our existing resources in the hereditary skill of our innumerable craftsmen, seeking at the same time to improve and expand them by the steady introduction of improved methods, new tools and machinery and scientific improvements. In the first place, this hereditary skill is really highly intelligent and remarkably adjusted to the traditional environment and in fact very efficient, though running in a particular groove, under the existing economic conditions and limitations. In the second place, this skill is not incapable of improvement. It is a fundamental mistake to suppose that Indian labour and skill have remained stationary through the ages. To be convinced of this we have only to consider the continuous improvements effected and invented by Indian craftsmen in the domain of decorative and art industries, of home industries and handicrafts, improvements which enabled India, to command for long the markets of both the east and the west. In agriculture the Indian peasant has proved his capacity by the introduction and acclimatisation, since the discovery of America, of new crops which make up about 55 % of the total Indian crops. *The proverbial immobility of the Indian craftsman is, in fact, horizontal, not vertical.* He is capable of improvement in his own special line and may adopt better tools, machinery and scientific improvements wherever these are actually proved to be economically successful. We may cite as a modern instance, the case of the Serampur handlooms. In effecting these improvements we may consult the plan of work in the technical schools of Naples.

It is therefore these hereditary craftsmen that will have to be organised in small factories or workshops by the present Indian *entrepreneurs* who must carefully avoid employing indiscriminately unskilled labourers drawn from the general population. Want of a due regard for this principle is responsible for the failure of many an industrial concern which placed too much reliance on literate classes or general unskilled labour. The many experiments that have been made in Bengal since the Swadeshi movement to convert our middle class literate youngmen into weavers of an improved class have all ended in miserable failures and, by creating a widespread pessimism, have, to some extent, set back the tide of progress towards independent livelihood. To similar causes is also to be traced the failure of agricultural farms which neglected to employ hereditary peasants.

In connexion with the organisation of Indian labour, the question naturally presents itself, How to turn out organisers and *entrepreneurs*? The *entrepreneur* who is without doubt the chief agent of production in the modern industrial world is, practically speaking, yet to be born in India, and without him the cause of Indian industrial progress must suffer to a considerable extent. Capital in India fights shy of industry and joint-stock concerns, simply because there is no business ability to attract it by assured prospects of profitable investment or utilisation. It is business ability that everywhere commands capital and organises industries. It is not the nature of capital to pioneer new industries or discover new fields of investment: it is always conservative and follows the beaten track. Our first necessity therefore is to build up a class of *entrepreneurs* who will create in industries a field of investment for capital that will successfully compete with other existing fields of investment.

We have no *entrepreneurs* among us because we have not the system of education that produces them. It is an astonishing fact that India, a vast continent, knows only of one system of education which was originally devised by officials for promoting only the interests of administration. Exclusively literary in its character without a touch of the

modern side, it can only produce clerks, deputy magistrates and lawyers but not technical experts, or captains of industry. For that we require a different system of education adjusted to the needs of industrial development. If we want the best talent of the country to devote itself to the development of its material resources by withdrawing it from the usual channels of its employment we must train it up on new lines from the beginning so as to give it a new turn, and develop industrial aptitudes. We have to devise a new and appropriate scheme of education of which the essential features will be the imparting of manual training in the lower stage and teaching applied science in the later stages as essential factors of a liberal education in order to overcome the traditional prejudice against manual labour. The education of an *entrepreneur* and indeed of all who are meant for industrial careers will thus have to be founded in the first instance on a thorough familiarity with the use of machines, supplemented afterwards by a knowledge of the Indian economic products in markets, museums and exhibitions and by a first-hand study of small factories through personal inspection and tour. We should have also, along with these special features and facilities, an organisation of researches for the development of new industries by scientific, mainly chemical, manipulation of raw materials and waste-products, and train our young men in such researches. A scheme of education mainly on these lines has been attempted on moderate scale by the National Council of Education, Bengal, (with which has lately been amalgamated, the Bengal Technical Institute) which has been working it now at a cost of one lac of rupees per annum under the able guidance and generous support of such well-known public-spirited gentleman as Dr. Rashbehary Ghose, C.S.I., C.I.E., Sir Gooroodass Banerjee, Kt., Mr. T. Palit, Mr. Brojendra Kishore Roy Chowdhury, and the distinguished President of this Conference. Along with a sound system of technical education we must have also as a co-ordinate branch a system of commercial education that will turn out trained commercial agents, bankers, correspondents and the like.

We now come to the methods of utilising our present resources in capital. As I have already said, our capital is

too small to admit of large production, and considering how it shrinks from joint-stock enterprises, the clubbing together of small capitals so as to form a large capital cannot also be relied upon. Under the circumstances, we must look to the most efficient use of our capital for some time to come on individual proprietary basis, carrying with it something of 'the magic of property.' The most profitable investment of such small capital must proceed on the principle of *quick returns* or having as many '*turn overs*' in the year as possible. As explained by Prof. Marshall, "dealers who buy and sell large quantities of produce in single transactions and who are able to turn over their capital very rapidly may make large fortunes, though their average profit on the turn over is less than 1 per cent." To realise this principle the small capitalist with a trained business instinct must hit those things for production for which the demand is very general and at the same time inelastic, and in producing he will have to care not so much for ideal finish at the expense of quantity as for practical utility coupled with cheapness. The quality will have to be the best possible under these two necessary conditions (*viz.* cheapness and quantity) of Indian consumption to which the production must conform. It is only in this way that small capitals can thrive and grow.

It should, however, be borne in mind that in the history of the growth of capital, a very important part is played by commerce, as distinguished from production proper, specially in the first stage before capital is sufficiently developed and large production begins. In fact, small industries cannot give rise to accumulations of large capital in the hands of the industrials.

It is chiefly commercial intermediaries who by sharing in the profits of these industrials accumulate wealth and then large industries become possible.

A few words may now be said on the methods of improving our resources in land. This task really rests not on small peasants wanting the required capital as well as knowledge but on the land-owning capitalist, our zemindars and taluqdars. It is these latter who should set up experimental agricultural farms worked not by unskilled

labour indiscriminately chosen but by the hereditary peasants themselves of their own tenantry under the superintendence of trained agricultural experts. The capital of the landlord, the scientific knowledge of the expert and the hereditary skill of the peasant are the three necessary factors that must all combine for the improvement of Indian agriculture.

We shall now proceed to consider the applications of the above principles to Indian conditions and mention some of those smaller industries that afford a field for the most profitable utilisation of our present resources in labour, capital, enterprise and the like. It will appear at the outset that small industries will comprehend two types of organisation ; (i) The small factory. (ii) The home industry and may be classified into the handicraft, mechanical and chemical industries.

In all these classes of industries, the essential points to be remembered for their improvement will be (1) bringing together craftsmen in a factory and drawing upon their hereditary skill; (2) the introduction of the use of improved tools and machines on improved mechanical principles, worked by hand power or small engines; (3) chemical manipulation of raw materials used in such industries; (4) supply of improved raw materials.

The following is a rough list of small industries that may be developed by the utilisation of our present resources :—

I. *Alloys* for preparation of utensils, wire, buttons, bells, ornaments, jewellery, gold, common jewellery, speculum metal (for making metallic reflectors), type, etc., etc.

II. *Blacking* of all sorts,—for harness, boots and shoes, blacking on metals, self-shining blacking, Nubian blacking, blacking water proofs, harness lacquer, etc., etc.

III. *Polishes* of various sorts :—Such as harness polish, brass polish, compound for polishing and cleansing glass-ware, silverware and tinware etc.; cutlery polish; polishes for marbles, horn and bone, iron and steel etc; furniture polish, etc.

IV. *Water-Proofing* for leather, textile fabrics, paper, paste-board, oil-cloth, umbrellas, canvas, etc.

V. *Bleaching* in its various aspects—for oils and fats, silk and cotton fabrics, paint, etc.

VI. *Brass*—its composition, coloring, finishing, cleaning; its protection from tarnish; frosting brass work; covering brass with beautiful shining colours, etc., etc.

VII. *Cements* of various kinds to be made both in the household and in the workshop : e. g., carpenter's cements, blacksmith's cements, etc.

VIII. *Cleansing, renovating, and protecting* of various sorts—such as renovating oil cloth, prolonging the life of rope, renovating picture frames, cleansing paintings, pearls, shoes, window glass, silk, silver, and wood; removing spots and stains, etc.

IX. *Perfumery, cosmetics and disinfectants.*

X. *Enamelling, galvanising, electro-metallurgy.*

XI. *Glue and its preparations, varnishes, paints and pigments.*

XII. *Extraction of essences from fruits, flowers, etc.; preparation of syrups.*

XIII. *Preservation of fruits, meat, milk, leather, furs and skins, etc.; preparation of tinned articles by pressure.*

XIV. *Extraction of fibre, rope-making.*

XV. *Wicker and bamboo work, mats, woodwork.*

XVI. *Hosiery, hat-making, and sewing, book-binding.*

XVII. *Button-making from celluloids and horns.*

XVIII. *Making copper and brass utensils by casting and moulding.*

Among slightly larger industries may be mentioned the manufacture of tobacco, sugar, oils and fats, pencils, pottery, tanning, matches, soaps etc., pharmaceutical works, flour mills, rice mills, printing, etc.

An expert from Japan has supplied the following list of machines, among others, very cheap in price, with the help of which several useful handicrafts and home industries may be taken up and pursued. They may very easily be introduced to Indian labour :—

1. Candle wick machines.

2. Round lace making machines.

3. Lamp wick making machine

4. Candle making moulds.

5. Envelope making press,

6. Cardboard box making press,
7. Rope (straw, hems etc.) making machine.
8. Paper cutter with spring and adjustment.
9. Shoe lace making machine.
10. Chalk crayon making machine.
11. Shell button making machine.
12. Small tin box making press and moulds.
13. Pumps (to be used in the places where there are no water works.)
14. Artificial flower making tools.

As regards home industries they will have to be organised in suitable centres by system of advances made by capitalists and agents and by utilising surplus labour. The conditions of Indian agriculture leave labourers out of employment for several months in the year and during these intervals they may be very usefully employed in making different things like pottery, cane and bamboo work, mats, dures, ropes, etc. These home or cottage industries will of course vary with local conditions and products. Thus among the Khasias and in Assam generally, there flourishes textile fabrics, silk, muga and endy weaving, and in Santhal Pargannas, extraction of mhowa oil, etc.

Lastly, there is also a great opening for Indian labour and capital in attempting large scale industries in some of their cruder stages, *e.g.*, industries like Iron and Steel works, glass blowing, Textile fabrics and dyeing, paper-making, Alkali works and the like are too large to be generally attempted at present, but we may step in some of their stages. Thus we may take up cutlery, nails, door-fittings, bucket-making, Foundry and moulding works, etc., under *Iron works*; bottles, bangles and other crude glass works, utilisation of breakages of important crockeries, etc., under *Glass blowing*; use of improved hand looms of all kinds, extraction of fibres, etc., under *textile fabrics*; use of aniline dyes (and country dyes) to produce chintz, coloured cloths, yarns and silks, etc., under *Dying works*; paste board and card board works under *Paper making*; utilisation of inflorescent earth such as reh to produce soda, nitre, etc., under *Alkali works*; etc., etc. In this way we may take to

manufacturing products of cruder quality if our resources are unequal to large industries turning out refined products.

The above list can by no means be expected to be exhaustive. It is intended to be merely suggestive; and I cannot conclude this paper better than by making an earnest appeal to this Conference, and through the Conference to the general public, for taking steps to organise a speedy survey of small industries throughout India and publish a report with practical hints and suggestions.

THE INDIAN SUGAR INDUSTRY

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The importance of Sugar Industry to India cannot be exaggerated. Apart from the attention it deserves at present, it is a very old industry. Sugar has been manufactured in India since very ancient times being mentioned in the Atharva Veda. Various Sanskrit writers and the travellers of the Middle Ages mention sugar as being manufactured in India from sugarcane; and there is sufficient evidence to show that the sugarcane was taken to European countries from South of Asia, at least, if not from India alone. The first official records of this Industry date from 1609, when the English ships sailing for India were commissioned to bring a "few chestes of best Indian sugar for a triall." Gradually with the expansion of East India Company's trade, the export of Indian sugar increased, the quality being good enough to secure a steady market in Europe, till the beginning of the 19th century when the West Indies Colonies also began to manufacture cane sugar. The competition which began thus between East and West Indian sugar was started a century ago, and has proved disastrous to the cause of the former. East Indian sugar could make a stand in England, and Europe as long as it was admitted free of duty. But in 1830, an import duty of 38 per cent. *ad valorem* was imposed on East Indian sugar only—which amounted to 120 per cent. on the gross price and 200 per cent. on the prime cost. (Evidence from Common's

Committee 1830—32, quoted by the late Mr. R. C. Dutt). This led to a reduction in the exports of Indian sugar : but a remission of duty in 1836, was again attended with increase in the exports which went on steadily, until checked by West Indian sugar which not only drove it out from Europe, but has made inroads into and established itself in India. At present India is exporting only a little of raw sugar, while her imports of sugar have been rising every year by leaps and bounds. The following figures of exports and imports of sugar, show the state of Indian Sugar Industry during the century, of course, indirectly.

EXPORTS.		IMPORTS.	
YEAR.	TOTAL SUGAR IN CWTs.	YEAR.	TOTAL SUGAR IN CWTs.
1800	120,471	1871-2	562,559
1821	277,228	1881-2	982,262
1835	101,100	1891-2	2,734,491
1839	519,000	1901-2	5,565,272
1841	1,037,501	1902-2	4,987,195
1851	1,607,508	1904-5	6,549,797
1861	845,961	1905-7	9,730,713
1888	1,180,208	1907-8	10,044,000
1904	192,890	1908-9	10,663,283
1905	230,438	1909-10	11,136,084

These figures prove the gradual decline of exports of sugar and the rapid increase of imports during the last few years, amounting to 1030 per cent. in the last twenty eight years, the figures for 1881 and 1909 being respectively .98 and 11 million cwt. It is certain that at least a portion of the imports was due to the sugar being protected by bounties in the manufacturing countries, and admitted into India on free trade policy : this can be seen, in a way in the reduction of the import of bounty-fed beet sugar, after the imposition of an import duty in 1899.

	Percentage of Cane sugar to total imports.	Percentage of Beet sugar to total imports.
1897-8	51.5	48.5
1902-8	73.1	26.9

This import duty was a source of revenue to the Government, amounting to about 40 lakhs of Rupees per year : it was however abandoned in 1903, when India was dragged into the Brussels Convention of 1902, as a tail of the free-trade-loving British Empire. At present all sugar is admitted free of duty in India except the usual *ad valorem* duty on all foreign imports. Whether due to the free trade policy or not, these imports of cheap sugar have certainly affected the Native Industry : yet, as the darkest cloud has a silver lining, this reduction in prices has increased the consumption of sugar in India, and has thus rendered, indirectly, the possibilities of success of Indian Sugar Industry greater, having expanded the large and near market.

The phenomenal transition of India from a Sugar exporting country to a sugar importing country, might be contrasted also with the rise of certain sugar manufacturing countries of the world. The following figures show the present state of imports of sugar into India and the way in which the supply is met.

IMPORTS OF SUGAR IN THOUSANDS OF CWTs.

	1904-5	1906-7	1907-8	1908-9	1909-10
Java	2,546	3,467	6,593	6,172	7,815
Mauritius	1,823	2,310	2,600	2,514	2,486
Total cane sugar ...	4,369	5,777	9,193	8,686	10,301
Austria	1,505	2,016	730	1,918	782
Germany	151	1,657	51	3	51
Total Beet sugar ...	1,716	3,803	794	1,944	859
Grand total including molasses and confecti- tionery	6,549	9,730	10,044	10,661	11,136
Total value in crores Rs.	6.7	8.1	8.8	10.4	10.7

On analysing the imports, it can be seen that the bounty-fed beet sugar has been replaced by the cheaper cane sugar : and that now the major portion of the imports comes from Java, Mauritius and Austria. The control of the Indian market by these countries is due to the perfection in the methods of cultivation and refining attained

by the sugar growers. A comparison between their methods and our methods will show and explain the present depressed condition of Indian Sugar Industry. The inflow of this cane sugar into India was greatly accelerated by the expansion of sugarcane cultivation at the hands of Americans in Hawaii, Philippines, Cuba, and Porto Rico which resulted in the closing of these markets against Java and Mauritius. Japan has also recently taken steps to expand the sugarcane industry of Formosa, and is expected in a short time to close her markets also, against these countries, and perhaps join them in invading the Indian Sugar markets. It is therefore, high time for India to make steady and sure attempts to check if not to stop the rapid inflow of foreign sugar which is soon expected to swell enormously and to destroy the indigenous industry just as the Indigo plantations have suffered from the importation of cheap synthetic Indigo.

Besides these large and increasing imports of sugar amounting to 10 million cwts. worth 10 crores of Rupees, India consumes a large quantity of sugar of her own manufacture. The total amount of sugar manufactured by India is difficult to calculate accurately, but has been variously estimated to approach 5 million tons of raw and semi-refined sugar including the output from the Native States. India is the largest single producer of sugarcane in the world, with an area of 2.5 million acres under sugarcane; she produces about 24 per cent. of the total supply of the sugarcane production in the whole world,* though she does not hold any rank among the manufacturers of refined sugar. Sugar is a valuable and useful article of food suitable for the warm climate of India: and the vast population of India ensures a very good and flourishing market for the commodity. Thus with a large supply of raw materials, and a good market for the finished product in the neighbourhood, there seems to be no reason, theoretically at least, why Indian sugar should

* The total production of sugarcane in the world during 1908-9 was 7,644,000 tons.

India	1,841,800 Tons	Hawaiian Islands	448,000 Tons
Cuba	1,513,482 "	Porto Rico	245,000 "
Java	1,241,885 "	Mauritius	195,000 "
Louisiana	855,000 "	Formosa	123,000 "

not hold any position against the imported article, which comes over long distances and pays large freight charges.

We will now try to see why this theoretical possibility is not being realised, restricting our attention to cane sugar only.

The details of the consumption of sugar in India will be of great help in our study. India produces about three million tons of sugarcane annually but a good part of it is chewed as such for its nutrient value; a large part of it is crushed by primitive wooden mills and the juice is boiled down to "gul," while only a portion is treated directly for obtaining crystal sugar. The "gul" or "gur" or Jaggery is valued and used by the people more than sugar, for its flavour, cheapness, and also for its larger nutritive value in the form of albuminoids, etc., which are removed in the refining of sugar. Calculation brings the figures for consumption per head to about 20 lbs. of gul and 7 lbs. of sugar (out of which 4 lbs. are supplied by foreign sugar). Gul, therefore, brings comparatively more price than sugar, though its cost of production is far less. Thus, the price of gul is about* Rs. 6 per Bengal Maund, and of sugar is about Rs. 7-8. This difference of Rs. 1-8 per Bengal Maund does not always pay the manufacturer to prepare sugar from Indian gul, because the percentage of sugar in it is scarcely above 50, and because much of the sugar is inverted, and the colour spoiled. On the other hand, manufacturing sugar directly from the cane juice does not pay so much as preparing gul from it. For example, 1000 lbs. of cane juice (worth Rs. 10) would yield 180 lbs. of gul worth Rs. 13-8, the same if treated for sugar would yield 80 lbs. of sugar worth Rs. 7-8 and 80 lbs. of molasses worth Rs. 5, making a total of Rs. 12-8, or say 13. This income falls very much short of gulmakers' receipts, and does not meet the expenses of sugar refining, depreciation of machinery, interest on capital etc. all of which are not to be paid by the gulmaker. This shows that sugar manufactur-

* The following figures from the latest Balance Sheet of the Prayag Sugar Company of Allahabad are interesting:—

Cost of gul for the Sugar manufacture	...	Rs. 6 9 0 per Maund
manufactured sugar (average)	...	Rs. 9 5 0 " "
Selling Price of the sugar	...	Rs. 11 3 0 " "

ing will not pay as much as gulmaking : unless we calculate the price of the sugar as that of the Benares sugar which fetches at present Rs. 11 to 13 per B. Md. (though loaded with impurities); but surely, the high price charged for Swadeshi goods is bound to be an economic failure in the long run, and should not be counted upon in all proper considerations of the prospects of any industry.

As long as gul fetches good price in the market, sugar manufacture in India will be always at discount, and we should not expect our sugarcane fields, vast as they are, to be utilised for manufacturing refined sugar directly. Sugar factories will not also get cheap sugarcane, as the gulmaker can afford to pay a little more, as the cost of production is so small for him. The competition therefore is, in a way, not between foreign and Indian sugar as between Indian refined and Raw sugar, the manufacture of the latter being conducted in a way most detrimental to the cause of the former. The number of sugar factories is smaller than gul-factories because of this great difference in profit in spite of wasteful management. The cause of failure of many sugar factories in recent years is the increasing price of the raw-produce sugarcane, the contracts for which are usually broken during the season. At the same time the importation of cheaper sugar from Java and Mauritius has introduced a tendency to reduce the price of the finished product. Thus a rise in the price of the Raw product (both sugarcane and gul) and a fall in the price of the refined sugar are among the most serious difficulties in the financial management of factories.

Besides, these difficulties, there are more important defects in Indian Sugar Manufacture, on the Technical and Scientific side which is utterly neglected at present, except in a few cases. The whole process has been followed with a hidebound orthodoxy involving a large waste on all sides. The Indian farmer is of course a hard worker and a frugal cultivator, but he is ignorant and poor. Though sugarcane can be grown on almost any soil, if there is a good manure, good irrigation and good drainage, the quality of the crop in India has never been so high (except in some portions of land in the Deccan) as in other cane growing countries, both

with respect to the yield of cane per acre and to the percentage of sugar in the cane.

Country	Yield of cane per acre in Tons	Yield of sugar per acre in Tons	Tons of cane to one ton of sugar	Cost of production per Ton
Java	42	3.6	7.1	8½
Sandwich Islands	33.4	8	10	8½
Egypt	22	2.2	10	9½
Bengal	20	2	...	...
Queens land	16	1.6	10	18¾
Japan	15.2	1.1	14.3	13 to 16
Mauritius	...	1.6	...	...
Hawai	...	3.6	...	...
Cuba	25	...	9	...
Peru	40.60	6	...	5½

These figures though not very complete, give an idea of the relative state of cultivation in these countries.

The soil is exhausted by centuries of continuous cropping ; and the poverty and the ignorance of the farmer has prevented him from using the best manures which are necessary in large quantities in the present state of the soil. The system of cultivation in small farms prevents him from taking full advantage of the Western methods of agriculture with costly appliances : it is also detrimental to the interests of the sugar manufacturer as it prevents the concentration of crop round the factory. It is necessary that cane should be crushed soon after being cut and under the present circumstances, the farms being situated in distant parts and the conveyances being not cheaply and readily available, the crop gets spoiled and a large proportion of sugar as much as 10 to 15 per cent. of the sugar becomes inverted before it can be worked into juice. Again, the irregularities of rainfall makes sugar cultivation a hazardous job for the farmer, who is more willing to cultivate cotton, the price of which also is increasing. Moreover, in those cases where a constant supply of water is available from the Irrigation canals, the farmer shows a tendency to use excessive water without providing for a good drainage.

Besides these, there are many points of agricultural importance *e. g.* the best way of keeping away insects and pests, the best rotatory and secondary crops, necessity of keeping the land fallow after three or four years, etc. which must be properly and intelligently attended to by the cultivator.

(It is necessary to point out that the central factory system alone can work satisfactorily with sugarcane. This system is the key of the success of canesugar factories in other countries.) For example, Mauritius which is a small island with an area of 800 square miles had 200 factories a few years ago, but now they have been centralised to 80 factories which turn out about 200000 tons of sugar annually. Similarly Cuba has 71000 acres of sugarcane area centralised into 186 factories, each factory dealing with the crop of about 380 acres: the production of sugar in Cuba is fast advancing, being 1545000 tons in 1909, 1765000 tons in 1910, and the estimate for 1911 being 2000000 tons. Besides these results which are convincing in themselves there are many reasons why India should resort to this or a similar system. The success of a sugar factory depends upon the quality and the quantity of the crop of the cane; the expected improvements in the sugarcane cultivation are not likely to be realised under the present system. As long as the farmer gets a good return by pressing the cane and boiling down the juice to goor, he is not likely to spend more money for heavy manuring or better water supply etc. No theoretical attempts to improve the crops by spreading agricultural knowledge among the farmers will succeed unless the factories themselves take the matter into their own hands directly or indirectly. In the other countries, a factory is located in the midst of an area of sugarcane or its rotatory crops the sugar cane is sent to the central factory by suitable conveyances to be crushed immediately after being cut. Looking to the facts that contracts for sugarcane have been so often abandoned, it is a necessity for the success of a factory to have its own sugarcane fields or to finance them or at least to manage them; and then it is an easy thing to introduce all possible improvements with expert scientific skill. Certainly, it would require large capital and resources, but the attempt if properly conducted is bound to succeed. It is only a

matter of detail to lay down the lines on which such a system can be worked out in different parts of India, dependent upon the climatic and the agricultural conditions, nature of land tenure, water supply, modes of transportation etc.: but this principle should be acknowledged and brought into practice if the industry is going to be a success. (One factory started strictly on such a basis on lines similar to the colossal plans of Tata Iron and Steel Works will do much more good to the Indian Sugar Industry, than 50 of the ordinary ones, dependent as they have to be on the mercy of the cultivators for the quality and quantity of the cane, which cannot be stocked even for a part of the season.

But the defects in Indian Sugar Industry do not stop with cultivation: if the cultivator has done any harm to the Industry, the refiner has done far greater. The methods pursued at present are of very crude type; the cane is crushed generally not soon after being cut, in primitive wooden mills, the juice is clarified by wasteful methods, boiled down to the viscous state allowed to solidify and sold as such under the name of gul. Lehman has shown that "more than one-fourth of the total quantity of the juice is left in the refuse by crushing with crude wooden mills, 20 per cent of the sugar is lost often by fermentation in careless work, and over 18 per cent. of the total juice is lost by underliming." Thus about one half of the sugar is lost in the manufacture, and only one half comes out in the market as output: and even the gul that is prepared contains such a large amount of inverted sugar which spoils the colour of the refined product beyond curing. The manufacture of gul therefore on a small scale by individual farmer has led to a loss both with respect to the quality and the quantity of the crystal sugar obtained from the cane. It is true that farmers cannot afford to work on a large scale, but improvements in the small scale machinery will surely benefit them. The attention that is being bestowed upon the industry by the different provincial Governments is surely fraught with important consequences; specially the work of Mr. Hadi under the auspices of the U. P. Government is noteworthy. He has devised an economical plant for manufacturing sugar directly from the juice on a small scale. Though the method is said to be a great and

ingeneous improvement on the older methods in various points, it cannot be expected to do much for the Indian sugar Industry in the face of foreign competition. The figures worked out on p. 146 have been taken from the results of actual work by that method in the experimental farm at Manjri, and show that the manufacture does not pay so much as the gulmaking. Again the work of Clarke and Banerji (Agri. Jour. of India, 1910 V.) has shown that 19.2 per cent of the sucrose entering the factory in the form of juice was lost by inversion, and that 4.7 per cent. was removed with the scums. Production on a small scale in isolated patches is bound to be attended with far greater loss than in a single large factory worked under expert technical advice.

If such a factory were working, the farmers will prefer to sell their cane to it, rather than undergo the troubles of preparing gul. A large portion of the gul prepared by the small farmer with crude appliances is used for refining to get crystal sugar, though it contains a large proportion of inverted sugar. In manufacturing refined sugar from this gul, about 22 per cent. of the gul is lost, 45 per cent. is sold as molasses, only 33 per cent. of it being recovered as yellowish sugar. If the sugar was prepared directly from the juice without stopping at gul, the loss, would have been obviated, the yield would have been increased, and better quality secured. It should be impressed, therefore, upon the minds of these small farmers or gulmakers that it is a great loss to the country to prepare gul by such methods: they should know that it is bad and injurious to stop at gul: and if they cannot improve their methods, they must co-operate to get better machinery, or send the same to a sugar factory in the neighbourhood. Many of the sugar factories at present refine sugar only from gul or the raw sugar which had been prepared by wasteful methods of crushing, boiling and clarifying the quality of this sugar is always yellow, as it cannot be improved without the use of animal charcoal, against which people seem to have strong objection; but if the cane juice were directly worked up by the factories using best machinery for crushing, etc., the yield would have been increased and the sugar would

be white, without using any animal charcoal, sulphurous acid being quite sufficient.

Moreover, there are many improvements in the refining and crushing for which we must take a leaf out of the foreigner's book. The crushing by wooden mills should be abandoned as soon as possible in favour of heavy iron and steel rollers, which ensure more complete extraction. Even where large factories are not possible to be established, similar smaller mills driven by bullocks would be very useful and economical. They would extract at least 70—80% of the juice, whereas the wooden mills extract only upto 50 or 60 per cent of the juice present in the cane. In other countries, under central factory system, heavy crushing machinery is used, 9 to 12 rollers being common: the residue in the bagasse is re-extracted after being soaked in water: the cane is crushed as such or sometimes after being cut into thin slices by a shredding machine. This method extracts more than 90 per cent of the juice and is very economical. Extraction by a diffusion process is also said to work more satisfactorily as no impurities are introduced except crystallisable sugar, the colloids remaining in the fibre, and as maximum amount of sugar can be recovered from the cane. But it requires an ample supply of water and fuel (about $\frac{1}{2}$ ton of wood for one ton of cane) besides the bagasse being utilised for the purpose. However a detailed study* of the two methods and their suitability to the conditions of India will surely be of considerable importance.

* Since writing this, I came across the latest edition of Mr. H. C. Prinseep Geerlig's masterly book on "Cane sugar and its manufacture." He seems to be in favour of the milling Process. Thus, though the diffusion method gives more regular work, extracts more sugar and gives a purer juice, it requires more fuel, more and also higher skilled workmen, more steam for the heavy slicing machinery, it gives the bagasse in a form less valuable as fuel, it lacks in an adaptability to a decrease or increase in the quantity of the cane to be worked, it leads to great losses on sudden stoppages due to irregularity of supply. Moreover, the improvements in milling machinery have increased its efficiency: 93 per cent. of the sugar in the cane can be extracted with a dilution of 14 per cent., whereas the diffusion process can extract 95 per cent. of the sugar with 25 per cent. dilution.

Improvements in the refining after getting the juice require great attention. The clarification is not done well here sometimes too much or too little of lime being added: the proper liming should be controlled by chemical examination of the test portions from time to time: an inquiry should be made to find out the best agent for neutralising the acidity of the juice and precipitating the albuminoids, *e. g.* lime, chalk, crude soda, or calcium phosphate, etc. Besides these, there are various other points, *e. g.*, determination of the ripeness of the cane for being cut and crushed, separation of the bye-products from molasses, and the general refining of sugar which require the help of a trained chemist, who is conspicuous by his absence in this field in India.

Machinery for filtration under pressure is necessary for the rapid separation of the solid impurities which accelerate the fermentation while evaporating. Double and Triple effect vacuum pans form a necessary though a costly part of the sugar machinery, but its use will soon repay the cost, as it prevents the sugar from charring or turning yellow and increases the yield. These and similar other costly appliances, *e. g.*, large centrifugals, the machinery for drying the sugar in the centrifugals etc., which though comparatively small items can be cheaply and profitably used only by large central factories with the least waste of fuel and power.

The utilisation of bye-products has been always a very important factor in the success of all large industries: and is the chief cause of the rapid industrial development in the Western countries. The molasses on the liquid separated in the centrifugals can be more profitably worked and utilised than at present. It is sold generally by the factories to the rum distilleries, instead of which a small distillery might be set up, if the excise department gives the permission, to get the profits thereof also, by distilling spirits and separating the various important products as is done in Germany with beet sugar molasses. Another better use can be made of the molasses, which may be worked for the sugar by the strontia method to get one more crop of sugar, and then used for distillation. The strontia method of separating the avail-

able sugar will ensure considerable economy, which on a large scale is sure to profit the factory by increasing the yield of sugar, and diminishing the amount of waste material. There is another and perhaps more profitable use that is made of molasses in Louisiana, which should be noticed by all sugar factories. The begasse or the megasee is soaked in molasses and is then given to the cattle as a very valuable food: thus a large price for a useful fodder can be easily secured from the wastages of the factory. The attempt made at the Manjri farm near Poona to utilise the molasses in this way bids fair to be a good success, in utilising the nutrient elements in begasse and molasses which were being wasted, and in bringing a good price.

The megasse is used generally as fuel in India: it can be used for the manufacture of paper also, but it is found that it requires mixture with Bamboo or some other fibrous plant to make good paper out of it. Moreover it can be easily dried and used as a fuel directly, saving other expenses of fuel in evaporating or refining: therefore, unless any cheaper fuel is available, the begasse cannot be spared for paper manufacture, for which there are few chances of success as long as the required chemicals are not manufactured cheaply in India. The ash of the megasse, contains a fairly good quantity of potash and other mineral salts, which can be separated and sold in the crude or the purified form to the soap manufacturer etc. It is used as a manure at present but it can be more profitably utilised for separating the mineral salts present in it. Perhaps the compounds so prepared may not stand the competition of imported chemicals, but will surely command a good market for immediate consumption in making crude soap, in clarifying cane juice, etc., etc.

It has been pointed out that the preparation of gul from cane is very injurious to the industry: but as long as the present conditions prevail, gul will have to be made for direct consumption, if not for refining. So all sugar factories must prepare gul also: and as the season for working cane does not exceed 100 days in a year, to get work for the remaining part of the year, the gul or the raw sugar is to be made and stocked. This raw sugar can be refined after the cane season is over: so, for the present, it is necessary that

the factories must have two plants, one for making gul during the season, and the other for preparing raw sugar and refining it after the season. It was shown that the price of gul should go down if sugar manufacture is to succeed : this could be done by extensive cultivation ; but it may be helped by the factories making cheap and good gul, using all the modern improvements, and selling it at a low price, which will soon bring down the market price also. If the price of gul is once lowered, its preparation will be abandoned by the farmers, who will be forced to send the cane to the central factory (for the conveyance of which a net work of light truck railway can be laid out) : and then the manufacture of sugar directly from the juice may be followed with much facility.

To sum up, the sugar Industry of India has been a historical fact in the past, and though threatened in the present, is not impossible to be revived in the near future. But there are various difficulties ; relative prices of gul and sugar are not very favourable for sugar manufacturer, unless he is a clever hand at finances and quick enough to take advantage of change in the prices : the methods of cane-growing are very backward, so also the methods of sugar refining are very wasteful and need to be considerably improved, so as to yield a maximum yield of sugar and to utilise to the utmost all the waste products. The future of the Indian Sugar Industry does not depend on the farmers or the capitalists, but will be worked out only by a sincere co-operation between the expert agriculturist to take care of the quality and the quantity of the crop, the Chemist and the Engineer to help the most economical management of the Technical processes involved and the able financier to take advantage of the rise and fall in prices of raw and refined sugar. And the failure of the recent sugar factories can be best attributed in a nutshell to the absence of this co-operation. If this co-operation is secured, the wastages in sugar manufacture amounting to 30 or 40 per cent. will be saved, and by the use of modern methods and machinery, with extensive and intensive cultivation, the sugar Industry of India will be put on a sound basis, and will surely be able to keep at bay the rapid inflow of foreign sugar.

FUNCTIONS AND SCOPE OF A MODERN POLYTECHNIC AND TECHNICAL SCHOOL

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In this age of conflicting ideals and numerous distractions, incidental to changed modes of modern life, any new idea, however useful or important it may be, fails to catch the popular mind, or receives but scant attention, unless it is repeatedly dinned into the ears of the public and its importance brought home to them by diverse methods and at different times.

Considerations like these and a genuine desire to contribute my humble quota to the efforts of my more capable and public spirited countrymen, constitute my only excuse for bringing the subject of Technical Education again prominently to the notice of my Indian brethren of all races and creeds. The learned writers who contributed a group of papers for the Lahore Industrial Conference, have lightened to some extent my task by furnishing very lucid definitions of commercial and technical education and dealing exhaustively with the theoretical aspect of this problem. I shall, therefore, content myself merely with making a few definite suggestions in respect to its practical side.

The most notable attempt to appeal to government and to revive public interest in this question during the current year was made by the Hon'ble Rao Bahadur R.N. Mudholkar, the General Secretary of the Indian Industrial Conference, when from his place in the Imperial Legislative Council, he, as a fearless and ardent advocate and apostle of the cause of Technical and Industrial Education, moved a resolution recommending the establishment of one fully equipped Polytechnic College for all India on a grand scale, commensurate with the growing needs of the younger generation, and the magnitude of the country,

for the purpose of imparting instruction in all the higher branches of physical, mechanical and chemical sciences, and their practical applications; *viz.*, in mechanical Engineering including machine construction, Electrical, Marine and Railway Engineering, Naval Architecture, Textile Manufacture, Mining and Metallurgy, and different departments of Industrial and applied chemistry &c. It is a melancholy and regrettable fact that this excellent resolution couched in the most moderate and respectful tone and submitted to the Council at the most opportune time, should have been ultimately rejected by 35 against 17, although it merely asked as a preliminary step that a committee of qualified officials and non-officials be appointed to frame a "scheme suitable for the requirements of the country and capable of being carried out in the immediate future." The Hon'ble Mr. Mudholkar was again the first man in the country to suggest to the Government that the establishment of a Polytechnic Institute for the whole of India would be the most appropriate form that an all-India memorial could take, to perpetuate the memory of the late King-Emperor Edward VII, whose sad and untimely death we all so sincerely deplore. Had this suggestion been accepted funds would have literally poured in from all the nooks and corners of the country and by this time probably the scheme would have been a *fait accompli*. But as ill-luck would have it, this timely suggestion also was not taken up. Under these circumstances, self-help is the only course left open to the people in regard to this question. The princely munificence of public spirited men like the late Mr. J. N. Tata and Sir Currimbhoy Ebrahim on the Bombay side, or Mr. Palit of Bengal clearly points to a moral and proves that much can still be achieved, if joint and concerted action on the part of the leaders of Indian thought takes the place of isolated efforts. If people are determined to help themselves in this matter, they are sure to secure the co-operative of Government.

The problem of Technical education resolves into two schemes:—

(1) Establishment of polytechnic institutes on a grand scale, capable of imparting instruction in all the subjects mentioned above.

(2) Opening of separate schools or colleges on a smaller scale for the training of students in one or more subjects according to the local needs of the Province, District or the city in which they are located.

The scope of a Polytechnical Institute.—I shall proceed to indicate succinctly the subjects which are comprised in the curriculum of a Polytechnic Institute as conducted in the countries of Europe and America or Japan.

(1) *Mechanical Engineering.*—Comprises Machine work; machine design; Power Engines; Researches in Engineering matters; Foundry work; Pattern and tool-making; moulding; Railway Engineering; Naval Engineering; practical knowledge of pumps, cranes, pulleys and other Mechanical powers.

(2) *Electrical Engineering.*—Theoretical and practical instruction in Dynamos, Motors, Machine design; lighting; methods of conducting power stations; telephony and telegraphy, ordinary and wireless; researches in higher electrical problems.

(3) *Chemistry.*—Organic and inorganic; its applications to practical sciences; *e.g.*, mining chemistry, chemistry of coal products, dye-stuffs, perfumes, essences acids, alkalis, varnishes, &c.; qualitative and quantitative analysis and synthetical chemistry; *e.g.*, analysis of oils, colors, fats, waxes, synthetical preparation of commercial products; Tinctorial chemistry; Chemistry of textile manufacture, and natural colouring matters.

(4) *Mining, Metallurgy and Geology.*—Investigations of ores; ventilation, excavation, lighting, sanitation, &c. of mines; application of hydraulic plants for testing, smelting, grinding and assaying of ores; field excursion

sions; qualitative and quantitative analysis of ores and other mineral products; mining law.

(5) *Commercial Education*.—Commercial arithmetic, commercial and international law; commercial geography; Book keeping; foreign languages; commercial morality; correspondence; distribution and places of occurrence of commercial products; political economy; Banking methods; shorthand, account keeping, &c.

(6) *Marine Industries*.—Fishing by improved apparatus; preservation of fish; their artificial culture; aquatic industries; *i. e.*, uses of sea weeds, mother of pearl, shells, coral, &c.

(7) *Agriculture*.—Physics; chemistry; natural history of soils, manures and products of the soils; cultivation; study of agricultural implements, harmful insects and plant diseases; their extermination or destruction; horticulture; sylviculture; sericulture; domestic and dairy animals (methods of their breeding, rearing, &c.); surveying; subsidiary agricultural industries; *e. g.*, butter, cheese, condensed milk-making; Bee-keeping; fruit culture; canning and preserving of fruit; poultry industry.

(8) *Naval Engineering and Construction*.—Comprises arithmetic; Logarithms; elementary and higher algebra; geometry and trigonometry; nautical tables; Inland (River and Lake) and ocean navigation; naval architecture (building of big steamers, motor boats, Launches, steamers and sailing ships); nautical astronomy; ocean meteorology; rules of the road and safety arrangements; how to avoid concealed dangers; uses of the mariner's compass; observation of latitudes and longitudes.

(9) *Textile courses*.—Spinning, weaving, bleaching, dyeing, calendering, glazing of fabrics; calico printing; analysis of dye stuffs and fabrics, and a study of their relative merits; designs of cloth; examination of cotton, wool, &c., manufacture of yarn and cloth by hand power.

The details given above are quite sufficient to give

you an idea of the provisions made in foreign schools and colleges for complete courses in each branch.

Complete and well equipped laboratories, Libraries, museums, and observatories are also the essential adjuncts of the foreign Polytechnic Institutes and are their special features. From the following list you can imagine the vast sums of money spent and steps taken to ensure efficient training :—

- (1) Zoological and Geological museums.
- (2) Museums of industrial, mineral, vegetable, marine and animal products.
- (3) Museums of natural and artificial dye-stuffs and textile fabrics.
- (4) Astronomical observatories.
- (5) Botanical Gardens and Herbariums containing thousands of species.
- (6) Laboratories for metallurgical chemistry.
- (7) Ore dressing Laboratories.
- (8) Assay Laboratories.
- (9) Laboratory for metallography for microscopic examination of metals and other opaque objects, &c.
- (10) Cloth worker's chemical Laboratories.
- (11) Practical dye-houses.
- (12) Laboratories for Researches in applied chemistry and industrial arts.

In a short paper like this, any attempt at completeness is impossible, but I have tried only to be suggestive and have merely indicated the lines on which a Polytechnic in India ought to be started. According to the estimate of the Honorable Rao Bahadur Mudholkar, a Polytechnic worth the name and the needs of the whole of India, will require an initial capital of at least a crore of Rupees, and from eight to ten lakhs a year for recurring expenditure.

The munificent donations made now and then by the philanthropic individuals in the different parts of India to promote the cause of technical education

however laudable they may be, fail to serve the object in view, which can only be attained by a joint and concerted action on the part of the leaders of public opinion, the chiefs of Indian states, Zamindars, wealthy merchants, and the co-operation of the Government. The ambitious scheme of establishing a polytechnic is worth trying and the idea of its final fruition should never be lost sight of. But till that time and even after it becomes an accomplished fact, there is bound to remain in the country unlimited scope for the establishment of separate institutions for post graduate courses and special instruction in the subjects mentioned below, to suit local circumstances and for the diffusion of Technical training. Each school of this kind should be complete in itself as regards its equipment (apparatus, laboratories, museums, and library) and teaching staff for efficient training and the starting of such schools being much less expensive can be undertaken by associations or even by enlightened individuals of ordinary means. Such specialised courses are urgently needed in addition to higher Polytechnic Institutes owing to the vastness of the country and its populations, and owing also to the growing desire in the youths to take to industrial or commercial training. In foreign countries, the main object kept in view by the Government and private institutions is to study the needs and difficulties of each class of students. Hence, there have sprung up Day classes, Evening and Night Schools short courses (which undertake the training of a student in a particular subject within only a few months by attending the classes for only one or two hours daily). These classes are so arranged that they can be utilized by office Clerks, labourers, farmers and others. If this method is imitated, there is ample scope for the opening of separate schools for instruction in the following subjects :—

- (1) Dairy industries (butter, cheese and condensed milk making).
- (2) Bread making.

- (3) Flour and Sugar confectionery.
- (4) Flour milling.
- (5) Tanning and manufacture of leather articles.
- (6) Wood working, *viz.*, furniture, fretwork, cabinet making, ornamental carving, &c.
- (7) Ship building, naval architecture and navigation in general.
- (8) Brewery work.
- (9) Sheet metal work by stamping, punching and other processes.
- (10) Book-binding in all its styles.
- (11) House decoration and construction.
- (12) Dyeing, bleaching, and glazing of fabrics.
- (13) Spinning and weaving of woollen, cotton and silk fabrics.
- (14) Blacksmith's work.
- (15) Silversmith's and Jeweller's work.
- (16) Motor car Engineering.
- (17) Electric lighting.
- (18) Watch manufacture and repairs.
- (19) Shorthand.
- (20) Typewriting.
- (21) Book keeping, and Banking.
- (22) Printing (type and litho) Compositor's work.
- (23) Drawing and Painting.
- (24) Dye sinking, engraving on copper, zinc, &c.
- (25) Sign board writing in all its styles.
- (26) Glass making.
- (27) Photography, photo engraving and other photo-mechanical processes.
- (28) Pattern and mould making.
- (29) Brick and tile making, pottery, &c.
- (30) Sculptor's work.
- (31) Machine knitting and needle work.
- (32) Soap and candle making.

SPECIAL COURSES FOR WOMEN

- (1) Domestic economy and management of the house.
- (2) Cookery.
- (3) Laundry work.
- (4) Dress cutting and sewing and other needle work.
- (5) Household hygiene.
- (6) Dairy work.
- (7) Embroidery and designs for.
- (8) First aid to patients and care of children.
- (9) Elementary drawing.
- (10) Home Knitting.

It is gratifying to find that in centres like Bombay, Calcutta or Madras and in several places in the mofussil, the importance of specialisation is already recognised, with regard to some branches and there is now the need only of the further expansion of this idea.

METHODS AND TRAINING OF INDIGENOUS TRADERS

(PAST AND FUTURE)

BY SIRDAR MADHAO ROW VENAYEK KIBE SAHEB, M.A.,

Indore.

Agriculture has been the main industry in India, from ancient times. The large class of Vaishyas was almost entirely devoted to it. Both the Indian epics, which were consolidated, at least, by the beginning of the Christian era, bear evidence of it. In the Mahabharata, Narada asks Udhishthira "my child, is agriculture and trade (*vārtā*) efficiently carried on in thy realm, by honest people? *Vārtā*, my child," he adds "is the source of happiness to the people." In the Ramayana, Rama asks his brother "Are all the arable and cattle farmers of the realm, pleased with thee? It is true, my child, that on the success of

farming, depends the happiness of the people." The well-known Bhagavatgita says that the duty of the trading caste consists in land and cattle farming and trade. Cattle formed the standard of exchange. The virgin soil, the abundant rainfall and the mild, well-defined seasons, gave an abundant harvest, which satisfied the few wants of the people. Although the artisan and other professional classes such as miners, were included in the Vaishya caste, yet they were not held on an equal level with it, even in the time of the Manusmriti. The reason is apparent. The latter involved manual labour which was looked down upon in the bountiful land of the Indus and the Ganges, while the legitimate duties of the caste, were more dignified. India possessed precious metals and gems, but, as the example of Spain in the 15th and 16th centuries shows, the mere possession of them does not make a people rich. It is by exchanging the things one has with those which he wants, that the commerce is established, and it extends, if the former increase.

Owing to the vastness and the climatic condition of the country, and paucity of its population, the circumstances of its society did not encourage such a state of things as is required for the flourishing of the trade. The rich and powerful kingdoms of ancient Persia and Asia Minor, the influence of the history of which is visible in earlier Puranas of the Hindus, may have had some exchange of commodities with the northern parts of India, but the inducement to develop it does not seem to have been great. It was after the invasion of Alexander the Great that the Indians began to come in contact with the inhabitants of other countries. The establishment of an empire in Northern India, a few years after it, gave an impetus to trade, which was brought into existence by the former event. But owing to the difficulty in transit, only most valuable things, luxuries or rareties could be exported. Even now the overland trade of India is small.

Although India has a long coast line, yet it has few good ports. Coupled with this drawback was the fact that the people living in the interior were contented. These circumstances combined to confine the over-seas trade to the smallest limits. Under the influence of Buddhism, the followers of which possessed great proselytising zeal, foreign travel was encouraged and the fame of India's riches was carried to distant lands. But it was left to their inhabitants to come to Indian shores for trade. When Buddhism began to be subdued in India, its followers emigrated to distant lands. The colony in Java was established there in the 7th century A. D. by Buddhist emigrants, who had to leave Gujaratha, owing to the Hindu revival, which made it difficult for the extremists among them to peacefully pursue the practices of their religion. The difficulty experienced by the followers of the resuscitated Hinduism in re-admitting converts into their fold, prevented them from venturing abroad. The rise of Mahomedanism and the incursion of the Christian nations of the west in the Eastern Seas, destroyed what there was of the Indian shipping, leaving only the coasting trade in the hands of the natives.

Since the dawn of history till almost the establishment of the British supremacy in India, feudalism continued to be the basis of the Indian society, throughout the greater part of the country. It is antagonistic to the increase of trade or the spread of commerce. When it was rampant in Europe, from the fall of the Roman Empire to the formation of absolute national monarchies, in the 15th and 16th centuries A. D., it annihilated trade and put a stop to industry. It was when the monarchies were brought into existence that owing to the requirements of a Court life, and the internal peace, trade and industry were revived. Even so was the case in India.

During feudal times the ideal of the men of the trading caste in India, continued to be what was described

in the Bhagvatgita. They were a pious people, spending their accumulations on charities and in erecting temples. Even in these days the indigenous millionaires of the Madras Presidency, called Nattakoties, (Navakoties *i.e.*, possessors of nine crores of rupees), confined their activities to doing things like those described above. Vaishyas were ignorant of other lands and they obtained advanced instruction only in religion. People kept their savings with them and they lent money to the needy. They managed the carrying of corn from one place to another on the backs of bullocks, herds of which they maintained. They stored corn and grain. Those living on the sea coast where pearls were found, or in the neighbourhood of mines of gems, took these things to feudal Courts, where alone there was a market for them.

There was no state finance in feudal times. When monarchies are established, they want financial stability as it is necessary for the establishment of dynasties. But extravagance is the bane of absolute monarchies. They have therefore to resort to people, who have stored money. Even Louis XIV of France had to borrow from a millionaire of his times. The four great Mogul Emperors, from Akbar onwards, established monarchy in India for over a century and a half. The Marathas tried to do the same, although they succeeded to a small extent and for a short time only. Both these monarchies required bankers to lend them financial aid. Delhi and Poona and other centres, became the home of many such persons. They established their own post, which was resorted to by the common people, as well as by the state, on emergent occasions, and their letters of credit facilitated the transfer of money. They became men of great importance. Their greatness vanished when the monarchies on which they flourished disappeared. Even if the latter had organised their finance, as the states of Europe began to do on the eve of the French Revolution and as Nana Pharnavis tried to do at

Poona, about the same time, the bankers would have suffered the same fate.

This happened in that part of the country which was brought under the sway of the British, who understood state finance. But in lands, which were left to be managed by the Native states, the enforcement of the principle of the *status quo* led to the establishment of several absolute monarchies, independent of one another. They suffered from the evils common to their kind. Their rulers freed from external danger and the burden of armies, indulged in extravagance of every sort, and for the carrying on of their states they became indebted to money lenders. Vithal Mahadeo and his wife Rakhamabai,* at Indore, the Parekhs at Gwalior and Mairalbhaoo at Baroda are among those, who assumed the task in states, under the protection of which they lived and established flourishing commercial concerns in the beginning of the 19th century A. D. and later. The revenues of the whole, or a part of the state, were entrusted to them. They were allowed a commission for keeping an account of the money in their charge. They were required to advance money to the state, whenever wanted by it. They were given interest on the sums thus advanced. Under the influence of British officers, who managed the states during the minority of their chiefs, or by the genius of men like Raja Sir T. Madhav Rao, who was called The Turgot of India, equilibrium was restored in the finances of most of the states and stability was given to them. This freed the states from the necessity of taking the help of money lenders.

Lending money to states was one of the main sources of their income. Various other methods were employed by them to increase it. They financed such trades as were encouraged by the luxuriousness prevailing at the courts of Native states. It is said that the gold-wire industry of Burhanpur, in the Central Provinces, was

* The paternal great grand parents of the present writer.

solely maintained by the requirements of the court of Nagpur, where ropes covered with the wire were used, even to tie horses and elephants. When Bhonsla's territories were annexed, the splendour of Burhanpur too vanished.

The traders conducted their operations in one or more places. Besides their head-offices they established Agencies at various places. Here three kinds of businesses were done. The agencies did the work of agricultural banks, the money order business, like that of the present postal department of the Government, and the banking business.

In order to carry on the business of agricultural banks, grain was stored in two ways. There were granaries above the ground and under it. Those of the former kind, were built with sides of brick and mortar and the head was covered with a roof. The underground granaries were like deep wells, with their bottoms and sides made impervious to water or damp, with bricks or stone and mortar, and their mouth too was covered, a small door being left to take the grain out of it. Here it remained undamaged for years together, if necessary. Every year, part of it was taken out of the granaries and distributed to agriculturists in neighbouring villages for the purpose of their maintenance and for giving them seed at the time of sowing. At the time of the reaping of the harvest, a quarter more than what was given was taken and the whole stored in granaries. If there was an excess, it was exported to places where there was a demand for it. But the traders concerned were bound to maintain as much stock as would be required for all purposes, in case crops failed. The Governments in whose jurisdictions these operations were carried on always covenanted that the amount advanced by the traders would be the first charge on the produce of the agriculturists. These operations tended to the benefit of all. In times of famine the grain storers were able to sell their stock at a lower

price than the circumstances of the year allowed. In the famine of 1877, the father of the present writer, opened shops at more place than one, in Central India, to sell grain at a price much lower than the prevailing rates.

The Hundi, or the bills of exchange business of the traders served the same purpose which is served by the modern money order system. Hundis were given to men who deposited the money and they were encashable at other places. A small commission was charged. The Hundi was a negotiable instrument and it was even generally honoured by a trader other than the one who issued it. These Hundis carried some interest on them and therefore people desirous of investing their capital on interest, bought them which thus did duty for the deposit system of the modern banking business. The Hundis were payable at sight or at some specified period.

The third important business of the traders was money-lending. They lent money on good security, either of land or some other valuables. The interest charged was moderate. Rightly taking advantage of the Zamindari system of the Government, some traders became landlords. Advancing money on personal security alone was not uncommon, yet its incautious use caused loss of capital.

Owing to changed circumstances, almost all these avenues are being closed to Indian traders. The increased means of communication, the prevailing high prices and the fact that owing to the disappearance of other industries, agriculture is becoming the sole occupation of an increasing proportion of the people, the Governments have less anxiety now than formerly, for the realisation of their revenue. They, therefore, do not enter into covenants with traders. These covenants were the sole security for advancing grain and in their absence, traders found it risky to continue their operations. The advent of foreign firms like Messrs. Ralli with enormous capitals and a sound organisation, has set up a competition which is too strong for the scattered indigenous traders to

overcome. They are now being reduced to the position of brokers, in respect to internal trade, as they had been formerly with respect to the external.

The money order and the savings bank departments of the post offices and the currency notes of the Government have killed the trade in Hundis, in which after all there was some risk.

The various land-legislations of the Government, in rayatwari tracts, have lowered the value of the security of land in the money market. Forgetting that the present agriculturists have sprung from the caste of money-lenders the Government is seeking by its legislations to make a distinction between them. The result will be that not only the agriculturists, who will have to look up to Government help for their necessities even, will suffer, but the Government will have a deteriorating class for its tenants. It will be unable to improve the land and consequently revenue from that source will be jeopardised. Already the minute shares into which land is divided, diminishes the desire and cripples the resources of the land-holding classes to improve their patrimony. The Hindu law of inheritance, which is severely socialistic, requires that one class of people shall be replaced by another fresh and more vigorous. The value of land as a security having diminished, the only acceptable security is of precious metals. Their remaining idle causes thus a double loss to the country inasmuch as money has to be sent abroad for their purchase, which means so much impediment in the trade of the country and the metals purchased remain a dead weight. In Zamindari tracts, the application of the principle of impartibility, which is desirable in a great many respects, is closing the ambitions of money-lenders in that direction.

In the central parts of the country an avenue for the employment of capital was opened by the action of the British Government and it is now being closed by its intervention. The part of the country known as Malwa, and some

portions of Rajputana, have a soil, which is extremely favourable for the growth of poppy. The agreement forced by the British on the Chinese, secured a steady market for the opium produced in these parts. Its value was increased and its cultivation spread. It became a common saying in those parts where poppy was grown that wherever there was the smell of opium, Lakshmi, the goddess of wealth, resided there. Lands in which poppy was cultivated yielded a revenue to governments, which was at least five times more than what was received from the next best crop. Irrigation increased and competition in trade became keen. Rakhamabai's agent, whose portrait is in the possession of the present writer, made several voyages to China in the pursuit of the opium trade and brought so much wealth to his master that her house was called "the Rothschilds of Malwa" by responsible British officers. The trade in opium, however, developed a business, which was not commendable. It was a firm of gamblers. Owing to the enormous profits in opium trade, long before the crop was sown, people entered into speculation as to the amount of its produce. Some agreed to supply a certain amount of it at a certain price, at a certain future date which others consented to purchase. Parties suffered or gained according to the turn out of the crop. This speculation suddenly made and unmade many families. But apart from this, the opium trade was profitable to all concerned; even the British Government purchased quantities of the Malwa opium for mixing it with the opium produced in other places under its jurisdiction. The cultivation of opium in China itself and other Asiatic countries had threatened to lessen the profits of the opium trade in India, but the new agreement of the British Government with China has almost sounded its death knell.

The only form of a new industry that has come into general existence is that connected with cotton. But its higher forms, such as the mills, required a knowledge,

capital and organisation, which are not among capitalists. Only those who had come into contact with Western methods, in Bombay especially, constructed them. The rest therefore, took to establishing only ginning and cotton presses, but owing to the want of capacity and understanding and the habit of imitation, it was done in such a reckless fashion as to cause enormous waste of capital, which fact is borne testimony to by the state of these factories in many a town in the Central Provinces and elsewhere.

Owing to the want of knowledge as to how to employ it, a large amount of capital is lying idle in the towns and even villages of Central India and Rajputana. The traditional ways of its employment have either disappeared or at least have become less profitable. The dangers to which ignorant men, with money, are exposed when they come in contact with unscrupulous financiers, was disastrously exemplified by the share-mania of Bombay, in 1865, which has been so graphically described by a veteran financier of the same place. Owing to the folly of his agents, the grandfather of the present writer had to suffer a loss of Rs. 75 lakhs in it.

Apart from the danger described in the preceding paragraph, the allurements of the modern civilisation, which thanks to the increased means of inter-communication, are now penetrating into the most secluded spots of the country would work havoc on the mass of capital. How they ruined some old families on the coasts, will be patent to anybody, who may care to look into their histories. The necessity of giving the monied class a suitable training is becoming a crying need.

The class of indigenous traders is painfully becoming conscious of the fact that the old methods which hitherto used to bring money to it, are not only becoming less profitable than of yore, but in a few years' time they threaten to cease to be profitable. Therefore its state, at present, is one of bewilderment. It is not blind to the fact that

merchants, in places like Bombay, have undertaken and do venture to follow foreign methods of acquiring money, but it is simultaneously, shrewd enough to see that all these undertakings generally require foreign guidance, which it may not be possible or commendable for it to secure. In order that it may have a closer knowledge of the new methods, means should be devised for placing it within its easy reach. At present no means for doing this are available.

The popular education, which is being imparted in India, is not wholly suitable for the purpose. It has eminently succeeded in giving efficient servants to Government and in enabling some to attain renown as scholars. But the indigenous traders do not require distinction in either of these respects. In fact they have not the time to master all the best education that is provided by the Government. A mere smattering of it makes them vain, frivolous and luxurious, as they become able to get a first hand knowledge of the means of enjoying prosperity obtainable in the West. The two Commercial Colleges, started by private enterprise in Bombay, are useful in their own way, but most of the subjects, which they teach, are useful to clerks only. There may be some demand for their products, but their founding is like the erection of the walls of a house without a roof and without a foundation.

What the indigenous traders ought to know is that the days of small capitals and large interests have been succeeded by those in which the conditions are reversed. In the West all undertakings are now on a vast scale. There, manual labour has given place to machinery, the construction and maintenance of which besides being costly, requires technical knowledge and organised management. It is, however, able to produce things much more rapidly and in bigger quantities, than is possible for human labour to accomplish. In India there are many industries which are within the grasp of small capitalists

to undertake without going in for a costly machinery, but if any impression is to be made on the ever increasing trade of the country, large undertakings will be required. This necessitates combination.

India requires two things to better her condition industrially. They are (1) Increase of manufactured goods in its exports, and (2) Decrease of the same in its imports. The trade, which is almost entirely in foreign hands, should also be brought under the control of the indigenous traders. Means by which they will know how to achieve this, are required to be devised. The diffusion of liberal education is one of them, but it should be brought within their easy reach and not hidden behind examinations. But something more than that is needed as the pursuit of commerce has also become a science.

Special schools for the teaching of the trading classes should be brought into existence. Persons, who have received a general education equivalent to the Matriculation examination of the Indian Universities, omitting some of the subjects demanded for it, may be admitted into them. They should teach the principal Indian vernaculars and such modern European languages as English, French and German. A high literary knowledge of them should not be insisted upon: a practical acquaintance with them would be sufficient. Vernaculars should be the medium of instruction in these schools. Besides the languages, subjects like the Political science and Political economy, the Commercial histories of India, England, Germany, Japan, and the United States of America, Commercial law and the theory and practice of Joint-stock Companies should be taught. Schools like the newly started London School of Economics should be the final stage of the former institutions. As the work in this direction will be of the pioneer kind, original thinkers will be required to give it a start and a shape. But unless this is done and a change brought about in the traditional policy of the indigenous traders,

by opening their eyes to the new circumstances surrounding them, now that their methods and training have become antiquated and there is a danger of their falling a prey to the fashionable follies of the young of the West, no number of industrial surveys or industrial conferences alone will succeed in bringing about that degree of commercial prosperity to India, which an enlightening of the class of indigenous traders will achieve.

MODERN CO-OPERATION

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Co-operation is an important factor in evolution. As society grows, arts and sciences multiply, the dependence of man upon his fellowmen necessitates co-operation, self-control, and mutual aid without which the progress of human race is impossible. A thorough and scientific investigation of nature reveals the fact that the real strength and glory of human race are the products of co-operation and not of competition. Herbert Spencer has pointed out that "the degree of co-operation measures the degree of evolution." In fact the writings of such practical naturalists as Charles Darwin, Professor Huxley, Grant Allen and a host of others show that it is the elimination of competition and the development of co-operation—mutual aid—that constitute important factors in the progress of society; without society, life neither of animals nor of men could have developed to such an extent as to resist the many phases of the struggle for existence.

The idea of co-operation, which is the primitive idea of man for mutual aid and succour, is the germ, which is now seen developed in the living force of combination or formation of co-operative societies, in other words, the joining together of individual forces or powers, in the form of labour and capital. Co-operation, therefore, is a scheme by which people throw into a common chest such capital as they can afford or can borrow and undertake to produce on

their account and risk. Production on this plan is called co-operation. This kind of organisation has played, and is still further destined to play such a supremely important part in the development of society that only a few have been able to understand the real significance of this important and powerful factor in industrial evolution.

Co-operation is a principle, which dominates in every part of a social organism. Without co-operation, that is without the interchange of services, individual human efforts cannot achieve much success in any undertaking. But co-operation in its technical sense implies combination for business activity, limited principally to commerce and industry. A Co-operative Society is, however, different from trade union and friendly society. The former is intended for collective bargaining and the latter *Société Mutuelle* is organised for helping the needy, aged and the infirm. It is also different in its aims and objects from Joint Stock Companies. The co-operative society is a combination of persons knit together in membership for the purpose of trade or manufacture, the profits of which are distributed in relative proportions to the capital they bring in, amongst those who are members or associates.

The history of co-operation reveals that its source does not originate from any new discoveries in social science or from any new schemes of any academical men, but from the moral ideas of plain and simple men as Robert Owen and the sturdy common sense of the Rochdale Pioneers. The movement of modern co-operation was set on foot in the year 1844, the year in which the Rochdale weavers opened their humble but now famous "store" and ever since, the movement has had a marvellous and steady growth. The earlier days of the co-operative movement in England and on the continent were days of hardship, failure and disappointment, as is the case in every social movement intended to ameliorate the condition of the common people. But in the later days of the movement when the active support, the will and the sympathy of the members had begun to be exerted, it was one of ever-widening activity and of success. Long before the organisation of the distributive side of the movement in 1844, many co-operative productive or manufacturing

societies were started on Owenite principles in England. But these had only a short existence. The founders of the modern movement of co-operation that combined the moral ideas of Robert Owen and the sterling integrity and the sturdy common sense of the Rochdale Pioneers, laid out their work in such a way as to ensure the weaker members of the population against precarious dependence upon fluctuations of a competitive market, and to protect all members who are industrious and willing to work against the afflictions of poverty. In the words of the Rochdale Pioneers they not only intended to establish a store for the sale of the means of life, but they intended to house their members, provide employment for the unemployed, and own and cultivate the soil. In short they intended to organise and control the power of *production, distribution, education and government*. The result of this has been an "onward" march of co-operators to a definite goal—an economic organisation in which "those who labour shall, and those who idle shall not, eat bread."

The co-operative movement has now become an important factor in the growth of the economic life of nations throughout the world. Co-operative credit is said to have had its beginning after the type of cash credit system introduced by Scotch Bankers. Co-operative Credit Societies can be formed from the standpoint of the producer and consumer. Credit is classified under three heads: Real, Chattel, and Personal correlated to Land, Goods and Character—the Capital on which credit could be obtained. The institutions organised on the basis of these three classes of credit are respectively: (1) the Land Banks of Germany, Austria & France, with the Building Societies of England & America; (2) the *Monts de Piete* of France; and (3) the popular Banks and Credit Unions of Germany and Italy. The Land Banks are the Land Mortgage Banks of the types started in Prussia under the ægis of the Great Frederick for relieving large proprietors. They, however, do not meet the wants of the peasantry and the artisan classes. The second class, *Monts de Piete*, possesses branches all over France and represent the interests of the poor artisan classes by advancing them money at a very low rate of interest. These are in fact

"pawn-broking institutions," but not attended with all the evils of usury associated with them and have practically helped to root out usury in the course of the last century. Similar institutions for the rural classes are seen in Italy in the type of *Monti Frumentarii* and the *Positos* in Spain. The third class known as "Popular Banks" is the most popular dealing with the problems of the peasant population and has aroused a general interest in the course of the last century not only in Continental Europe, where co-operative credit has become established as part of the economic life of the country, but also in England and Ireland, and in India too in the form of Co-operative Agricultural Banks, the object being to relieve the poor agricultural classes from the grip of the money-lender.

These popular concerns are what are called the Co-operative Credit Banks. They are conducted on the Joint-Stock principle and their success is due to the spirit of co-operation and not that of competition. The successful of these were first started in Germany and the best types are known as Raiffeisen Banks, Schulze-Delitzsch and Luzatti.

Raiffeisen's idea in starting an institution on the co-operative principle was for the amelioration of the peasants of his district, who were driven to starvation owing to the exactions of the Jews. The Jews would lend money to these peasants only at ruinous rates as the latter had no security to offer beyond their own personal credit, but Raiffeisen thought that if he could get the peasants to stand together and to guarantee each other they might in that way create a security and with this idea in mind, the scheme for a credit society was first evolved on modern type, the aim being a combination for mutual aid. The distinguishing feature of a Raiffeisen Society was *unlimited liability*, every member being fully liable for all advances made to other members. Great care had, therefore, to be bestowed in admitting men to the society. With the exception of a paid cashier, all the other office bearers were honorary and were elected by members from amongst themselves. Provision was made for periodical audit of the society's accounts, and exhaustive supervision over the management and utmost publicity as to the condition of the banks' resources. The loan granted for

any specific purpose if not utilised for the object for which it was allowed was required to be immediately repaid.

Schulze-Delitzsch Credit Association was first started at Delitzsch in East Germany, in 1850. On the other hand Schulze Societies though purely economic in their aims are more suited for the urban population, artisans and such other folks who draw a regular weekly wage, and who require occasionally a small loan. They are not suited for the agricultural population as are Raiffeisen Institutions, which are entirely rural and co-operative in principle. In the words of Henry C. Devine, the author of *People's Co-operative Banks*, Schulze-Delitzsch Banks, whilst genuinely co-operative in character, the constitution of the societies is less fraternal and more commercial than the other type, and has consequently not exercised a similar educative influence upon their members. Both Raiffeisen and Schulze Societies had but humble beginnings in 1849, and made slow progress, there being hardly two dozen members within the space of twenty years, but by 1904 they began to attain phenomenal success, numbering by thousands! These have not only covered the German Empire, the country of their origin, but gradually spread into Italy, France, Austria-Hungary, Belgium, Denmark, Holland, Switzerland, Sweden, Russia and Finland. In Roumania, Servia and Bulgaria, a few in Greece and a number of them in Cyprus only go to show that the poor people of these smaller States have realised the value of co-operation for their advancement. Several Co-operative Banks can also be seen to-day in Canada, in the Dutch Colony of Java and in Japan. A considerable number is being formed for the benefit of the urban inhabitants and the small cultivators of India. One interesting incident to be noted in this connection is that about the time when Raiffeisen was organising his scheme of popular banks for Germany, people of Madras conceived the idea of forming their Loan Societies known as "Nidhis" in the city of Madras about 1850.

The Luzatti Co-operative Bank is the next in importance amongst these co-operative organisations of Italy. Luzatti the founder was a young Professor of Economics and subsequently became Minister of Finance. These institutions are on the limited liability principle, with a share capital

subscribed only by members and a heavy reserve, serving as a guarantee. They resembled very much the Schulze's Credit Associations, except that in some of the large offices a certain proportion of the working capital each year is earmarked for being lent out on Raiffeisen principle.

In Austria-Hungary, both types are to be found; Schulze banks name first in the field, but fell into considerable disfavour owing to the greed for big dividends while the Raiffeisen Banks received ample support from the State. Since 1886, each newly started credit association has been receiving, as a nucleus to start with, from the State a grant-in aid of 250 Florins and a loan of 2000 Florins, the latter repayable in two years.

The State of Denmark has done a great deal to improve the condition of the rural labourers and to assist the people in the purchase of small holdings, which generally consist of three to ten acres, Government advancing nine-tenths of the purchase-money. The Danish Government also assist these small holders to form a society with borrowing power to the extent of £ 333 out of which loans for a period of one year not exceeding £ 2, s. 15 are advanced to each of the peasant holders at a moderate rate of interest. The advance is, however, granted only for productive purposes. In all countries Agricultural Co-operative Societies, have followed the development of credit banks, while in Denmark, the State itself promoted co-operative production by forming societies to enable the smaller holder to profit by the advantages derivable by co-operation. Thus in Denmark co-operative production by her industrious but comparatively small population, in connection with such industries as dairy farming, bacon-curing and eggs selling, is carried on on a larger scale than in any other country in the world.

A similar development has taken place in Ireland under the statesmanlike guidance of Sir Horace Plunkett and the Irish Agricultural Society. Since 1890 Ireland has been remarkably successful in its efforts to create agricultural prosperity and it owes its inspiration to the example of Denmark. Both the small and large farmers receive substantial help from Government and by the institution of Raiffeisen Credit Banks, the small men are enabled to participate in

the advantages of co-operation. The idea that the small farmer can be made an independent worker by the help of the several credit institutions on modern lines has been put into practice more in Ireland than in any other country in recent times. To-day there exist in that country as many credit banks, supply societies, the dairy, the egg-selling societies, the flax societies as are required to meet the demands of the people.

England was rather late in coming into the field of modern agricultural co-operation and this may, to some extent, be ascribed to the condition of the land problem of that country due to the relationship between the landlord and the tenant, the big landlords taking the place of rural societies towards their tenants. Several proposals for the working of agricultural co-operative banks have been set on-foot with the passing of the new Small Holdings and Allotments Act, with a view to restore the small agricultural labourer to the position of independence which he had occupied under the old village community, and which was destroyed by the Inclosure Acts of the eighteenth and nineteenth centuries.

The late appearance of modern agricultural co-operation in England may be accounted for by the early failures of co-operation in connection with land, such as Robert Owen's community at Queensland (1840-4) and the Assington Farms in Suffolk which, though still in existence, practically do no work. The failure of their attempts to apply co-operation to the ownership and cultivation of land in those early days had long discouraged the growth of the movement.

Co-operative society may be organised from the standpoint of the producer as well as of the consumer. The numerous concerns like boot and shoe societies in England, builders and decorators societies of France or labour societies of Italy are organised on the basis of "labour co-partnership." In Germany, the labour co-partnership is non-existent as the producer seeks help from the town credit bank. The labour co-partnership in Germany, in the absence of town credit banks, helps to bring the members together under one roof and educates them in controlling a modern business. In

machine industries, co-partnership is gaining strength in England and the strongest of the English co-partnerships are to be seen in building and furnishing industries, leather industries.

Co-operative Stores from the standpoint of the consumer perform the function of collecting and distributing to the members their necessities in various departments of life. The best types of these are seen all over Great Britain, but they are largely supported by her progressive working class which has been brought into existence as a result of the Industrial Revolution during the last century. The profits of their labour, secured through the agency of Trade Unions are laid out to advantage on these Co-operative Stores, through which they in turn derive untold benefits. This working class which comprises over one-fifth of the population of Great Britain is directly interested in the financial management of one or other of these store movements. Thus in Great Britain the development has been more in the direction of co-operative stores, while in Germany and other Continental countries it has been on the lines of co-operative credit societies.

I have presented to you but a general description of the principles of co-operative credit societies in the foreign countries touching on the organisation and working of those societies. I shall pass on to the circumstances that led to the formation of co-operative banks in India.

It was the indebtedness of the ryots due to the usurious rate of interest charged by the money-lenders and the exactions of the Jews in Germany that made the philanthropist Herr Raiffeisen, the Burgomaster of Hammersfeld in the Westerwald, to propound a scheme, to relieve the peasants in his district, in the form of personal co-operative credit societies. It must be said that the principles underlying his scheme take after the model of the cash credit system that has been introduced into Scotland. Both businessmen and agriculturists have built up large fortunes in their country by the accommodation obtained through this system. A large number of small holders of land in Germany and the other Continental countries became independent farmers through the help of co-operative credit societies. Seeing

the success attained in those countries amongst the small holders of agricultural population, although they do not constitute the bulk of the population as in India, the Government of Lord Wenlock in Madras deputed (Mr.) now Sir F.A. Nicholson, K.C.I.E., to enquire and report on the feasibility of starting credit unions for the benefit of the rural population. It is unnecessary for me in this connection to deal with the history of the different classes of holdings in India. Suffice it to say that it is the class of peasant proprietors, who hold land of five to sixteen acres that are affected by seasons of drought, and having no resources to fall back upon, often get into the clutches of the usurious moneylenders. It was for the relief of this vast body of poor cultivators who in fact constitute the bulk of the Indian village and who required help from the State that the movement was conceived. Let us notice what help the State rendered to these classes before the Co-operative Credit Societies Act of 1904 was passed. The oldest that we can trace and which served the purpose of relieving the peasant population from the exactions of the village money-lender is what is known as "*Takkavi*", once so common all over India. Under the *Takkavi* system, Government advanced loans to the ryots for meeting the immediate needs of the cultivation season, which in course of time got into disuse and developed into the Land Improvement Loans Act and Agriculturists' Loan Act. Both these Acts were the means of rendering help to the ryots during times of pressure and the Government became in fact the ryot's banker to lend him money at a moderate rate of interest.

The indebtedness of the rural population dates back to the period of early British administration, if not to periods anterior to that, when certain changes were introduced for the payment of the land revenue. Instead of the revenue being allowed to be paid in kind as was the custom in pre-British period, revenue was demanded in coin. This change was, no doubt, influenced by considerations of the requirements of a progressive and ever-widening administration, but was by no means suited to the needs of the Indian peasantry. Besides, it upset the economic life of the community which had been obtaining for centuries in this

land. The country had already suffered from a devastating war, and the immediate change of money assessment made the ryot to bring in more produce to the market to find sufficient cash at a time when the amount circulating in the country was insufficient to meet this new demand. The ryot was compelled to sell more produce to obtain sufficient money to pay his revenue, which occasioned a glut and brought down prices. Two circumstances also added to straiten the position—one, the advent of the "*Sowcar*", who, with his desire for aggrandising, made his fortune on the difficulties of the rural people. It is believed in some quarters that the troubles of the peasantry so far as this presidency was concerned was the introduction of a new Revenue Settlement during the *regime* of Sir Thomas Munro. Although it was with the best of intentions that this system was introduced yet it had a worse effect than the fiscal changes wrought almost about the same period, in destroying the village communes managed on true democratic principles, and which all along stood as a bulwark against outside aggression. The unity and solidarity of these village communes were broken, bringing in its train the spirit of Individualism of modern days, which resulted in ryots being thrown on their own resources for finding funds which they were all along obtaining from their communes. This outside help they were able to get only from the village usurer, who not infrequently charged 40, 50 & 60 per cent. interest for the sum advanced, and as a consequence, land passed into the hands of the moneyed people and the original owners were reduced to the position of cultivators of the soil under them.

It is to help the poor peasants in times of need that credit unions have been started in India. In Europe the credit unions have been the product of private initiative, whereas, in India it is the work of Government as in several other matters. The enquiry and investigations of Sir Frederick Nicholson as to the feasibility of starting credit unions in this country resulted in the enactment of the Co-operative Credit Societies Act of 1904. Under this Act, Societies in India are divided and registered into three classes, Central, Rural and Urban. The law provides that the liability of the rural societies shall as a rule be unlimited and

that of urban limited. The number of societies is rapidly increasing and the total number of membership has increased from ninety thousand in 1906-07 to one hundred and eighty-four thousand in 1908-09, the capital from twenty-three lakhs to eighty lakhs and the expenditure from twenty-nine lakhs to eighty-four lakhs. These are, no doubt, important figures, which only go to substantiate the opinion expressed by such an eminent authority as Mr. Wolff that nowhere has co-operative banking taken such a deep root so quickly or made such progress in its earliest stages as in India. This is not to be wondered at in the case of a people who have for centuries built up communal organizations. The development of the "Madras Loan Societies" or "Nidhis" within a comparatively recent date, without any aid whatsoever from the State may be cited as an instance to prove what the people are able to do in the matter of establishing credit societies more or less on a popular basis. Nay, much more must be the beneficial effect when the movement receives the cordial support of Government.

I have so far dealt with the various phases of Co-operative Credit Societies which have been developed as an aid to agricultural improvement. We have also noticed whether it is in Germany, the most aristocratic and individualistic so far as the *clientile* of the Government is concerned—France, Austria-Hungary, Italy, Denmark or any of the other smaller States on the Continent, in Ireland and at the present day in England too, that the formation of these credit societies has served many useful purposes besides supplying capital for the working of the agricultural holdings.

The banks which were originally started for the artisan, small trading and professional classes gradually extended their operations to the rural population and were worked on the principle of unlimited liability, thrift and the productivity of the loans granted. *Thrift* was the back-bone, without *thrift*, there was no credit. So, the moral fibre of the poor men became strengthened particularly of those who sought help from these institutions. Gradually there has grown up a band of poor men realising the value of self-help and able to render most valuable help to the extension and development of these societies. One of the grand principles, which

the learned Doctors Schulze-Deltizsch and Raiffeisen tried to inculcate on those for whom these popular institutions were founded, is that to help the poor and the weak, the poor and the weak should be employed, and not those of the "upper ten", who naturally spurn the poor. But to the originators of modern co-operation State aid was not unwelcome. Since the establishment of the Continental co-operative credit societies with their State-aided banks of finance there have grown up two classes of people, one in support of State Aid and the other against it. Whatever may be their arguments for or against the help rendered by Government in this direction as regards their own country, it cannot be doubted that as far as India is concerned, the Government could not extend its aid to any more useful purpose than helping to establish co-operative credit institutions. The help rendered by the State in Europe has been the means of starting thousands of these institutions and were the means of relieving millions of peasants from the tyranny of money-lenders, and which have taught these people thrift, punctuality and honesty. These are even more urgently needed in the case of the poor and thriftless peasants of India and the help which these credit institutions expect at the hands of Government is solely for the purpose of enabling them to own Central Banks for financing the smaller credit societies which are so rapidly developing into healthy institutions giving ample promise of becoming in their turn feeders of a parental institution. "Credit primarily needed by the ryots in India", in the words of Sir Frederick Nicholson is continuous small loans for current needs including maintenance, cultivation expenses, purchase of stock, payment of revenue, rent and the like ; secondly, *long term loans for permanent improvements.*" This desideratum is difficult to be met without proper financing agencies, and especially in a country like India where the poverty of the peasants is proverbial, the loans granted, unless it be for a long term and for a lower rate of interest than that usually charged by sowcars, they will not serve the purpose for which they are granted.

It is to meet these difficulties that the idea of organising Central Banks to help the establishment of a number of

village societies has been conceived. In England practical philanthropists have formed Central co-operative Agricultural Banks for the purpose of financing such credit societies as are formed. In a recent discussion on the subject of establishing credit banks to assist the small owners of land in England Mr. Howard Frank, of Messrs. Knight, Frank and Rutley, a leading firm of land and property agent in Great Britain suggested the desirability of instituting a Central Credit Bank with a State guarantee behind it. Mr. Frank asks why should not each County put aside a portion of the money subscribed to King Edward VII's Memorial Fund for this purpose? If England with all its civilisation and capacity for business organization should require direct care and supervision of Government for developing credit unions for the benefit of her rural population, does not India with her traditional difficulties stand in greater need of the same to a greater degree? *Laissez faire, Laissez aller!* This is, no doubt, a good maxim; but the co-operative movement which is but in its infancy is likely to fall into discredit and disorder, if it is not brought directly under governmental control at least for a time till it can get over its initial trials.

What is necessary, therefore, to achieve success in the movement is for the Government to afford ample facilities for its working. Reports of the existing societies in the various districts in India show healthy signs with prospects of future development. But, for greater expansion, a plentiful working capital is essential and for this purpose Central financing agencies are being established in the various Provinces in India. In the Madras Presidency the work of financing the small societies is undertaken by two Central Banks established at Madras and Salem, respectively. In Burma, the Bank of Rangoon is doing this work. In the United Provinces loans have been raised from the Joint Stock Banks, while in Bengal a co-operative union of some 50 societies is formed. In Bombay the scheme for the creation of a Central Bank with a government guarantee is awaiting the sanction of the Secretary of State. These are, undoubtedly steps in the right direction, full of promise for the future. The movement is bound to play a consider-

able part in the economic development and well-being of agrarian India if in addition to the establishment of Central financing agencies, steps are taken to effectively organise and supervise these infant institutions.

In some quarters it is asserted that the State-aid is likely to hamper the incentive for people to exert themselves, while on the other hand those who are in favour of it "claim that the diffusion of cheap credit in both town and country districts is of such immense social utility in counteracting usury, encouraging industry, and in increasing production, and so beyond the power of private capitalists that in the interests of the whole community, the State should support it, even if occasional losses result." Although co-operation is still in its infancy, the instances of Burma and the Punjab are examples of private capitalists bringing in their hoarded wealth for productive purposes in the direction of these societies and to make them free from the control of Government.

It may not be out of place, however, to cite practical methods of State aid in existence at present in some of the civilized countries of the world to render help to the agriculturists. I shall quote the example of France: The Banque de France has about 150 branches all over the country making advances to the peasant and the small trader, even in the remotest Provinces enabling these classes to secure money on moderate terms. With a view to help cultivators to get loans on easier terms, the bank introduced a few years ago an entirely new system of credit, known as the '*warrant agricole*' by means of which cultivators were able to borrow on the agricultural or industrial products which result from their labour, these products meanwhile remaining in their charge. Bank of France carries on business and discounts such small bills from the peasant population that in one year it discounted nearly 3,000,000 bills of less than £ 4 in value, more than half of which were of less than £ 2.

Both the Imperial Bank of Germany and the Central State Bank of Prussia do a great deal to promote the welfare of the humbler and middle classes; the Central State Bank of Prussia was established at Berlin in 1895 as a

Central institution for credit banking operations on behalf of the co-operative societies in Prussia.

State-aid has thus no doubt done a great deal in promoting co-operative movement abroad, but it must also be recognised that it had been preceded by organised voluntary effort on the part of the people. It is only by combined effort, superior organisation coupled with better education that the Continental cultivator, has been able to become a superior man as compared with his *confreres* in England, Scotland and Ireland. They found that combination in the development of the land problem was very necessary for the economic well-being as any other class engaged in other industrial pursuits. Combination amongst them is a practical thing of today either for purchasing their agricultural requirements at the cheapest rate and of the best quality or in ordinary farm operations, to secure the use of the latest agricultural machinery and appliances or for the sake of obtaining, by mutual support, the credit required for bringing in fresh working capital for the purpose of effecting any new development in their business.

Prof. H. B. Lees Smith, M. P., in his book on "Studies in Indian Economies," observed :—"The great test as to whether the people of a country were adapted to self-government was whether they, apart altogether from what the government did, did of their own inherent genius create self-governing institutions. I cannot think of more important service to be done in the interests of the community than promoting the growth and enlarging the scope of co-operative credit societies."

The growth of the movement in India in the last few years under the fostering care of Government is exceedingly encouraging. In the last year alone the total number of the societies established has been doubled and the number is fast increasing. The work done so far and the future development of the movement are so encouraging, that the proposals of the Registrars for the amendment of the Co-operative Credit Societies Act, which came into force as Indian Act X of 1904 have been received with cordial support by Government. It is, however, hoped that the movement, which owes its growth entirely to the work of the officials of Government,

will begin to receive the sympathy and support of the public and that the principle of co-operation will be applied to all kinds of social and economic movements, whether productive or distributive, with the result that it will bring together men who have previously had no dealings with each other and that it will be clearly understood that self-help and mutual aid are important factors in the working up of a brotherhood between man and man. Co-operation will be applied as Emerson has pointed out to make our house-keeping sacred and honourable, to raise and inspire us and not to cripple us. Economic co-operation has supplied the modern world with its marvels. If we find that our world is inert, hard, mechanical or soulless, it is only because we do not find active and energetic men behind the machine. There we have the motive power in the shape of millions of lives—lives of men, of women, and of children. Utilise this motive power in the form of co-operative ideal to this modern life of ours and it will no longer be a mere machine but a living force of which we will ever be proud. Co-operative ideal is great enough for a world created by economic co-operation. Discourage an elaborated private life ; Simplicity in the home life leading to a rich, stately and noble public life, should be the basis of co-operative ideal, such was the dream of the wisest and best minds of ancient times.

OUR JOINT-STOCK COMPANIES.

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The above title perhaps requires no apology. Those, who are aware what an amount of money

is lost every year by young and inexperienced persons, wholly or partly ignorant of the different manners of joint-stock investments and their promoters, will readily admit the necessity of an attempt of this kind. This paper does not at all pretend to be exhaustive, nor does it try to teach what hard-earned experience alone can teach in this matter. But apart from these two points, there is a

large field of knowledge in the matter and manner of investments of various kinds, which can be profitably acquired second-hand. I have attempted in this paper to place briefly before my audience some useful hints, suggestions and warnings which if well understood and strictly followed in practice, will not only save an investor from many a pit-fall, but will show him how to invest his savings with the maximum of advantage and the minimum of risk.

The various investments of an individual go to form the working capital of his country and contribute to its material prosperity. The prime object of India's industries should be to supply India's own needs ; for it is an economic scandal that a country like India, with her vast and varied resources, should be a large buyer in foreign markets. If her industries were properly worked, foreign imports will automatically fall off. Her principle customers, then should be the population within her own borders, and her secondary customers should be foreign nations to whom she will send her surplus stores. India's agriculture is magnificent ; but it is her manufacturing industries that have yet to establish their greatness. To achieve this object successfully, immense capital is required and this is possible only when Joint-stock Companies are started to finance them. Consequently if the savings of the individual who is to help in contributing to the funds of these Joint-stock concerns be lost by his investing them in concerns not well thought-out, not only is it a great blow to the individual who invests them, but it is a great loss to the country at large. Besides, if this loss be caused by the failure of one concern, it creates a general panic and distrust, and thus further serves to contract all capital and credit of that country at least for sometime.

Fortunes are lost more easily than made. It proves that to some extent it is easier to make money than to keep it. However, argus-eyed and careful a man may be, about the manner of his investments, he is sure to lose, sometime at least a part of his capital. The inherent vice of all kinds of property, ways to fluctuate, cannot be avoided and is responsible

for such losses on many occasions. Some of these fluctuations are due to natural and other accidental causes which cannot possibly be foreseen. Thus, for instance, a man invests his money in land, which in his opinion is the safest of all property. He then erects chawls and other buildings, which are at first paying. But after some time to his great dismay many other chawls and buildings are erected in the neighbourhood and keen competition brings down the rent. Thus, the investment depreciates in value ; sometimes the buildings or the locality becomes unfashionable or becomes uninhabitable for certain reasons and so the value falls. Taking a contrary case, a person purchases a piece of land, never thinking that it will ever be more than an ordinary investment. But a time comes when the same land is required for some public purpose, such as roads, Railways, and then the value mounts up so quickly, and so much, that he gets many times the amount he originally paid. Thus, some persons, who had many years ago purchased land very cheaply in the neighbourhood of Bombay, reaped a rich harvest when plague broke out in the City and drove its rich population out to take shelter in the suburbs. The plots were sold at prices, which, at the time when the land was bought, would have been considered quite fabulous.

Similarly, in the case of other kinds of property, be it gold, silver, stocks and shares, this tendency to fluctuate in value always more or less exists. In fact, fluctuation is the very nature of all investments. So it will be evident that the loss arising out of this very nature of property cannot be avoided. But this unavoidable loss is no argument why a man should not take care of his money any more than that he should not take care of his health, because he suffers in spite of all his efforts to keep himself in good health. On the contrary, men should be more anxious about their savings than about their earnings, for what they have already earned is theirs much more than what they are going to earn. But strange to say, the case is quite the contrary. Men neglect their savings which they have earned with great pains, and run after new earnings, forgetting the well-known saying that "a bird in hand is worth two in the bush."

Since the British Rule, the people of India are making a new departure in starting joint-stock concerns and investing their savings in them. They were originally quite strangers to the principle, on which such concerns are worked, and even now they have not fully grasped it. But this was to a certain extent, the case even in European countries, when the joint-stock system was first introduced and where it has now far advanced. This will be quite evident from the manner in which the laws relating to its working have often to be changed in order to bring them more and more into line with the present requirements of the people at large. Besides, the occasional failures, of huge joint-stock concerns in those countries, still shew the defects in the manner of their working.

But for such defects in its working, the principle of joint-stock itself cannot be condemned. As civilization advances, the necessity of mutual dependence of individual upon individual, society upon society, and nation upon nation for common benefit becomes more and more self-evident; and the joint-stock system is one of the necessary results of this interdependence between man and man. It enables man to unite and create a tremendous force, and by means of this force to supply his various wants more easily and cheaply and to remove even the most stupendous natural obstacles in his progress. Without the extensive co-operation it offers, it is not possible either for individuals, or for private firms, however rich, to finance and carry out successfully large enterprises such as Railways, Telegraphs, Steamship lines and other public works. By its means the people of different places and even of different countries, without ever knowing or seeing one another, co-operate for common object. The concerns thus started, do not die, like other concerns of purely private nature, after a few years' existence, but last for generations and even for centuries. They can employ the services of the best men available. Any man, whether rich or poor, and of any caste, creed or colour, can have his share in such concerns. Thus, joint-stock is a vast

Joint-stock a new departure in India.

Joint-stock is the result of civilization and is co-extensive with it.

co-partnership of commercial intelligence and capital of any country or countries. In short, this principle of joint-stock brings out the best part of man's nature, and is coeval with civilization. By its very nature, it has no place in primitive societies in which a man is the worst enemy of his neighbour. That nation only which is very highly civilized, will know how to work this system to the greatest possible advantage of all.

As joint-stock is of recent growth in India, it will be many years before the people are able to thoroughly grasp and work it successfully. Consequently many failures must happen in the beginning, but each failure will bring its own lesson, and will show them how to avoid future mistakes. At present some people who are "once bitten and twice shy" are alarmed owing to the failures of some concerns and condemn all the joint-stock companies alike. But these prophets of evil are under a double delusion. In a word, they greatly overrate the evils of failure and they also greatly under-rate the vast amount of prosperity which the system has already brought to this country and which, if they only open their eyes, they would see around them. It is not the principle but the method which is faulty. The fact is, that the shareholders, who thus suffer and condemn the system are themselves to blame and this will be made clear later on.

It has been stated above, that the system of joint-stock has nothing in it to blame. It is the particular method followed in the working of it, which is sometimes faulty and which is mainly responsible for the breakdown of many of our companies. Like the different wheels of a clock, the joint-stock system depends, for its smooth running, on the loyal co-operation of many different sets of men, such as Shareholders, Directors, Agents, Auditors, and others, and if even one set be dishonest, self-seeking and unscrupulous and were to make its own interests separate from those of others, the whole concern must come to a deadlock. But if they all be men of honesty, intelligence and character and understand and fully exercise the ample powers that are bestowed upon them by law; if shareholders, directors, agents and others thoroughly understand and insist upon their rights and perform their

duties, then very few concerns will ever fail and spread so much havoc around us, as we see, they do now-a-days. In these days the protection of person and property, is left to

The shareholders must be watchful. the Government but the rights and privileges must be taken care of by every one for himself. If the shareholders choose to remain indifferent and ignorant, and take no intelligent interest in the management of the concerns, in which they put their hard-earned money, so long company promoters will not fail to profit themselves at their costs.

Many persons seem to entertain very peculiar notions about the joint-stock system. They expect to double or quadruple their capital in a very short time. They think that it offers a short cut to wealth and prosperity without much trouble. Thus without any serious inquiry they choose the most shaky concerns which promise them the highest dividends. But their greed costs them heavily in the end. Not only do they get no dividends, but they lose their capital in the bargain. For instance, sometime ago, a Company was floated to undertake the cultivation of sugarcane. The shares were of Rs. 25 each and were to be fully paid up in the course of the year. The percentage of profits expected was very large, and was proved by clever manipulations of figures to the satisfaction of the intending subscribers. There were two kinds of shares, Ordinary and Insurance. A person who purchased only one, Insurance share of Rs. 25 in the company, secured, on his death, for his legal heirs, the premium of Rs. 500. Advertisements of the concern appeared largely in all the leading newspapers and the shares were speedily taken up, especially by the poor middle class. After sometime, however, the concern failed as it was bound to, partly owing to the false calculations and mainly owing to the dishonesty of the chief promoter, who was afterwards sent to jail. The great pity of it all, was the loss of capital and consequent distress. Now, if the shareholders, before they actually subscribed for the shares, had really convinced themselves of the truth of the statements made in the prospectus, on their own account, and had taken pains to see whether the said profits were possible in India, even though they were so

in other countries, and also if they had *studied the Ordinary Laws of Life Insurance*, they would have easily found, that the statements made in the prospectus were considerably exaggerated.

Even in England, during the speculative mania of 1720, over the South Sea Scheme, a number of wild cat joint-stock enterprises were started; one of them was for extracting silver from lead; another for importing assese from Spain; a third for a wheel for perpetual motion and to crown all, there was a company for carrying on an *undertaking of great advantage of which nobody was to know at the time what it was to be* but in which a subscriber who deposited £ 2 per share was to be entitled to £ 100 per annum !!! Even this prospectus attracted, in five hours, deposits to the amount of £ 2,000 with which the projector decamped!

It is, therefore, absolutely necessary for intending subscribers of any concern to spare a few minutes, to discuss the whole concern in a truly businesslike fashion and to ascertain the various statements and calculations given in the prospectus before actually underwriting the shares. But after the shares are subscribed, it is equally their duty to watch the concern in its various stages and to scrutinize the balance sheet and other documents relating to the business. It does not require much time but if they have not that much time or inclination even, then they had better not subscribe shares.

Speaking generally, the majority of the Shareholders in India, either do not know or rather do not care to know the nature of the concerns, in which they invest their money. Many of them do so to please others. Some one, who undertakes to get the shares subscribed, for a certain amount of commission, comes to a subscriber and places the prospectus before him. He draws a rosy picture of the future prospects of the concern, gives facts and figures, which to a lay and inexperienced person appear quite convincing. If he is still unsuccessful, he appeals to the subscriber's patriotic feelings, saying that he must help to start the industries of his country. He holds out prospects of large profits and thus appeals to his greed. He brings letters of introduction and recommendations from

friends and relations, who more often than not, have themselves a hand in the newly projected concern, and whose request, it becomes very hard for the would-be subscriber, to refuse. Thus, closely besieged, and himself unable to judge, he falls an easy prey and at last purchases some shares either for the regeneration of his country, or to please friends or to satisfy his own greed. Sometimes he is easily convinced even though as a matter of fact he does not at all understand the ins and outs of the concern. Sometimes, he subscribes, only because there is some one who has purchased some shares and in whose judgment he has full faith. Such is the real description of most of our shareholders, who put in their hard-earned money in many of the concerns. In short, those who really understand anything of the business and who decide on the merits of the new schemes by their own judgment are very few in number. It is not an easy thing to decide this. It requires some technical knowledge of facts and figures, which have to be collected at some pains and even after they are collected, it requires some amount of patience and time to come to a right conclusion. Few men have this patience and fewer still, the inclination.

But this is not all. Even if it be proved that the concern

The promoters of a concern.

is likely to succeed, it has yet to be proved that the persons who undertake to run

it have the character, capacity and the necessary business-ability to carry it to success. This is again not an easy matter, nay, it is on many occasions more difficult. The facts and figures necessary to find out whether a particular business will be a success, can be obtained from various sources, such as books, Government reports of exports and imports and from Industrial and Technical experts. But as regards the honesty and business capacity of its promoters, who is to give the information? And even supposing it is obtained, how can it be considered as absolutely reliable? Here again, the subscriber is at a disadvantage; but as this knowledge is indispensable, he must act upon his own resources and make the best of the knowledge he so obtains.

It will not be out of place here to describe briefly

the methods sometimes followed by promoters in starting concerns. They make a grand appearance before the public by having on Board of Directors a large number of gentlemen with big high sounding names. A large temporary office is opened and the business is advertised on a very large scale in all the leading newspapers. The list inviting the subscriptions of capital is kept open for two or three days only, thus leaving no time to the intending subscriber to collect the necessary information. In order to assure the public, it is given out (though, sometimes, it is not the truth) that the Directors, the Agents, and their friends have, between themselves, already taken up one-half or two-thirds of the share capital, and as a favour, the rest of the capital is left to be taken up by the public. The whole thing has the appearance to show that the promoters are fully convinced of the success of the concern. The public is asked to apply sharp for the shares in order to avoid the bitter disappointment of getting no share in such a highly profitable concern. Great is the hurry of every one to be first in order to secure some shares. Applications after applications pour in from every side, and sometimes the rush is so great that the shares so reserved for the public are subscribed many times over. For instance, if the capital be divided into 10,000 shares out of which 5,000 shares are taken up by the promoters and their friends and the remaining 5,000 are issued to the public, applications for 25,000 shares are sometimes received. Consequently, great is the disappointment of those who get fewer shares than they apply for, or do not get at all. Even before the first call is made payable, the shares are sometimes quoted at considerable premium. Here is then the opportunity for the directors, the agents and their friends to transfer most of the shares nominally held by them, at a considerable premium, and to quietly pocket the profit. By this fine *coup de-etat*, the clever directors and agents make the public take up almost all the shares, everyone who gets them thinking that he is one of the fortunate few.

Sometimes, in the prospectus of a Company, every blessed little thing that is in favour of the concern and its promoters is blazoned

The Prospectus.

forth in big type, while anything which may not be so favourable, is printed in small type, and is relegated to some remote corner in order that it may escape attention. It is, therefore, in the interest of every one who wishes to protect himself, always carefully to read everything written in small type and to note it down.

When reading the prospectus, the intending subscriber should first direct his searching criticism, not to the directors, though their names appear first, but to the agents, whether Managing Agents ; managing directors ; or secretaries, treasurers and agents, or by whatever other name they may be called in different companies. The duties they generally perform are practically the same in all concerns. Their character is the chief thing. Their ability to run the concern successfully, though it ought to be great, is of secondary importance only. If they are rigidly honest and fully conscious of their responsibility and consider themselves trustees of public money, there will be no harm to the Company. Their honesty is placed first, because, if they be honest, they will try their best to supply the necessary ability. Thus, the greater their honesty, the better will it be for the shareholders. But if they be dishonest and self-aggrandizing by nature, the greater their ability, the worse will it be for the poor shareholders. It is a well known thing that some dishonest agents, while making purchases of coal, cotton and other kinds of raw materials and provisions for their mills, factories and other concerns speculate largely in them and if there be loss, put it to the account of their concerns and if there be profit put it into their own pockets. In this way, they speculate at the cost of the shareholders. They always gain, while the Company always loses in this kind of speculation. In years of prosperity when large profits are made, sometimes even as much as cent. per cent., these dishonest agents would never allow their poor shareholders to enjoy a proportionate share of these profits; while in bad years, they get a very good excuse to cover their dishonesty, even though good concerns pay dividends. They try their best to attribute the fall or loss of dividends to the bad season and other extraneous causes and never to their dishonesty.

Again there are some agents who would try to make the concern their private one by purchasing it very cheap. To achieve this end, they purposely mismanage the concern, and gradually bring down the dividends year after year, until it entirely disappears. In order to do this sooner, they start all sorts of rumours about the failure of the concern, the poor shareholders are alarmed and hastily come to the market to sell. The price goes on falling gradually, and these very agents, through their own nominees, purchase the shares at a very low price and ultimately make the concern their own. Thus, after it has changed hands, the same concern, without any apparent reason, goes on showing profits.

Thus, it will be seen how very necessary it is, to minutely examine into the character of the agents. Without honesty in the agents, the concern is doomed to failure. As shown in the beginning of this paper, joint-stock system is the outcome of civilization, and civilization means higher honesty and better co-operation.

Next in importance to the Agents, comes the body of men called the Directors. The object of the law in having the Directors, is to have a consultative and a directive body of men, who are remarkable for their independence of character and business capacity, and in whom the public have implicit confidence. It is not absolutely necessary for them to possess the technical knowledge of the business over which they are going to preside ; but it is absolutely necessary that they must be both men of business in the ordinary sense in which we understand the word, and business-like in addition to the abovementioned qualifications. They must inspire confidence in both the agents and the shareholders, and hold the balance even between them. It is their duty to keep proper check on the accounts, to carefully make the contracts, to consider and pass large schemes and to have a watchful eye on the income and expenditure of the company and in every way to manage it successfully.

But unfortunately such directors will be few everywhere, much more so in the country, where their services are more indispensable, since our shareholders do not quite understand their own interests.

Roughly speaking directors can be divided into three classes : The first class Directors are generally men of good character, greater influence and more or less possess the knowledge of the technicalities of the business over which they are called upon to preside. They are always anxious to keep up their reputation and credit in the business world. They will never lend their names to any scheme before convincing themselves of its success. They keep the agents in proper check. Thus they are of great service to the concern. The public feel great confidence in all their concerns, which consequently stand at a very high premium. It is sometimes four or five times its original value. The credit of such companies is very sound and their position is strong in the market. The names of the directors are a sort of guarantee and their word is like a bond.

The directors of the second-class may be men of great honesty but many of them belong to other professions, such as law, medicine, etc., and though very eminent in their own line, they necessarily lack the power of organization, which is one of the greatest requirements in business. Besides, as their professions are different, they have no time necessary to study the various problems about the business in which they take part as Directors. Their knowledge of the commerce and trade of the country is very scanty and their credit in the market *nil*. Consequently their hold on the Agents is not so complete. Necessarily they play into the hands of the Agents. The concerns managed by these people are, therefore, ordinary. They may be good in ordinary times, but may collapse at the first touch of adverse circumstances.

The last class of directors are the worst. They are neither honest nor business-like. Not only do they not prevent the agents from acting contrary to the interests of the shareholders but they actually aid them in their nefarious practices. Their principal object is to get the directors' fees and to help themselves out of the funds of the company. They are, therefore, tools in the hands of the Agents of the company. Every person, therefore, who puts his hard-earned money in any concern, is bound, in self-defence, to look minutely into the character of all these people.

Next in importance to the directors, are the auditors.

The Auditors. Like that of the directors, though their appointment is subject to the final approval of the shareholders, duly assembled in general meeting, they are, in the absence of any real interest being taken by the shareholders, practically appointed by the Agents. It is, therefore, not seldom, that these auditors are their own relations and friends. Many of them have no real qualifications for the high and responsible office they hold, nor any status. Naturally they look to the agents for their own advancement and implicitly obey their commands. It will be, therefore, easily imagined what the poor shareholder, is to expect from the majority of such auditors, in whose appointment he has little or no share. Thus, it many times happens, that a well cooked Balance Sheet is kept before them and they are ordered to pass it. They, too, knowing their own position well, affix their signatures to it with a very elastic and stock proviso of "to the best of our knowledge and belief." In these circumstances, if any auditor be so bold as to pass any adverse remarks in the balance sheet, he is quietly reminded that he will be thrown out the next year, and the poor fellow having no support from the shareholders, withdraws his criticism.

The next point of importance is the Memorandum and Articles of Association, and the contract between the Agents and the Company. It is not easy to say anything definitely about the various articles contained in these contracts, as they will vary according to the nature of the concerns. But, generally speaking, the articles dealing with the commission and other remuneration of the Agents, their powers of appointing high officers of the Company, of dealing with the funds at their disposal, the duration of the Agency, the rules of holding General and Extraordinary meetings, and the number of votes of each shareholder and such other articles are of great importance. They should be carefully studied, if possible, by each intending subscriber before investing his money in any concern. It is not possible here to discuss, at length, each and every question

abovementioned; but I will take the Agents' commission to illustrate my point. In early days of joint-stock companies, the Agents' commission was fixed at a certain proportion of the total production of goods. But afterwards it was found that the system would not work satisfactorily. In order to increase their commission, the Agents would produce the goods on an extensive scale which would not sell and which had the effect of dumping the market. The result was to lower the prices to such an extent, as to cause enormous losses to the company and its shareholders. Still the Agents get their full commission all the same. Consequently the eyes of the shareholders were opened to the faulty system of fixing the Agents' commission on mere production. Then a change was made and their commission was fixed on sales. But that too did not work quite well as the goods were sold at a loss; then a further improvement was made in the agreement of the companies that followed. The Agents' commission was fixed on a certain percentage on profits actually made. After sometimes, however, a still better form of agreement was evolved. Most of the Agents now-a-days guarantee a certain fixed dividend to the shareholders before receiving their own commission, whatever that may be. If the shareholders do not get that dividend, the Agents cannot get their commission. Thus, the once separate interests of the Agents and the shareholders are now insolubly bound together. Thus, it will be seen how absolutely necessary it is to examine very closely into every article of the Memorandum and Articles of Association and the Agents' agreement with the Company.

I now come to the shareholders. These again must be divided into *bona fide* investors whose object is purely to earn the profits in the shape of dividends and the speculators, whose object is mainly to take advantage of the fluctuation in the prices of the shares they deal in. As shewn before, it is the nature of all property to fluctuate and all shares being property, there cannot be exception to this rule. This being the case, clever and calculating people will always take advantage of the constant fluctuations, when those fluctuations go in their favour. There is nothing wrong in this, so long as

they do so within certain limits and having a strict eye to their own pockets and to the intrinsic value and stability of the concerns in which they deal. But if they go beyond this, they tread on dangerous ground, and the legitimate speculation degenerates into mere gambling, for which there is neither method nor calculation. The result is invariably the ruin not only of the gambler himself but also of those who are both intimately and remotely connected with him in his unlawful and ruinous practices. It is not my present purpose to speak of such gamblers. Everyone should discourage such people by all means in his power for the sake of public safety and for the protection of capital and credit which are so essential for the various industries of this country.

It is very necessary for every individual investor, having regard to the amount of his savings, and to the sudden calls that may be made at any time on his investments, by sickness, marriage, death or failure in his own business, to study carefully what investments he goes in for. In case of a poor investor, his capital must not only be safe but must be always at his beck and call. He cannot afford to lose, nor can he afford to wait. This is the case with poor aged people, widows, minors and others. Such people should always look to the safety of their little fortunes, rather than to profits. They must choose only the best investments such as Government Paper, various Port Trust, Improvement Trust and Municipal bonds. These will answer all the requirements of poor investors. If they wish to increase their incomes, they can only do so by hard work and rigid economy and not by choosing shaky concerns which promise handsome profits. If Rs. 10,000 be invested in these bonds and the interest thereon, be reinvested, year after year, it is doubled in about 16 years, quadrupled in 32 years, becomes eightfold in 48 years and the investor or his heir gets about one Lac and fifty thousand in about 60 years ! ! ! This is not a small progress for the original sum of only Rs. 10,000. The same rule holds good for any small or great amount.

Coming to the rich middle class investors, the case of investment is somewhat different from that of the investors enumerated above. Their accumulations are far larger than

what their immediate wants require. They can, therefore, very easily afford to go in for some shares of some good companies where their capital can be safe and also help the regeneration of the industries of the country. Such shares should be no other than debentures, preference shares, and so on. It is not for them to go in for speculative shares, in which the fluctuations are necessarily great.

The third or very rich class of investors possess vast wealth and therefore, they can and ought to invest their money in shares of different companies, started to exploit the various industries of their country. All business is enterprise, more or less, and it is they who ought to undertake the risk by investing the greater portion of their capital. As already stated, speculation within certain limits is legitimate and will always exist, and if cautiously indulged in will give a healthy tone to the market.

Having described the different classes of investors, it will not be out of place here to discuss briefly a few important kinds of investments, so as to make it clear, how each individual investor should satisfy his own different requirements by choosing a few from each.

Roughly speaking, a good investment should possess four qualities. It should be safe, paying, convertible and least fluctuating. A *bona fide* investor whose prime object is merely to derive an income, should as far as possible, choose investments possessing all these qualities. A speculator who wishes to purchase cheap and sell dear, without any regard to the dividends, must choose such stocks and shares, which have the first three qualities, with the greatest possible fluctuations. Every shareholder, whether he be a real investor or speculator, must have a certain portion of his savings invested on guilt-edged securities, on which he can raise money at a short notice. These securities should be the base or foundation on which he should raise the superstructure made up of very good shares such as Debentures and Preference shares of some good joint-stock concerns. If a speculator, he should adorn the top or minaret with a few fluctuating securities to satisfy his speculative tendencies.

Before concluding these pages, it is necessary to say a few words about the time of buying and selling different kinds of stocks and shares. Like the capital of a private individual, the capital of a country is more or less a fixed quantity. There are two seasons, busy and slack, in all countries, especially in India. When the crops of cotton, wheat, jute, opium and other articles are ready and are to be exported; when the communication opens after the monsoon; when Export and Import both foreign and inland commence; all the available capital in the country is required for their purposes. Bank balances gradually fall and the rate of interest gradually rises. Securities of various kinds are sold to make the capital free and thus their price gradually falls. Roughly speaking this period lasts from the end of October to the middle of June, every year. Again, when the monsoon sets in, all the sea and some part of the land communications are closed. There is very little of foreign and inland commerce and trade. Bank balances rise and they are again invested in various stocks and shares, which, consequently rise in price. This period lasts generally from the middle of June to the end of October. This invariably happens every year.

Thus, it will be seen that the best time to purchase any stocks and shares is the busy or working season and the best time to sell them is the slack season. Sometimes, there are certain counteracting causes, such as speculation, panics, sudden changes in the money market and good or bad harvests, etc., which, every investor must always take into account.

After his investments are purchased, the investor must get them periodically re-valued, adjusted and overhauled by some competent authority who makes it his special business to study the trend of Railways, industrial and other commercial undertakings. As observed before, all property is constantly changing. Since his purchase, some investments will rise and others will fall. He must, therefore, ascertain periodically whether their capital value and their dividend earning capacity are rising or falling. If he does this, he will himself know what to do in case of their depreciation in value or fall in dividend earning capacity.

Investment is a science and not an empirical method depending upon mere chance. Unfortunately this is not realized by most of our investors. Success more or less depends upon close, constant and comprehensive survey of various facts and figures about trade, commerce and crops, the state of the money market, the scientific and technical methods, daily coming into vogue, the physical features of the country, machinations of big operators, political condition of the country and so on. Owing to easy and improved means of communications, the world is drawing together more and more, and consequently, these investigations have, on many occasions, to be extended to other countries, in order that we may come to the right conclusion. Information of other similar matters has to be collected from every available quarter. Coming events cast their shadows before, and those who can appreciate their proper significance and act promptly, become every way successful in their investments.

THE LABOUR PROBLEM IN INDIA.

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An outstanding feature of the contemporary history of Western nations has been a marked advance of democracy and with it the aggressive character of the labour movement. Modern economic developments summed up by the word 'industrialism' or 'commercialism' have pushed into the forefront many serious social problems, which demand immediate attention. Whatever one may think of Socialism, it is a factor, that has to be counted with. Present social and economic conditions, the tendency of wealth to concentrate in a few hands, the reduction of large masses of people to the condition of human machines, the degrading nature of the drudgery which numbers of work-people have perforce to undergo, the problem of unemployment which is becoming more pressing every day, the prevailing high prices, and the general discontent of the working classes with their lot—these have even furnished a justification for

some of the proposals Socialism has been pressing. One of the unfortunate and disquieting tendencies of the times is the form the struggle between labour and capital has taken. The demand for a rise of wages, and for easier and more convenient conditions of work by organised bodies of workmen, begins instead of ending with a strike and threatens to throw society and the industrial world into immediate chaos. France, England, and Germany have recently had occasion to realise the power of concerted labour. Remedies, legislative and otherwise, coercive and conciliatory, have been devised to meet such unhappy occurrences and they have met with varied success. In spite of them, however the prospect is not very reassuring. On the other hand, there is every fear that, from time to time, the labour difficulty will be seriously felt to the detriment of social peace and economic progress. Comfort lies in the hope that fresh cures may be discovered to remedy new ailments.

Fortunately for us, the day is yet too distant, if it is to come at all, when India may have to face a similar situation. We have scarcely yet emerged from our primitive conditions of industry. Custom yet rules supreme among the masses of our people. Old industries are still in the domestic stage. We are strangers to capitalism. Indian manufactures are in the embryo or sickly infants. Millions are wedded to their fields and have to emerge out of their agricultural state. Large cities and towns are exceptions, and hamlets and villages the rule. The masses are illiterate and immobile. Labour is unskilled and inefficient, unambitious and unenterprising. Capital is lacking, and shy where it exists. Organisation is unknown to both. Under these circumstances, for us the industrial struggle, on the Western lines, is a thing of the future, if it cannot be avoided. The conditions, which make for industrialism are yet absent in this country. Not that there is no poverty and squalor, destitution and misery, among us. We have enough of these. We have our economic and labour problems also, though of a different type. The country is undergoing a slow and almost imperceptible change in its economic condition. Among the requisites of wealth production, labour occupies no unimportant position. We have always been laying the unction to our souls

that, whatever our difficulties with regard to capital, enterprise and scientific knowledge may be, we are rich in raw materials and labour, and these need give us no trouble. But latterly conditions have intervened, which show that this comfort cannot last long. And we are required seriously to consider how we may best secure the requisite quantity and quality of all the essentials of wealth creation. It is proposed, in this paper, to deal only with the labour question in relation to the present condition and prospects of the indigenous industries.

Agriculture has always occupied a conspicuous position among the industries of India. But her manufactures have been no less conspicuous. Trades and industries have been the occupations of certain castes, and among the Hindu as well as the non-Hindu population of this country, we have had trade guilds like those of Europe in the Middle Ages. The constitution of the guilds in India has proved more rigid, though it has served the same purpose as the European organisations. In spite of the revolutions wrought by time, the Indian guilds may be seen in their pristine condition even to-day, while their European prototypes were broken up long ago. Under the inelastic guilds, which prescribed the patterns and the standards of the articles manufactured, the industries of India reached a very high level of perfection. But the advent of the cheap machine-made goods imported from out-side, deprived them of much of their business and most of them have now become disorganised.

It may be generally asserted that we have not yet passed the domestic industry stage. Many industries on a large scale have, however, been started and there we are following in the footsteps of the nations of the West. Machinery is replacing manual labour and hundreds and thousands of hands are employed together in mills, mines and factories. Thus the Cotton and Jute Mills, the tea gardens and coal mines provide work of a mechanical kind to masses of men and women, who only contribute their physical labour. Numbers of the working classes are attracted to industrial centres and are thus induced to leave their homes. They go to tenant the densely-crowded chawls and dirty slums of cities like Bombay and Calcutta.

Healthy village life and occupations are deserted in favour of the alluring prospects of towns. The State has had to interfere on behalf of the labouring classes by enacting factory laws and ensuring fair and healthy conditions of the recruitment and treatment of work-people. It has found it necessary to control migration and emigration of labourers. We are thus entering upon a new phase of industrial and economic evolution, in which, it appears, the break-up of the old system will be followed by the introduction of Western conditions. The foundations of the caste-system have been sapped and its rigidity has been relaxed. The decline of the old industries has driven thousands of craftsmen on to agriculture and many of them are finding work in the new mills and factories. Owing to over-production, dull markets or the dearness of raw materials, many of the large concerns have either to shut down for a time or lessen the hours of work. Sometimes differences between the employers and the employed create difficulties. At such times there is distress among the mill-hands. India is not an utter stranger to strikes, many of them of varying dimensions and seriousness having occurred within recent times. Indian labour, most of it being illiterate, is unorganised; but with the spread of education organisation is bound to come. Here and there we have labour associations, but their power is yet nothing compared to that of the labour organisations of the West. Indian employers of labour on a very large scale have their organised bodies and they can act in concert if they choose to do so. The Factories Bill now before the Supreme Legislative Council will find many strenuous critics from among the employers; but the views of labour cannot be adequately and properly represented. Indian agriculture, being yet in a backward condition, is not much affected by the change that is coming over the manufacturing industries. But even there signs of the ushering in of a new era are visible.

From every quarter comes the cry of the scarcity and dearness of common labour. Whether it is agricultural, factory or domestic labour, skilled or unskilled, the complaint is the same. The manufacturer and the trader are handicapped by the higher wages they have got to pay to the

labour they must employ. On the one hand, we are told that the potential supply of labour is ample, nay, inexhaustible, that the agricultural industry has been congested and that an out-let for that superfluous labour must be found by employment in manufacturing industries. "From inquiries instituted regarding the supply of industrial labour in the United Provinces and in Bengal, it seems that, though there is a shortage in the supply of skilled artisans, there is no real deficiency in the amount of labour potentially available, and that no difficulty in that direction need be anticipated, if the conditions of work in the mills be made more congenial to the labourer and if the manufacturers adopt more systematic method of recruitment." (Statement exhibiting the moral and material progress and condition of India, 1907-08). On the other hand, every industry is to-day clamouring for a sufficient supply of labour and the agricultural industry is no exception. The cry is the loudest in those Provinces where the commercial and industrial expansion of cities absorbs large quantities of skilled and unskilled labour. We find in the above statement the remark with regard to Bombay that "there is shortage in the supply of agricultural labourers, who are, therefore, able to command relatively high wages." In the Land Revenue Administration Report, Part II, of the Bombay Presidency, for 1908-09 we find the Commissioner, Northern Division, observing as follows :—"From almost every District comes the report that agricultural labour has been exceedingly scarce—a serious matter this since the dearth of labour may to a large extent lose to the agriculturist the full advantage of the extraordinarily good monsoon which has just closed." The officials in the other parts of the Province speak in the same strain about this labour difficulty from which the sister Provinces are not free. It is not only the skilled labourers, who are in request everywhere. Even the common coolies are becoming scarce and demand high prices for their labour. In their welcome address to His Excellency Lord Hardinge, the Bombay Chamber of Commerce adverted to this point. His Lordship, while recognising the hardship which dear labour must place on industry and commerce, pointed to the high level of prices which at present prevails and explained the

dearth of labour by the increased cost of living of the coolies in large cities like Bombay. We are thus confronted with this phenomenon. There is undoubtedly an abundant supply of potential labour in the country and yet industry and commerce are feeling the pinch of scarcity. How are these two facts to be reconciled ?

A considerably high level of wages of all species of labour has now become a marked feature of the economic condition of the country. Various causes have been suggested as having contributed to bring about this result. (1) The first and foremost and the most obvious of these is the high prices of food-stuffs. For many years Indian labour has been very cheap, and that was regarded as an important asset of the Indigenous industries. But high prices have raised the cost of living and wages are highest where the cost of living is the greatest. Government have had to reconsider the scale of the salaries of their servants and wherever possible, they have been enhanced. Customary wages no longer satisfy the labourer and they have considerably risen automatically. It is estimated that in the majority of cases this rise has been commensurate with the rise in prices and that the labourers are on the whole, better off than they were a few years ago. (2) The second cause assigned is the depopulation owing to Plague. Though the havoc caused by this epidemic cannot in any way, be compared to the destruction which resulted from the Black Death in England, the consequences have been similar in India, though on a smaller scale. Since Plague broke out in Bombay in August 1896, to the end of the year 1908, the epidemic took no less than 61,82,796 victims. Up-to-date the mortality owing to Plague may be taken in round numbers, to have been three quarters of a crore in the whole of India. This comes to nearly 2 per cents of the whole population in about 13 years. Though some Provinces appear to have been the special favourites of the Plague, it has claimed its toll from all, and Native States have not been exempted. Plague is naturally the poor man's disease, though it respects neither rank nor riches. It may be easily conceived how its hand must have come heavily upon the lower classes of people, the labourers. Their ranks have been evidently thinned and scarcity has

been the consequence. It is on record that "in some parts of the Punjab the mortality in 1907 was so severe as to disorganise the labour market and to affect the level of wages." (3) Another important factor that must be noted is the extension of industrial enterprise. New avenues are being every day opened to labour and it is running into a number of profitable channels. The new mills, factories, and other industrial concerns which are, fast rising on all sides are creating an increasing demand for labour. Skilled workmen are not easy to obtain and they everywhere command a high price. Even unskilled labourers are pressed into service for want of better material. These latter are needed in large numbers for Railways, canals, public buildings, and such other works and the increasing commercial activity of our large towns is to a great extent also responsible for the enhanced demand. (4) On account of Plague, scarcity and the prospect of higher wages, the labouring population has begun to show greater mobility. The migratory movements of labourers have indeed become a noteworthy factor during recent years, and are reported in almost all Provinces of India. With regard to the United Provinces, it has been stated that "the increased emigration from the Eastern Districts and from Oudh to Bengal, Assam and Burma, has rendered the population less dependent on agriculture, as the emigrants remit substantial sums to their relatives." This is besides the fact that "during 1907-08 in spite of famine conditions, labourers were able to find large amount of work at good wages, owing to the large demand in factories and elsewhere." In the Punjab we read, "labour becomes more mobile every year and labourers move of their own accord to places, where remunerative employment exists." In the Central Provinces and Berar, "labour is being attracted from the villages to towns, where sufficient labourers cannot be obtained, although the rates of wages have greatly advanced during recent years." In Bombay "the commercial and industrial expansion of cities like Bombay, Karachi and Ahmedabad, the growth of mining, and the construction of public works offer a wider field every year for skilled and unskilled labour." This tendency of labour to migrate to new fields has been emphasised in the

reports of Commissioners and Collectors in the Bombay Presidency. To quote a few typical instances : The Commissioner, Southern Division, says :—

"The people of jungle villages in the Mallad Talukas of Belgaum and Dharwar are reported to be gradually leaving their villages in search of employment, which trade-centres like Hubli and the Railway can supply.....Bombay as usual furnished employment to very large numbers of labourers from Colaba and Ratnagiri."

We read in the report of the Assistant Collector, Nasik :—

"Many of the able bodied cultivators, (from Sinnar Taluka) especially Dhangars from the east, 'go to Bombay to ply their carts for hire or work as coolies.' This year (1908-09) a special attempt was made, by careful inquiries in each village, to estimate the number of such emigrants. Out of a population of 78,564, it was ascertained that 10,091 went to Bombay, while 3,832 went to work on the Godavari Weir and canals. Thus, nearly twenty per cent. of the entire population left their homes for five months."

While these migratory habits are to be welcomed as giving remunerative employment to many who would have had little or no work in their villages, as helping the development of industry and commerce and as making the immobile village people more active and enterprising, to their own advantage, it cannot be forgotten that agriculture suffers owing to a scarcity of local supply of labour. The agricultural employer has to pay unusually high wages to procure the necessary quantity of field labour. It is reported that in Broach, where most of the field labour has to be imported from Kathiawar or Kaira, it is said to be not uncommon for a man to obtain eight annas a day for mere weeding. The migrations of labour, inevitable and useful in themselves, have not, therefore, proved an unmixed blessing to many localities. The emigration of coolies to Assam, under the strict supervision of Government, causes a considerable movement of labour every year.

"The number of emigrants of all classes recruited in Bengal, Madras, Central Provinces, the United Provinces and the adjoining Native States embarked at Goalundo during the year

ending 30th June 1910, was 33,744 as compared with 56,791 in the preceding year. The decrease is attributed chiefly to the greater prosperity of the labouring class on account of the good harvests generally obtained in the recruiting districts." It is stated that the labourers recruited from the various provinces to work as coolies in the gardens get good opportunities of improving their condition, which they would not have obtained if they had stayed at home and that many of them become happy peasant proprietors. Government is doing the proper thing in controlling the recruiting agencies employed by the tea planters and in vigilantly watching their operations in the interests of the coolies. There can be no doubt that this immigration to Assam from distant parts must exercise an energizing influence on the inert and unambitious mass of labour thus recruited, and make it more active and enterprising. But it must be noted that the emigration of best coolies from Madras is tending to make labour scarce in some districts and the same wages have to be paid for inferior labourers. It cannot but have a detrimental effect upon the industries of the Province. It is needless to say anything here as regards the emigration of coolies to British and foreign colonies. Large numbers of Indian labourers emigrate every year to develop the resources of Mauritius, Natal, British Guiana, Fiji and other places and they must diminish the local supply of labour. It is curious to see that while there is a pressing demand for all kinds of labour in their own country thousands of Indian workmen choose to emigrate to other lands. Either Indian employers do not take sufficient trouble to secure all available labour in the country, or the colonies afford better prospects to the labourers. The new restrictions in the Colonies, it is said, are producing a deterring effect upon emigration. This may slightly relieve the pressure now being felt by the indigenous employers of labour.

The condition of the labourers, it is asserted, is improving under the *regime* of high wages. But there are no indications of greater efficiency to be seen anywhere. The operative or the cooly gets better wages not because he works more or better; but because the employer has no choice in the matter and has to pay what is demanded.

However intelligent and clever the craftsman may be, the inefficiency of the common Indian operative has become notorious. He has become conscious of his own importance and value to his employer, and good, bad or indifferent, he wants to get the highest price for his labour. The demand being in excess of the supply, the labourer finds himself in a position to dictate his own terms. The inefficiency of the labour is a serious draw-back in our industrial position, and coupled with high rates of wages, works as a handicap on the manufacturers. It is difficult to estimate accurately the comparative efficiency of the Indian and the foreign workman. But the impression of outside observers is not favourable to the Indian operative. A large proportion of the mill-hands of Bombay, for instance, are men of the agricultural class. Each one has a piece of land of his own or the property of a joint family, and it is found that they have to absent themselves from work in the mills for months together for the sowing and harvest season, even without leave. They are not thus entirely dependent for their maintenance on their employment in the mills. Their going away to their up country homes from time to time must disorganise the work and the employers be greatly inconvenienced. A recent European visitor to India, with wide experience of European conditions of manufacture, after watching closely the working and management of the cotton mills in Bombay, has recorded his opinion about indigenous labour, which is far from creditable to it. He says that Indian labour is irregular and inefficient. The workmen are lazy who come to the mills. He saw much loitering about the mills and little energy in the operatives. Their living is very cheap and few of them can read. Climatic conditions, which do not allow continued work, are a factor, which must not be lost sight of in setting up comparisons between the Indian and the foreign workman. Efficiency of labour and management has raised the English textile industry to the pink of perfection. In spite of the difficulty of having to import raw material from outside, Lancashire can out-bid foreign manufacturers, both in the cost and the quality. This is easily explained by the calculation that the production of a mill in India is only 65 to

66 per cent. of that of an English mill, though many more operatives are engaged. It is stated that the operatives are careless and their moral tone leaves much to be desired. Many of them become the victims of money-lenders. It is further calculated that in India it takes five or six men to do the work done by one Lancashire operative. If this estimate of comparative efficiency be correct, it is obvious that Lancashire must out-bid Indian manufacturers, so long as there is no improvement in the indigenous labour. The position of the Indian mill industry is peculiarly difficult. With the rise in wages, there has been little rise in efficiency, both of labour and management. With the increased foreign demand for cotton, the price of the staple must go up. Outside demand for the product of the mills is not extending; it may perhaps contract still further. The internal demand also is not satisfactory. Under these circumstances the inefficiency of labour must prove very detrimental to the indigenous industry in the face of foreign competition. The same remark holds good in the case of the other industries in the land.

A FEW THOUGHTS ON ECONOMIC INDIA.

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I.

INDIA AS A WHOLE.

When a farmer grows rich and has enough and to spare, he cannot keep his surplus produce for a long time without injury to the crops. He sells them and keeps the gold or silver or he may invest the sale-proceeds in some way. At any rate purchase of large quantities of gold and silver is surely a sign of his growing wealth. Similarly in the case of a country as a whole, large and growing imports of the precious metals indicate its growing wealth.

2. India is a vast agricultural country, and for the above reasons, she exports her raw produce and imports

manufactured articles that she wants and with the surplus she purchases gold and silver. India is able to export her bulky raw produce of small value only since about 1880, after the Suez Canal was opened and the principal ports were connected with the interior by railway lines. This new economic phase in India may be taken to date from about 1880; and for the 20 years ending 1901-2 she imported about 3 crores of tolas of gold valued at about Rs. 27 per tola and about $18\frac{1}{4}$ crores of tolas of silver. Since then import of precious metals has gone on in an increasing proportion. For the 7 years ending 1909-10 net import of gold was worth about 101 crores of rupees and net import of silver was worth about 107 crores of rupees. These figures clearly show that India as a whole is growing richer and richer.

3. In fact the volume of trade of a country is a sure index for determining its prosperity or otherwise. The average import in India between 1870-1880 and 1883-4 was worth $61\frac{1}{4}$ crores of rupees and average export for the same period was worth $80\frac{3}{4}$ crores of rupees. For the year 1909-10 the total import was worth $159\frac{1}{4}$ crores of rupees and the total export was worth $194\frac{1}{8}$ crores of rupees. As principal articles of export and import trades are agricultural produce and hides and cotton goods, it is clear that very large number of people are being benefited by it. It is often said that we are parting with our food-grains for toys. But the principal articles of imports, cotton goods (39 p. c. of the total) metals, sugar, machinery, mineral oil and precious metals are not mere toys. We import these things, because we get them cheaper than here. We should not shed sentimental tears over the fate of our weavers. The machinery, we are so busy in introducing in India, will alike displace them as Lancashire machinery has done. We must pay for the imported goods; but no country can pay for the huge imports in cash. It is impossible for India to pay $159\frac{1}{4}$ crores of rupees in cash. She pays her imports by part of her ex-

ports and without exports she cannot get the imports. And what can India export except her raw produce? In fact this export trade gives a great stimulus to her productive activity. It is true that this extra demand for export raises prices of agricultural produce; but that affects only the small portion of the literary and non-agricultural population; but over $\frac{2}{3}$ of the population is agricultural and they are benefited by it.

4. The principal agency which is causing this tremendous economic evolution is the Railway. Irrigation works also materially help production and Peace is the fundamental necessity. But Peace, Railways and Irrigation Works cost money. Irrigation Works are necessary also to prevent famines and Railways also serve to mitigate its severity by carrying food-stuffs to the affected districts. If these absolutely necessary works were left to be done by private companies or from surplus revenue, the progress would have been extremely slow. Government therefore borrows money for these productive works. In fact more than $\frac{2}{3}$ of our public debt has been incurred for these useful purposes. These works have been so productive that "in introducing the budget for 1903-4, the finance minister (Sir E. Law) showed that taking the whole of the Government debt on one side, and counterbalancing the commercial assets (capitalised value of state railways and canals, &c.) on the other, the net excess of debt over assets on March 31, 1902, was only 33 crores: and as he said few states can boast of such a favourable financial position." It may be pointed out also that 33 crores is equivalent to 6 times only the surplus revenue of some good years.

5. Another measure which is benefiting India immensely is the adoption of gold standard by Government. Before 1893 the Indian mints were open to the free coinage of silver. That means any body could take silver to the mint and have the bullion coined into rupees. Consequently the value of the rupee was the value of the bullion

contained in it. Down up to 1873 the relative value of gold and silver was almost the same and one sovereign was worth Rs. 10 only. From after that date, the value of silver began to fall all over the world as compared with gold and so value of rupee also began to fall, so much so that at one time one sovereign became worth 20 rupees. In 1893 Government adopted gold standard on the basis of 15 rupees to a sovereign and this ratio is kept up by closing mints to free coinage of silver and by virtually selling sovereigns at Rs. 15, when they have a tendency to go higher. If this measure were not adopted, one sovereign would have been worth more than Rs. 20 till now. India gets an important advantage from this measure. For the last ten years, our yearly average import of goods was worth about 100 crores of rupees, i.e., $\frac{100}{15}$ crores of pounds at the ratio of 15 rupees to one pound. Now if £ 1 was worth Rs. 20 now, this $\frac{100}{15}$ crores of pounds would have been worth $(\frac{100}{15} \times 20)$ crores of rupees or $133\frac{1}{3}$ crores of rupees. But we have paid 100 crores for that. In other words $33\frac{1}{3}$ crores of rupees have been our yearly gain for the last ten years, or 333 crores of rupees saved on our imports during the last ten years. This annual saving will continue to be made as long as the present ratio will remain and silver at the present low figure. On the side of export, although the gold value of our produce has been raised, the export trade has not been affected at all. Export of merchandise in 1893-4 was $106\frac{2}{3}$ crores and in 1909 to 1910 was $184\frac{2}{3}$ crores.

6. Besides its humanitarian interest, the famine policy of Government prevents much economic loss to India. "Famine is writ large across the pages of Indian History from earliest time" and one writer wrote grimly "flesh of a son was preferred to his love." Famines occur on failure of monsoons and this must occur now and then in a country like India where more than 20 crores of

people live on agriculture depending on the monsoons. Formerly there was no communication from one part of the country to another ; and people perished of famine in one part of the country while there was more than plenty only 100 miles off. "In 1780-1 the land revenue demand in Sylhet District was suspended because the harvest was so plentiful that it did not pay to carry grain to market." Government is systematically attacking this problem. In the first place, the irrigation works eliminate the chance of monsoons from the field of production. Secondly, where famine occurs, the railways bring food to the affected tracts. In other words, formerly there was famine for want of food as well as for want of money. Now-a-days food is brought by the railways and money or food is supplied by Government opening relief camps and organising charitable operations of private individuals. I will point out that great economic loss is prevented by the famine policy of Government. The following extract shows the effect of some of the previous famines.

7. "The famine of 1770 resulted in widespread desolation of the most affected districts, so that we read of depopulation and ruin, the thinness of the inhabitants, many hundreds of villages entirely depopulated, half the ryots credibly reported to have perished and a complete disorganisation among the landed classes which lasted for many years. The famine of 1803 struck such a blow at the prosperity of Khandesh and Ahmadnagar that even in 1867, the traces of its ravages were still visible in the ruins of deserted villages which had not been repopulated. In the famine of 1833 so much land went out of cultivation in the Guntur District that even in 1850 the land revenue was only three-fourths of what it had been in 1832. In 1837, in the North-western Provinces, the pressure was so great that the ordinary bonds of society seemed to be broken by it. In 1841, the still deserted lands and abandoned houses in the Etawa District bore evidence to the devastation and waste of life, and during the next

five years the land revenue continued to be less by 12 per cent. than in the period preceding the famine." During the famine of 1896-7, an area of 225,000 square miles was affected; and had the old state of things continued, we may safely assume that at least 1/20th of the cropped area (*i. e.* $2\frac{1}{2}$ crores of bighas) would have remained uncultivated for 5 years (say). Now taking the net produce per bigha to be Rs. 5 after contributing towards the maintenance of the cultivator, the loss would have been 60 crores of rupees in 5 years (say). But the railways and irrigation canals and famine relief operations (although it cost $10\frac{1}{2}$ crores of rupees), together with the growing wealth of landowning agriculturists under the British rule, prevented all this loss. The total cropped area in British territory excluding the Punjab was 54 crores of bighas in the year before this famine; in the year of famine (1897) it fell off to $50\frac{1}{10}$ crores of bighas and in the next year it rose again to $54\frac{9}{16}$ crores of bighas.

II.

INDIANS AS INDIVIDUALS.

8. Hitherto we have dealt with how India as a whole is growing richer under the British rule and how Government is bringing about this. Now we come to discuss the case of individuals. When we say of a country growing richer, we mean only some persons (more or less) in the same are growing richer. The case of individuals rests on different principles. In the first place, you must remember Government cannot directly produce wealth. It cannot hold the plough or run the mills. Its main function is to preserve the peace. It can assist in the production by educating its subjects or by undertaking large works like railways and irrigation works. Secondly, the obvious test of determining the position of an individual is by determining the wages he can earn and the prices prevailing. Now wages and prices depend on the inexorable economic law

of demand and supply. Government has nothing to do with that and Government cannot control that. It is for this reason that abject poors are found in the streets of London and New York. The proper way of proceeding will be by separate investigation of those tracts where wages and prices are similar. Each of these tracts may be called an Economic Block. It is beyond the scope of this essay to enter into this inquiry; but in illustration of the above principles let us look at an agricultural labourer with (say) 4 children. His poverty is surely not due to any Government action. Examine what tax he pays to the State and perhaps he pays a tax of 10 annas yearly in the shape of salt tax. His wages are low because there are so many labourers and so little capital for employment. Similarly remuneration for educated labour is low because the supply is more than the demand.

9. Let us now examine the condition of different classes of people. Take three classes of people; land-owning agriculturists, agricultural labourers and the middle class. The first two classes comprise more than $\frac{2}{3}$ of the 30 crores people of India. Three elements enter in agricultural production, (Land, Labour and Capital) and the necessary charges are therefore rent, wages and interest. In India, Government is the ultimate landlord. This is so from the time of Manu. The Hindu Rajahs used to take $\frac{1}{6}$ th of the produce per bigha as Land Revenue. During the Mahomedan time Rajah Toder Mull fixed the share of the State to be $\frac{1}{3}$ rd. But Mr. Field in his Regulations says that there was no limit to the exactions from the tenants save his capacity to pay. The Mahomedans generally used to realise land, revenue directly from the tenant and there were intermediaries also. During the commencement of the British Raj they found that these intermediaries (Zamindars and Talookdars) were paid $\frac{1}{11}$ of the net collection from the tenants as their remuneration. All these things have been changed under the British rule. In Bengal, parts of

Madras and N. W. P., Government engaged with Zamindars for realisation of Land Revenue and fixed its demand in perpetuity. In Bengal it is estimated at present that Government revenue absorbs not more than 25 P. C. of the economic rental and 75 P. C. is left to be enjoyed as net rent by Zamindars and the big class of middle-men who stand between them and the actual cultivators. In N. W. P. and the Punjab, settlement is also made with Zamindars but for 30 years and 20 years, respectively, and 50 P. C. of the assets are left to the middle-men. At the same time Government has framed laws in order that the tenants may not be oppressed by these Zamindars and middle-men. In Bombay and Madras, the settlement is entered into directly with the raiyats for 30 years and Government takes less than $\frac{1}{8}$ th of the produce of the soil. That the Government demand does not reach up to the economic rent, is shown by the fact that the ryotwari tenants have begun subletting. The policy of Government is to leave a large share of its dues in the shape of Land Revenue in the hands of middle-men and cultivators for accumulation of private capital in their hands. The effect of this policy has been increasing prosperity of the land-owning agricultural classes. With the rise of prices and rising value of their holdings, the resources and credit of these people have increased and these are not liable to suffer much during a famine.

10. As regards wages, the position of the agricultural labourer is certainly not bright. "They are multiplying rapidly on the margin of subsistence and beyond the requirements of agriculture, and by so doing are keeping their own wages low, while cash payments for work actually done are superseding, over large parts of India, the old customary payments of grain at each harvest. Agricultural progress will do little to improve their position. Emigration when feasible will only temporarily postpone the pressure on the

soil, unless the growth of population, is checked. 'No remedy for present evils' say, the Famine Commissioners of 1880, "can be complete which does not include the introduction of a diversity of occupations through which the surplus population may be drawn from agricultural pursuit and led to find the means of subsistence in manufactures or some such employment." These labourers are first to fall victims on the approach of a famine and industrial development in India is their only salvation.

11. As regards agricultural capital it is well known that the cultivators are generally indebted to village money-lenders who exact very high rates of interest. This is one of the main causes for transferring the produce of the soil to the hands of the money-lenders. It is needless to note that it is beyond the resources of Government to do banking for $\frac{2}{3}$ of the 30 crores people of India. If the Government were to advance 10 rupees, as loan to (say) 10 crores of cultivators, it will amount to 100 crores of rupees, and this of course no Government can do. Government however is doing what little it can do. Under Act XIX of 1883 and XII of 1884, Government advances loans to the cultivators for agricultural purposes, and improvement of land at interest varying from 5 P. C. to 6½ P. C. About 27 lakhs of rupees are yearly lent for this purpose. In 1900-1 the total advanced to cultivators amounted to more than 2 crores. At the close of the year 1908-09, the total advanced was 5 crores, 79 lakhs of rupees. The supply for cheap money must come from the people themselves. They must make a common stock of their own savings. But to direct the energies of the people in the right direction, the "Co-operative Credit Societies Act" was passed in 1904 for facilitating incorporation of agricultural banks. The idea is that local cultivators should start local banks with their own savings, aided financially by Government, Zamindars and outside public, if necessary. The success of this measure (which means freedom of the cultivator and artisan from the

necessary but usurious grip of the money-lender will depend on the capacity of the people themselves.

12. As regards the middle class in Bengal it had its origin on the policy of Government in settling the land revenue in perpetuity with Bengal Zamindars and recognising sub-infeudation by them. There having been no big manufacturing or trading interests then in the country, Government thought that by limiting the State demand, a middle class would grow up depending on the increasing rent from the land, loyal and faithful to itself. For a long time this middle class had prosperous days. But as their number began to increase, their estates were reduced by partition among themselves; and by tenancy legislation (the salutary character of which is indisputable) arbitrary exaction from the tenants or arbitrary enhancement of rent is impossible. Meanwhile prices of articles have risen and the standard of living has also risen among the middle classes. At the same time over-supply of literary labour has made it less remunerative. These circumstances have made the condition of this class very critical. Manufacture is the sole remedy of the middle class of Bengal and of the labourers alike. And we are earnestly after it.

13. But protection is unsuitable for India. Protection is economically unsound, free trade being nothing but application of the principle of division of labour in international commerce. In European countries and America protection is based on Nationalism. But India is a continent with different races and peoples with mutually conflicting interests, and nationalist school of political economy can have no place here. Further to some extent India is naturally-protected on account of her distance from the manufacturing countries and the cheapness of her labour.

14. The poverty of the masses in India has its origin in remote pre-British days. The quotation as regards the effect of previous famines shows their helpless and resource-

less condition in past times. The head-way we have made is really within the last 25 or 30 years, *i.e.*, from the opening of the Suez Canal and development of railways. This is really a very short period for a deeply conservative country like India. But already the signs of material progress are visible. The import of treasures shows that at any rate the trading classes are growing richer. The rapid recovery from the severe famine of 1897 shows that resources of the land-owning agriculturists have increased and are increasing. "The expanding revenue under excise, stamps and income-tax points also to the steady growth of general prosperity." Only the classes which are failing to keep pace with this great economic evolution are suffering from a passing crisis.

Statement showing the total amount of advances to cultivators by Government under Acts XIX of 1883 and XII of 1884 at the close of the year 1908-1909.

* * * * *

Advances for Improvement of Land (Act XIX of 1883).

	Rs.
Imperial	5,19,329
Provincial	2,47,68,543

Total 2,52,87,872

Advances for Relief of Agriculturists and other purposes (Act XII of 1884)

	Rs.
Imperial	3,03,254
Provincial	2,23,14,054

Total 3,26,17,308

Grand Total 5,79,05,180

Statement showing the net imports (quantity and value) of gold and silver in each of the seven years ending 1909-10.

	GOLD.	Value.	SILVER.	Value.
	Weight.		Weight.	
	Oz.	Rs.	Oz.	Rs.
1903-1904	2,179,992	13,44,47,045	79,182,136	13,65,27,664
1904-1905	2,136,562	13,26,18,153	74,349,595	13,26,14,724
1905-1906	559,564	4,04,55,824	84,317,765	15,72,30,193
1906-1907	2,939,773	18,08,97,510	118,198,837	24,00,55,193
1907-1908	3,329,431	20,51,46,134	97,915,359	19,46,82,696
1908-1909	1,177,236	7,53,21,008	73,740,131	12,06,84,555
1909-1910	4,071,151	24,93,04,094	61,014,752	9,44,49,223

* Figures defective, the weight of certain parcels exported by post not being declared by Post Office.

1 Oz=2½ tolas.

EDUCATION IN INDIAN ECONOMICS.

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In an essay on "Popular Education and National Economic Development," the celebrated Professor, Dr. Tews of Berlin stated his conclusions thus :—

First, general education is the foundation and necessary antecedent of increased economic activity in all branches of national production, small industries, manufactures and commerce. Secondly, the consequence of the increase of popular education is a more equal distribution of the proceeds of labour contributing to the general prosperity, social peace and the development of all the powers of the nation. Thirdly, the economic and social development of a people, and their participation in the international exchange of commodities, is dependent upon the education of the masses. Lastly, for the above reasons, the greatest care for the fostering of all educational institutions is one of the most important national duties of the present.

If the above sentences are applicable to an European State, how much are they to India where the indispensable means of raising our condition is a sound system of education. In suggesting remedies to bring about India's regeneration, one of the Presidents of the Indian Industrial Conference said that what we require are a wide provision of elementary education, foundation of technical schools and scientific institutes, establishment of commercial schools and acquisition of scientific and technical knowledge by students sent abroad. All these suggestions are included and comprised under one comprehensive word, *Education*.

Two facts are self-evident. First, the question of mass education which is of vital importance to us—the Indians who are lagging behind in the race of human civilisation, and secondly, it is also a patent fact that our Government must increase its rate of expenditure on public education. This will be clearly evident from the fact that

in England every child of school-going age—this is a rule which holds good in Japan and in fact, in all the civilised countries—is compulsorily required to attend a school. The amount which the Government in England is now spending is 11½ millions as contrasted with 4½ million which it used to spend 15 years ago. Observe the contrast in India. 90 p. c. of our population is uneducated and do not attend school but "in the quinquennium from 1885-86 to 1889-90 the state grant to education rose from 124·3 lakhs to 131·6 lakhs only, i.e., by less than 6 p. c. and this inspite of the fact that the amount for the latter year included state expenditure on education in Upper Burma which the former year did not." * It was only from 1902 that the Government of India has been making special grants for education but this, we must submit, is not enough for our purpose. The well-known writer Max once writing in the "Capital" on India's education thus wrote and we commend this passage to the notice of all right thinking Englishmen—

"We will look forward and welcome the day when the millions of the lowlier orders in India will have reached that platform when free and compulsory primary education may safely become an institution in India ; but that day according to present appearances, is not yet near at hand, but education is going on all the same. Would that the cultivators knew how to bring up their boys to make two blades of grass grow where only one grew before—to make the earth yield 50 p. c. more weight of food crops from the acre than is taken now. That would be a primary education worth speaking about. *And it is the first and foremost kind of primary education that ought to be fostered in India.*"† In fact all are agreed that free education must be placed within the

* Those who want to study this question deeply are requested to refer to the able speech of the Hon'ble Mr. Gokhale in the Budget Debate of 1903.

†The Statist in an article on "Increasing the purchasing power" rightly observes "obviously, if the production of India could be increased 50 p.c., the producers would immediately be able to raise their own standard of living, and they would likewise be able to find that their production was increasing so greatly and that there was a free market for it, to offer better wages." Evidently if this is to be done as the Statist observed "the really sound system of education must be provided for

reach of the agricultural population and that it is the duty of the state as well as of the rich to provide as extensively as possible, sound elementary education for the labouring classes.

Let us now take a cursory view of the spread of education in some advanced countries.

First take Germany, which is going ahead in manufacturing Industries. In the census of 1900 the population of the country amounted to 56,367,000 souls. The number of primary schools was 60,000, the number of teachers 125,000 and the number of pupils exceeded 8 millions. In 1898-99, only 7 men out of ten thousand were returned as illiterate. The number of secondary schools exceeded one thousand, while there are more than 20 Universities having some 34,000 Students with about 3,000 Professors. 18,000 Students were receiving technical education.

In England, students attending elementary schools were 4,566,000 in 1900. Of the number of secondary and higher schools, technical colleges and universities, there is almost no end.

In Japan, the object aimed at by the State may be gathered from the Imperial order issued in 1872 to the effect that education was essential for all persons and that whereas in the past, learning had often been looked upon as a means of securing official position, henceforward the whole population of the country, regardless of classes, must be educated, so that no village should contain a house devoid of learning, nor any house contain an illiterate inmate. In fact, education as Baron Dairokukichu, President of the Imperial Kyoto University remarked "education is regarded as one of the most important functions of the State." There

the whole people." The Hon'ble Rao Bahadur Mudholkar in the first Indian Industrial Conference very aptly said "The first thing that has been done is to recognise the fact that some education is necessary even for workmen and artisans and that our industrial development cannot be said to be established on a solid foundation unless the mass of operatives on whose labours it would depend are better fitted physically, intellectually and morally for their work than at present. The Government have in India the same duty and responsibility in regard to the instruction of the masses than they have in England and we are justified in appealing to them to take here the action which is deemed absolutely necessary in Great Britain."

in Japan, the ordinary elementary school course extends over six years and is obligatory on every child, who must enter it at the beginning of first school year after it has completed its sixth year of age.* The method of attendance as Mr. Lajpat Rai remarked is typically oriental. When children belonging to the school absent themselves for seven consecutive days without good reason, their guardians must at once be notified and be instructed to make the children attend. In case, their absence continues for another successive seven days, the headman in charge must be notified thereof. On receipt of such notification, the headman impresses upon the guardian the necessity of making the children enter the school or attend regularly. When such a pressing intimation is given for the second time and still no notice is taken of their neglect to enter or attend the school, the matter is reported to the superintending authorities. On receipt of such report, the district headman on behalf of the town, or village headman or the local Governor on behalf of the Mayor, makes a fresh pressing demand that the children shall be compelled to enter or attend school. We are ourselves orientals and certainly it should be our best aim and endeavour to follow in the footsteps of another oriental nation.

I should also like to point out here that no fees are charged for ordinary elementary schools and as the result of this, 90 p. c. of the "school population" are at present receiving the prescribed course of education.

In America, has been achieved the highest development of Industrial education. Education is imparted to students *absolutely free*, because as H. H. The Maharaja of Baroda said "No fees are charged in these state colleges, *because the proper training of citizens in technical arts is considered a matter of national importance* and lands and annual grants are assigned by the States for the maintenance of these colleges."

Two comparative tables are given below—culled from the Hon'ble Mr. Gokhale's Budget speech of 1908—one to show "the position as regards the spread of primary education and the total expenditure incurred in different countries" and the other to show "the figures of expenditure on

* Vide Modern Review, September 1910.

Higher education." The tables clearly prove our position and categorically calls upon our Government and other rich people to pay more attention to this all-important question.

Names of countries.	Population in millions.	Total emolument in Primary Schools in millions.	Ratio of emolument to population.	Total expenditure in millions of pounds.	Expenditure per head of population.
					<i>s. d.</i>
Austro-Hungary.	41.4	6.2	15	5.35	2.6
Belgium ...	6.7	.8	14.5	1.5	4.6
France ...	38.5	5.5	14.4	8.9	4.11
Prussia ...	34.5	6.3	20	9.2	5.4
England and Wales ...	31.7	5.7	17.7	12.1	5
Scotland ...	4.3	.7	17	1.6	7.8
Ireland ...	4.5	.8	17.6	1.2	5.5
Russia ...	126.5	3.8	.3	.14	0.8
Switzerland ...	3.1	.65	20.7	1.3	8.5
India ...	221.2	3.16	1.4	.76	3.6
Japan ...	42.7	3.3	7.8	2	0.11
United States ...	75.3	15.3	20.9	44.5	9.10
Canada ...	5.2	.95	18.	2.	7.9
Australasia ...	4.3	.79	18.	2.5	11.7

EXPENDITURE ON HIGHER EDUCATION.

Country.	Total amount spent.	Expenditure per head of population.	Country.	Total amount spent.	Expenditure per head of population.
Austria ...	Sterling 56 millions.	6d.	Sweden.	.14	6½
Belgium...	.16	6d.	United States.	3.5	11d.
France. ...	.92	6d.	Canada.	.21	10d.
Germany .	1.6	7d.	Australasia	.13	8d.
Great B. & Ireland...	1.7	11d.	India.	.28	¼d.
Italy ...	.46	3½d.	..	...	...
Russia ...	.95	2d.	...	...	...
Spain ...	.1	1½	...	...	...

In Europe, Russia spends 2d. and Spain 1½d. But in India we have ¼d.

Who would now deny that there is no other subject which should call our whole-hearted enthusiasm than education? Government is really increasing its scale year by year but even then who would deny that Government should encourage it more and more? And last but not the least of all, who would deny that we require more men of the stamp of Tata and Palit? *

* I have not dealt with the indirect effects of education upon the economics of India but the following passage which I take from Dr. Herschell's "Jottings from Jail" will open the eyes of many to this question of indirect effect. "I wish the Schoolnet were more diligently and successfully cast. Of 78,416 persons apprehended in London there were 8426 males and 4677 females who could neither read nor write, while 45,021 males and 4,677 females are described as being able to read only or read and write imperfectly, i. e., out of 78,416 persons apprehended 75,789 were altogether uneducated or imperfectly educated." If this happens in England, how much more in India?

PRACTICAL SALESMANSHIP.

By C. GOPAL MENON, ESQ., F. I. P. S.,
F. C. I., A. I. B.

Madras.

History reveals the fact that the principal means by which nations endeavoured, whether through their Governments or through other institutions, to promote their commerce and industry, have been by the establishment of Commercial Museums, or floating Exhibitions, Bounties, Protective Tariffs and Technical and Commercial Education.

Commercial Museums or floating Exhibitions are intended to convey the samples of a country's commodities to various places in distant markets.

Bounties, *i.e.* payments on the export of goods are sometimes resorted to by Government to encourage industries.

Protective Tariffs, *i.e.* duties levied on such a scale as to encourage the protection of the goods so taxed in the country itself by the total or partial exclusion of such goods of foreign origin.

Technical education and Commercial education are very important means above all others of promoting national commerce to a considerable extent. As regards Technical education, Germany, France, Belgium and Switzerland are ahead of other countries. This is borne out by the most flourishing condition of the various industries of those countries. There are excellent Technical institutions in various parts of those countries. The teaching of industries is carried on in the workshops. But even there instances are not wanting as to industrial success achieved in certain cases by imparting instruction in the class room. Schools of design and schools in which the principles of Chemical industries, such as dyeing, are taught are evidences to substantiate this fact.

In the Schools of Commerce established on the continent, instruction is imparted in the methods of business

and particularly in Commercial geography. There are important universities of commerce in America, England, France, Antwerp, Brussels, Russia and Switzerland. Graduates turned out from these institutions, find themselves so fully equipped for practical business affairs that soon after leaving the universities, they enter the foreign market either as buyers or as sellers, with an enormous advantage over the man whose education has been acquired under less systematic methods.

There was a period when the business of merchandising was thought of as an occupation unworthy of the refined intellect. But that day has long gone by and at present the wealthy traders and intelligent manufacturers are ranked on a par with the nobles of the land, and are in fact leaders in every great movement of material progress. The work of the salesman more than that of any other class of people, contributed to the prosperity, consolidation and greatness of this work-a-day world.

The capacity of the salesman is the foundation upon which success or failure of any business depends. Manufactures which are valuable to the people, are lying dormant for want of proper introduction and representation. Methods of production have undergone changes in the past hundred years and manufacturing has been revolutionised by new inventions, improved machinery and enlarged demands. In fact the difference between the commerce of to-day and that of hundred years ago is the increased complexity and the increased competition. These two factors being the characteristics of modern commerce it seems to follow that the education of businessman should be such as will develop in him "*business-power*" and "*business-knowledge*." As business-power and business-knowledge are both needed in modern business, each should be made to help the other. A man may possess great business-power, and yet he may fail in his business through lack of business-knowledge. To the young man who is the aspirant of a great business, business-power is all-important; for business knowledge, he can rely on others. Business-power, however, depends to a great extent on natural aptitude, and that attitude may be

greatly developed by proper training just as any other qualities—intellectual or moral.

I question the possibility of a young man acquiring the mastery of the art of salesmanship in the office and the sale room. Merely disposing of goods—even large volumes of them, is not salesmanship. I consider that true salesmanship is the art of exhibiting a reasonable profit in the sale of the commodity one sells. Salesmanship may, therefore be defined as the ability of the seller to persuade dealers to purchase goods to his profit, in other words, briefly defined, it is the sale of goods for profit, it is also the power which enables us to make others think as we think, believe as we believe, the power to create a desire for things where such desire did not previously exist. He must possess a combination of qualities, mental, moral, spiritual and physical—the influence of which will have to be brought to bear upon men whom he interviews with a view to making them purchase his goods at a profit.

Then what sort of a man is he to be whom you require to make a successful salesman? Would you be satisfied with a man who is able to bring a good batch of orders? The business of an order-taker and that of a salesman are of the *same* character, the latter possessing the important element of the "*power to persuade*" which is absent in the former. Of course, the salesman takes orders, and takes a good batch of them 'but the order-taker takes indents only from those who already wanted goods. He does not really sell anything to anybody. It is this element that is wanted in a great measure in our future businessmen. The industrial development of our country is in its infancy and our productions have to meet with the competition of foreign markets. To overcome this difficulty and to induce merchants to purchase articles, which in some cases may be even dearer than those which are already available in the market, we require travelling men with genuine knowledge of salesmanship. The steady worker,—the man who grinds showing healthy and continuous results, is the one to be preferred. If he is a man possessing a good physique, is susceptible to instruction and has a

disposition to obey orders, he is bound to become a successful salesman.

It is often remarked: a salesman is born—not made, just as it has often been said that a journalist, lawyer, professor, or doctor should possess aptitude for his profession inborn in him. I do not deny that he should have confidence in his work and love it, and that he will do better work and be happy in the doing of it, but I do not entirely depend upon natural gifts alone, and it might truly be said that natural instinct alone is not enough for the attainment of the highest efficiency in any profession.

What is after all a salesman? To me it appears that business institutions, great and small, are the salesmen, and the object of these business houses being the sale of goods for profit, every one interested in that concern, from the head of the institution down to the office peon contributes to the making of profit. It is the item of profit in a balance sheet that tells one whether good salesmanship has really "played a part." The business world consists of thousands and thousands of great salesmen having business instincts inborn in them, but they would never have attained the record of success if they had merely depended on the natural gift in them and had not had the benefit of scientific training. Business talents and sound education combined with physical strength or reasonable health, are not all that is required in a practical salesman. I admit that the development—moral and spiritual—side by side with intellectual and physical does not handicap men in the race for business success, but the businessman or the practical salesman must possess that potent factor—the power to persuade; also he must have that rare "commodity"—common sense in a great degree. Above all, he must have "grit, gum and gumption."

We find to-day numbers of salesmen of mediocre ability, while the salesmen skilled in the art of selling goods are sought after by captains of industry and leaders of the great commercial enterprises more at the present time than ever before. The practical salesman not only studies to secure business, but also takes care to see that

he does not lose it. He studies his own character as well as his customers' peculiarities.

A salesman should be polite, but instances are not wanting when you have to assume an air of superiority towards your clients without your losing the power of absolute self-control. Scientific salesman is a good student of human nature. While trying to canvass a prospective business, one has to see whether the occasion is favourable or inopportune for pressing for business; if the occasion is unfavourable, he must retire diplomatically, leaving the way open for a future engagement. Business which was often lost could have been easily secured, if a little more thought had been bestowed upon the problem.

This elementary treatment of the subject shows that scientific training is being rightly recognised as the only sure means of ensuring success in business and we require men endowed with the fundamental business faculties of strong common sense, energy and particularly reliability, together with a sound training to promote the industrial awakening which has but just begun in our country.

MODERN METHODS OF ILLUMINATION.

BY

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Among the many problems with which applied science is concerned at the present time that of illumination is one of the most important. We have only to travel back in imagination to the days when primitive forms of oil lamp and the tallow candle represented the highest available types of artificial illuminant in order to realise the enormous importance of the problem of illumination, whether considered from a general or from an industrial standpoint. It is thought that in view of the extraordinary developments which have taken place in methods of illumination within recent years, a brief review of the whole

subject and of the present position of the problem will not be without interest.

The selection of the best system of illumination to satisfy given conditions is by no means so simple as might at first sight be supposed. This is due to the fact that cheapness is far from being the only consideration which has to be taken into account. We have, in fact, in many instances to have regard to various special requirements which are of equal if not of greater importance than slight differences of cost. Among such special requirements may be mentioned safety from fire risk, cleanliness, convenience of handling, and ease in lighting or extinguishing the illuminant, colour of the light, possibility of using the illuminant in confined spaces and in any position, absence of noxious fumes, physiological effect of the illuminant, etc. The varied requirements to be met in different cases account for the comparatively large number of methods of illumination in use at the present day, each of which has a field of application of its own.

Most artificial illuminants may be referred to one or other of two classes: (1) those in which a high temperature is obtained by the combustion of a suitable fuel, and (2) those in which a suitable body is rendered incandescent by the expenditure of energy within its substance. The distinction between these two classes is a fundamental one. In class (1) the cost of light production is mainly determined by the cost of the fuel employed; while in class (2) the cost is very largely that of the energy consumed in maintaining incandescence. Some sources of light partake of the characteristics of both classes; a well-known example is that of the ordinary open arc lamp in which the carbons form a fuel undergoing very slow combustion, but in which incandescence of the positive carbon end or crater is maintained almost entirely by the power supplied to the arc. The cost of carbon renewals in this case forms a by no means inconsiderable item in the total cost of lighting. In each case, in addition to

the cost of fuel or cost of energy, and the cost of renewals, we have, in determining the total cost, to take into account depreciation and interest on the capital spent in providing the various appliances for a given system of lighting.

Dealing with illuminants of class (1), we may conveniently divide them into three types, using solid, liquid, and gaseous fuels respectively. Those in which solid fuels are employed and of which the camp fire may be regarded as the prototype, represent some of the most primitive forms of illuminant and hardly merit serious consideration from a modern point of view. Illuminants of the second class are represented by the various forms of oil lamp. The oil lamp will probably continue to be used for a long time to come as it possesses the great advantage of being a self-contained appliance of comparatively simple construction, is fairly portable, and employs a fuel of wide distribution and easily procurable in most places. Its disadvantages are almost too well-known to require mention. It may become a most dangerous contrivance if used carelessly, and requires a very considerable amount of attention if really satisfactory results are to be secured. By far the most important illuminants of this class are, however, those employing various forms of gaseous fuel, such as coal gas, acetylene, petrol-air gas. Among these, coal gas stands first in order of importance.

The improvements which have taken place in the application of coal gas to illumination are so great that it seems desirable to give some idea of the enormous progress made by quoting figures relating to the consumption of gas in the various types of burners used since the introduction of gas lighting. The earliest gas burners gave only 2 to 3 candle-power-hours for every cubic foot of gas consumed. In later burners of the flat flame or bateswing type, 4 to 5 candle-power-hours were obtained per cubic foot of gas. By the use of various other special types—such as the Argand burner—the efficiency was further improved. It was not, however, until the advent of

the incandescent gas mantle that gas lighting received a fresh impetus which enabled it to compete more successfully with its greatest rival—electric lighting. The extremely delicate nature of the incandescent gas mantle, however, and its rapid deterioration when in use prevented its more general adoption for some time after its introduction. In spite of these disadvantages, it made fair progress owing to its enormously high efficiency in comparison with burners of the ordinary type, as much as 20 candle-power-hours per cubic foot of gas being obtainable. The keen competition with electric lighting stimulated the gas companies to further efforts, and in the latest type of gas burner—the high incandescent burner—the efficiency has risen to the high figure of 60 to 70 candle-power-hours per cubic foot of gas, the gas consumption per candle-power-hour being thus only about 1/20th of what it was in the earliest types of burner. The main disadvantage of the incandescent gas mantle, however, still remains—it is still delicate structure requiring careful handling, and its deterioration during use is extremely rapid. The usual life of even the latest type of mantle does not appear to exceed 200 hours.

Unlike the oil lamp, the gas burner is not a self-contained appliance capable of holding a considerable supply of fuel, and requires a system of piping and an elaborate and expensive plant for generating the gas. While, therefore,—as already pointed out—oil lamps are particularly well adapted to cases in which the illumination is required with the minimum initial outlay on lighting plant and portability of the illuminant, gas lighting is essentially a system of what may be termed wholesale illumination, that is, a system in which a large number of consumers derive their fuel supply from a single generating centre.

Many of the disadvantages of oil lamps are equally characteristic of gas lighting. We have the same naked flame burning freely in the atmosphere and liable to

ignite any combustible matter accidentally brought into contact with it. We have the same formation of noxious gases frequently charged more or less heavily with fine particles that have escaped combustion, and objectionable not only from a hygienic point of view but also because of their effect on delicate fabrics and costly decorations or on works of art liable to be affected by the products of combustion. It is on account of these disadvantages that gas lighting has not made more rapid strides in spite of the remarkable improvements which have undoubtedly taken place in the efficiency of the burners, and the fact that in point of cheapness it could probably easily beat the majority of its rivals. In cases, however, where the disadvantages in question need not be considered, and where cheapness is a factor of prime importance—as in out-door and street lighting—gas lighting has made considerable progress.

We now come to the consideration of the second class of illuminant, in which incandescence of a suitable body is maintained by applying electrical energy to it. The progress of electric lighting and the many improvements which have been introduced into the construction of electric lamps are no less remarkable than the advances made in gas lighting. The efficiency, it is true, has not been increased in quite the same high ratio as in the case of gas burners, but, on the other hand, improvements in other directions have been effected which to a large extent compensate for the smaller increase in efficiency of the latest as compared with the earliest types of lamp. The more important landmarks in the development of electric lighting may be briefly enumerated as follows:—Introduction of the arc lamp, invention of the incandescent lamp and consequent solution of the problem known at the time as that of the 'sub-division' of the electric light; improvements in the construction of incandescent lamps with carbon filaments and introduction of the high voltage incandescent lamp (up to 250 volts); introduction of the Nernst lamp, the

flame arc lamp and the high efficiency metallic filament incandescent lamps.

The three most important types of electric lamp at the present time are undoubtedly the flame arc lamp, the metallic filament incandescent lamp and the carbon filament lamp. Of these the carbon filament lamp is steadily losing ground, and in all probability the time is not far distant when it will be of little more than historical interest. No surprise will be felt at this result when it is considered that the carbon filament incandescent lamp uses from 3 to 4 watts per candle power, while in recent types of Tungsten filament lamps, the consumption is only 1 watt per candle-power. In addition to the great improvement brought about in the efficiency of the incandescent lamp, its useful life has been considerably increased and its deterioration with age greatly reduced. A modern Tungsten filament incandescent lamp maintains its original candle-power far better than any incandescent gas burner or carbon filament incandescent lamp.

In order to render the present position of the illuminants under consideration quite clear, it will be necessary to examine their main characteristics a little more in detail and to point out the advantages which they possess over their predecessors.

The flame arc lamp may be regarded as one of the best illuminants for the lighting of streets and large open spaces. It represents an enormous advance on the older type of arc lamp from which it differs in several important respects. The main difference lies in the fact that whereas in the old type of arc lamp in which the 'carbons' consisted of practically pure carbon rods, the bulk of the light was derived from the incandescent surface of the 'crater' or white hot end of the positive carbon, in the flame arc, the light is mainly derived from the arc itself or the column of incandescent vapour between the two carbon rods. The luminosity of this column is due to the fact that the carbons contain a considerable proportion

of metallic salts. By impregnating the carbons with suitable salts, the efficiency of the arc as an illuminant is enormously increased. Thus, the ordinary non-luminous arc using pure carbons requires about 1 to $1\frac{1}{4}$ watts per candle-power; whereas the flame or luminous arc takes only .25 to .35 watt per candle-power. The consumption of the carbons is much more rapid in the flame than in the ordinary arc lamp, a disadvantage which not only greatly increases the cost of carbon renewals, but necessitates much more frequent re-carboning. The latter difficulty has been overcome by the introduction of 'magazine' lamps in which a number of carbons are provided, and by a suitably arranged automatic device, a fresh carbon is brought into action as soon as the one in use has been consumed. Another point of difference between the two types of lamp lies in the colour of the light. A somewhat serious disadvantage of the flame arc lies in the fact that it evolves poisonous fumes much more copiously than the ordinary arc, and is, for this reason, unsuited for in-door illumination.

A characteristic common to all arc lamps is the occasional unsteadiness of the light. This is of little importance for out-door lighting, but, for in-door illumination, may become a serious disadvantage. The difficulty may be largely overcome by the use of the 'inverted' arc system, in which the craters of the arcs are arranged below instead of above the negative carbons and throw their light on a white-washed ceiling which diffuses it and yields much more uniform illumination; any flickering of individual lamps is then hardly noticeable.

It is interesting to note that attempts to use carbons containing metallic salts were made in the very earliest days of arc lighting. But owing to various technical difficulties connected with the use of such carbons no successful type of lamp was evolved, and it was reserved for a later generation to deal with the problem in a satisfactory manner.

The flame arc lamp is undoubtedly the favourite type

of illuminant for out-door use in all cases where strong illumination is desired, and it has steadily been displacing the ordinary types of arc lamp. As already pointed out, it is unsuitable for in-door use. Ordinary arcs have in the past been freely employed for the illumination of interiors—such as shops, offices, etc,—but their use in this connection could not be justified nowadays. The capital outlay which they necessitate is considerable, and equally good illumination at a smaller cost may now be obtained by the use of metallic filament lamps.

Besides the flame arc lamp, there is another recent type which may possibly prove a rival to it in the future. This is the magnetite arc introduced by C. P. Steinmetz, in which one of the electrodes consists of a block of copper which is not consumed and forms a permanent part of the lamp, while the other electrode consists of magnetite mixed with other ingredients.

Although so far as electric lighting is concerned, the flame arc lamp and the metallic filament incandescent lamp are undoubtedly the most important illuminants, there are besides the other sources briefly referred to, a number of types of electric illuminant which present many points of interest. The Nernst lamp, in which a special type of burner, non-conducting at ordinary temperatures, is maintained at a white heat by the current, has had a large measure of success in the past. The Nernst lamp differs from other forms of electric incandescent lamps in that, the light-giving portion is freely exposed to the atmosphere, and is not enclosed in a vacuum bulb. It suffers from the disadvantage of requiring a special device for the preliminary heating up of the burner to make it conducting—an operation which takes from 15 to 45 seconds—so that the lamp cannot be quickly turned on and off. Its efficiency is much below that of the Tungsten filament lamp. At the time of its appearance it was one of the most efficient electric lamps in existence.

The mercury vapour lamp also deserves mention. It

consists essentially of a tube filled with mercury vapour which is maintained incandescent by the passage of the current. A special starting device is provided to vaporise a sufficient quantity of mercury at the moment of turning on the lamp. The efficiency of this lamp is high, as the power consumption amounts to only $\cdot 5$ to $\cdot 6$ of a watt per candle-power. In the ordinary form of this lamp, the light is almost monochromatic, being largely confined to the green rays. For this reason the general effect of the light is somewhat ghastly, and it is absolutely impossible to distinguish colours by it—red, appearing black; white, green; and other colours undergoing similar striking changes. Mercury vapour lamps have been used to some extent for the lighting of drawing offices; they give a highly diffused light, and by those who have had experience of it, the light is said to be very restful to the eyes. A modification of the mercury vapour lamp has recently been introduced, in which the tube is made of quartz instead of ordinary glass, and which allows of the mercury vapour being raised to a much higher temperature than is possible with a glass containing tube. The effect is to broaden the spectrum of the light by the addition of a large number of rays to the original green ones, and thus to improve the quality of the light. The efficiency is also enormously increased, the lamp taking only $\cdot 25$ to $\cdot 3$ of a watt per candle-power. It may be mentioned that the quartz tube lamp emits powerful ultra-violet radiation, and this type of lamp seems destined to be of some importance in connection with the problem of water sterilisation on account of the well known bactericidal properties of ultra-violet radiation.

The Moore vacuum light is another form of illuminant which has found a limited application in practice. It consists of a ramifying tube containing some suitable rarefied gas which is maintained luminescent by an electric discharge. The light is pleasantly diffused, and by using a suitable gas, may be made to resemble that of daylight.

A consideration of the history of the two most important classes of illuminants—those depending on gas and electricity respectively—shows that enormous advances have taken place in their efficiency since the introduction of the earliest representatives of each class. It would be idle to suppose that finality in this respect has been reached, and that further improvements are unlikely to take place in the future, although it may be extremely difficult to attempt any forecast of the lines along which future developments are likely to proceed. One thing we are certain of—namely, that as regards efficiency, even the best of our modern illuminants fall far short of the ideal to be aimed at, and that there is still plenty of room for improvement. The study of luminous sources and the methods of using them to the best advantage—especially the latter, is of comparatively recent growth. The problem of providing satisfactory illumination is by no means a simple one, for, taken in its entirety, it involves the consideration of many obscure physiological effects as well as of purely physical facts. That the various difficulties arising in connection with the problem of illumination are fully recognised and the importance of their satisfactory solution to modern civilization realised is clearly shown by the foundation in both England and the United States of Societies of Illuminating Engineers. In view of the extreme activity now prevailing in this field, it is not too much to hope that the next decade will witness many further striking improvements in our methods of illumination.

INDUSTRIAL WORK IN THE AMERICAN MARATHI MISSION, AHMEDNAGAR, WESTERN INDIA.

ITS GROWTH, DIFFICULTIES AND HINDRANCES AND RESULTS.

BY REV. H. FAIRBANK.

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In the early days of mission work in India, industrial education was not undertaken to any great extent. Literary

education, the ability to read and write as a preparation for work as teachers and preachers, this was the education given. A change has of late come about, and I wish to state in this paper the reasons for the change and the difficulties overcome, or still hindering the work, and some of the results that have been achieved.

What is here said applies to the industrial work in the American Marathi Mission, established at Bombay, and in the districts of Ahmednagar, Sholapur, Satara and Poona. I shall refer particularly to the work done at Ahmednagar.

The reasons for the introduction of industrial training are briefly as follows:—

1. Dissatisfaction with the results of a purely literary education. The first effect was to make the graduates of our schools dislike and despise work with the hands. Mr. Booker Washington in the United States of America has said that the Negro looks upon education as a means of escaping from manual labor. A graduate of one of our schools was helped to get a position as a farrier. His brother-in-law came to the missionary and berated him soundly for disgracing the family by getting such a menial job for one of their number. A teacher in one of our schools never allowed his boy to touch a pencil even or learn to draw for fear he would get some of the new manual training. This has been the result not only of education in mission schools, but also in Government schools. As long as there was employment for all the graduates of our schools, this matter did not receive serious attention. But there came a time when employment could not be found for these boys as teachers or as preachers, and then their contempt for anything else proved a serious hindrance to their supporting themselves.

Then there were boys in the schools who could not get on in their studies. What to do for these was a serious problem, solved only for a good many by manual training of some sort. A course in carpentry has been the means of changing some boys from dullards into stirring active workers.

2. The growth of the Christian community, especially at the time of the great famines of 1896 and 1900, when over

3000 orphan children were taken by the Mission in its orphanages, stimulated the growth of industrial education. It was a serious question what to do for these boys and girls, so that they might earn a living, when they grew up. To teach them trades seemed the only method of preparing them for life. These boys and girls have come largely from homes of day laborers. To take them out of their former life entirely was not the thing to do. There was no desire that they should still be day labourers, but that they should feel that labor with the hands was the way for them to earn their livelihood, has been the aim of our teaching.

3. There has been a change in the community as a whole. Men and women formerly dependent on the village, and living on perquisites doled out by the people of the village, have found that they were not getting what they ought to get, and are becoming independent in their modes of life. Some are becoming traders on a small scale, dealing in eggs and chickens, and horns and bones and the tan-bark, and things like these. They themselves need to be introduced to the world, and feel that they are a real part of industrial community. The great mills in Bombay and Poona are filled with these people.

4. The missionaries have felt that a great part of their work would be left undone, if they did not build up communities that were able to earn a reasonable amount of money for themselves and for their religious and social organizations. There is too much dependence on money coming from America, and the test of our work will be the permanent character of the communities which we help in forming. Many of the people who have come to us are of the poorest, not very different from beggars, and it is our duty to make them independent of others as they are not now. It is true that a good many in the villages have relations with the village, and depend upon their share of the harvest, and not upon a money-wage. But those who know trades are independent after all, and can earn something if the farmers of the village do not give them anything, whereas those, who are day labourers merely, find it hard to stand any loss of their connections with the village, and are the first to succumb in time of famine. I feel more and more that this last reason

is the great reason for Industrial education. The "Swadeshi movement" must extend into the Christian communities in such a way, that they will be left independent if all the missionaries were packed off to the countries, from which they originally came.

The beginning of the real industrial work in our Mission was made by Rev. Mr. Winsor at Satara. Mr. Winsor later moved to Sirur in the Poona District, and the school he started is still flourishing in Sirur.

The next movement was at Ahmednagar in connection with the Mission High School there. This school is called the Sir D. M. Petit School of Industrial Arts and much more money is spent in its workshop, than in the High School from which it started, and in connection with which it still is. (By the way, the Sirur School is also called the Sir D. M. Petit School, from the generous Parsee Merchant in Bombay, Sir Dinshaw Manockji Petit, who gave large sums to both schools.)

The famine of 1900 brought in a great many children into our care, as has been mentioned above and the Industrial School at Ahmednagar has become very much larger than it was. It has changed not only in numbers but it has also changed a good deal in character. The first carpentry class was intended to be a training only of the hand and eye, and the idea of a livelihood afterward was not at all prominent. Carpentry was very much like Algebra or Sanscrit, to develop the powers of mind and body.

But the famine brought about a change very quickly and now the thought of teaching trades is the dominant thought. The boys themselves measure the value of any particular trade by what it will do for them after they leave the school. The actual kinds of work will be spoken of later under the head of results.

It was not long before difficulties began to appear in this work.

The first difficulty was that the missionaries on the field were not trained mechanics, and were not able to superintend industrial work properly. This meant the bringing in of experts to do this work, and this has necessitated a large increase in the expense of our schools. The

difficulty was not one simply of experts from abroad, but of men of India who could and would teach. The condition of things to-day is however very different from what it was when we started the work. There are many men now available for teaching, compared to what there were at the start.

The second difficulty, which should perhaps have been mentioned first, has been to get the interest of the people themselves enlisted in this cause. In one of our schools some time ago there was a dialogue gotten up by one of the teachers as a part of the graduating exercises of the school. Two boys came in, one a carpenter, and the other a teacher. The carpenter pointed with great pride to a chair he had made and told about it. The other boy, the teacher, said to him that what he had made was simply for the convenience of the teacher. "You make a chair and I sit in it." This was meant to show the superiority of the teacher over the carpenter. This is the feeling among the teachers and educated men of the community, and among the children themselves. They much prefer to study books, and feel they are in an inferior place when they are set to learn a trade, or to do something with their hands.

This has been helped by the missionaries themselves, who have generally put into industrial work only those boys and girls who were dullards and incapable of study of books. One missionary from another mission recently said that in his mission industrial work was a kind of Botany Bay for dullards. The results of work in our industrial schools must be judged with this fact in mind. This feeling is gradually wearing off. Steady work and good pay for boys trained in industries are the only answers that will finally do away with the objections that are felt by so many people to industrial education.

The third difficulty in the way of the man desirous to teach trades to Christian boys and girls comes from the structure of the Hindu community, and the customs of caste that are ingrained in the whole life and thought of the people. This difficulty is the difficulty of upsetting the traditions of Hindu caste. Castes in India are the most hard and fast trades-unions in the world. All the common trades are in the

hands of certain castes, of carpenters and blacksmiths and shoemakers, and so forth. They do not wish to teach boys of other castes than their own, and they do not wish to employ or work with these outside workers, especially if they are from the out-castes, whom to touch is pollution. So we have had to strike out for ourselves, and train our teachers ourselves, and then we have had to get employment for our boys wherever we could. This has been a very serious handicap in the way of the success of our industrial schemes. Boys who were able to work could not get work, and the choice of trades has also been limited. One result has been that Christian boys have been forced to go to the big cities, where there were shops under European management. This has been a distinct loss to the village life of the Christian community.

Besides the difficulties already mentioned is the lack of initiative and independence especially as the boys sent to the industrial schools have been the dullards. This is not strange, when one considers that there have been no industries in the homes of these boys or their ancestors for hundreds of years. They have come to feel that such things were not meant for them.

There is another difficulty, which comes out when the boy has gone out from the school, and begins to do for himself, and this is the inability to use money in a thrifty and far-sighted way. This does not mean that they do not know how to drive a bargain. It means that they do not know how to save their money and it means that they do not know how to get a capital and how to keep it. Any trade that demands an outlay for tools and materials must be managed by those capable of handling money. The weaver, according to new processes, must have in his possession a loom worth a year's wages, and the yarn necessary for him to have in hand is worth three or four month's wages. The hereditary Hindu weaver, with a much cheaper loom and needing less yarn for his warp, gets his yarn on credit ordinarily. This job of teaching the boys and girls in our schools how to be forehanded is perhaps the most difficult part of the work we are trying to do, but it is a very essential part of the process. This matter will have to be learned to a

very large extent after the boy leaves school, but even in school we are trying to teach them this by putting their money into savings banks, and giving the money to them only when it is needed to start them in their trade.

I will now turn to the actual carrying out of the work and speak of the different trades we have taught and of the success attending our efforts.

Carpenters have been more successful in getting steady employment after leaving school than any other class of workers, and carpentry has been the first trade to be taught in our schools. Here there always has been a choice between the methods and tools of the West, and those of the East. Benches and fine tools from England and America and wood from the saw mills of Bombay, such as teak and blackwood, appeal most to Europeans, and are the easiest for him to teach. Cabinet-making has been the trade taught in our schools generally, and the work done at Ahmednagar is very fine. But lately we have started teaching the use of the adze and other tools used by the native carpenter, and the boys sit on the floor, and the wood they work with is the hard cross-gained and crooked acacia, that is so universally used for ploughs and harrows and country carts by the people of the villages. Moreover this wood comes in the roughest of logs, and has to be sawn by hand. The trade of a sawyer has been added to the carpenter's trade, and promises to be a profitable trade.

Boys who have been taught cabinet-making in our Mission workshops are now working for themselves in a good many places and are doing well. A number are also teaching this industry in other schools.

In connection with our workshops there has been an engine, and from the beginning we have had more or less work in iron taught and done. The making of handlooms has also developed workers in iron, and a number have been trained here that are doing good work elsewhere. We have started recently a class for fitters. There is a steady demand for fitters for mills and motors and other like work.

Persian pile carpets are made in Ahmednagar in the Industrial School, and the goods made are most excellent in quality. It is not however an indigenous industry, and the

school has been obliged to train almost all its workers, and also to arrange for the sale of the manufactured carpets. There is not much local demand for these, and selling them in Europe and America has been difficult. A rug-factory was started in Ahmednagar by the Indian Missions Industries Co. of London, but the difficulty of getting a good man to run the factory, and of getting patterns that were saleable and the distance from the market were too much for this concern, and it had to be closed, much to the grief of those who had hoped for a permanent business here in these carpets. The class learning to weave pile carpets in the school is still kept up, and has some encouragement. Two boys formerly trained in the school have looms in their homes, and are making good carpets, which the school buys from them, and sells wherever it can. The Indian Missions Aid Society in London is now giving us orders, which help us very much indeed.

Metal-hammering is another trade taught at Ahmednagar. The chief attention formerly was paid to the repousse work. The shapes were made by one set of boys for another set to ornament. This class was very successful in its work, but here too there was difficulty in selling the goods as there was not a local market. The boys in the class were continually asking what they were to do when they got out of the class. The repousse department was finally given up. Attention is now being given to making such brass and copper utensils as are in common use among the people. The boys can go around in the town and sell their wares, and the difference in their interest and enthusiasm is wonderful.

Handloom weaving has been introduced into our Industrial School, and we believe has a very promising future. Mr. Churchill, who came out as an industrial expert during the famine, has gone into perfecting a loom suited to the requirements of the country. The importance of the industry may be seen from the fact that thousands of weavers in Ahmednagar, Sholapur, and other places in these districts earn their living on handlooms of a type handed down from time immemorial. The mills of course have cut tremendously into the work of hand weavers, but these hand weavers with their rude appliances still weave most of the garments worn

by the women of the country. This industry is promising for our boys and girls, because it supplies a demand of their own people, and the sales of their goods are to their own people, right at their own door.

The work done by the school has commended itself to the weavers and merchants in Ahmednagar so much that several men have copied the type of loom first made by Mr. Churchill, and are weaving various kinds of cloth on them now.

Rope-making and stone-cutting and house-building are also being taught with some success in different places in the Mission, though not at Ahmednagar. For girls lace and sewing form industries that can be followed in their own homes, and a large number of girls are being taught these trades.

I have not yet spoken of Agricultural training, because it stands by itself both in importance, and in the way it has to be taught. In connection with our plans for teaching industries to famine children, we brought out a man to teach them agriculture, who had had an excellent training in his subject in America. He worked with us for a time, and then we found that the expense was going to be too great for us and Mr. Knight went into the employ of Government, where he is doing excellent work. Agriculture is an industry that appeals to our people, as no other industry does, and I am glad to say that an increasing number are becoming farmers.

There are two difficulties in the way of our teaching farming. In the first place a large outlay is necessary, and secondly, in addition to skill and industrious habits, an ability to save and use money in a far-sighted way is absolutely essential. Such ability to save and use money comes only to those who have saved money themselves, and have bought to those who have saved money themselves, and have bought their land with their own hard-earned savings. Some thirty years ago one of our missionaries tried to put some farmers on their feet. He bought land for them, and gave them their ploughs, harrows, oxen, seed and fodder. Not one of those he tried to help is to-day a farmer. They thought there was a gold mine at the missionary's bungalow, and all they needed to do was to go and help themselves. However others have saved money themselves, and are to-day fairly successful farmers.

In two places in our Mission large fields have been taken to see if anything can be done in teaching farming. In one place some of the boys taught are now working on a monthly wage, but none of these boys are yet independent farmers.

The foregoing statement tells briefly what we have tried to do to help along the Industrial regeneration of India. We feel that we have accomplished some things, but we have become convinced that we have still a great deal to learn concerning this most important matter. However we feel hopeful that the future will be better than the past, because of the things that have already been done.

SWADESHI, TRUE AND FALSE

BY DR. ANANTA K. COOMARASWAMY

Arts Section, U. P. Exhibition, Allahabad.

All those who have studied the Industrial Arts of India unite in recognizing and deploring their profound decay, and in very many cases, their practical extinction. Investigation invariably shows that goods that ought to be, and once were, common in the market, are now only to be seen in Museums. One hundred, or even fifty years ago, it would have been possible to fill many Museums worthily with the every-day hand work of Indian artisans: now this would be hardly possible after years of patient collecting in remote districts. One gentleman, indeed who was asked to serve as a juror in the Fine and Applied section of the present exhibition, declined to do so on various grounds, particularly because he did not think any of the modern work deserved awards. During the nineteenth century, India has in fact, ceased to excel in those Industrial arts which provided the bulk of her exports, the main source of her wealth (after agriculture), and of the refined luxury of her homes during a period of time that must be counted in millenniums.

During this period—if we are to judge from the wreckage of her Industrial arts remaining to us—we must rank

the civilisation of India indeed highly, for it could have been truly said that in her homes, whether of rich or poor, there could be found nothing that was not either useful or beautiful. In exchange for this world of beauty that was our birthright, the nineteenth has made of our country a 'dumping-ground' for all the vulgar superfluities of European over-production, and all that the Swadeshi movement of the twentieth century has done is to provide us with many spurious imitations of these unlovely inutilities.

It could hardly have been otherwise, for behind the Swadeshi movement, there is no serious and consistent ideal. Its leaders have had but one thought before them—to save money. The movement has lacked almost totally in those constructive elements which we meet with in similar movements in other countries, such as Denmark or Ireland. Never have I seen in any Swadeshi literature the wish expressed to preserve Indian manufactures on account of their intrinsic excellence, or because the presence amongst us of these highly skilled craftsmen represented an important element in the national culture, or because these craftsmen still worked under conditions of life still infinitely superior, physically and spiritually, to those of the European factory-slaves.

Too often the leaders of our political movement have forgotten (as men forgot in the early days of the development of European industrialism) that elementary principle of statecraft, that *men are of more account than things*. They have forgotten that the goal of all material civilisation is not labour but leisure, and that industry without art only brutalises and degrades. For *things* then—things economic, political, temporary—they have been willing to undermine both our immemorial industrial culture, and to degrade the status and destroy the physique of those artisans who once served us so faithfully and who even now, if we would let them, make our cities and our houses beautiful again. I know no sign more

ominous for the future of the Indian civilisation, than our utter indifference to social industrial idealism, and the heartless callousness with which we have cast aside the services of those who built our homes, and clothed and wrought for us in the days before we learned to hate our own culture,—leaving them to eke precarious living by making petty trivialities for tourists, curio-collectors and for Anglo-Indian bungalows, or to drift into the ranks of menial labourers or factory hands. Do you think that we can thus degrade the status of so many men, without impairing the vitality of our national life and without injury to the basis of its possible prosperity ?

We, who think that we are educated and progressive, we, who attend Conferences and sit on Legislative Councils who are rulers of states, or earn more princely incomes in courts of law, we ourselves have despised and hated everything Indian, and it is by that hatred that we have destroyed our industries and degraded the status of our artisans. And when at last our pockets were touched—then so far from realising what we had done, we set ourselves to form Swadeshi companies for making enamelled cuff-links (with pansies on them), for dyeing yarn (with German dyes), or making uncomfortable furniture (for Anglo-Indian bungalows). We never thought that the fault was in ourselves. We lived in caricatured English villas, and studied the latest fashion in collars and ties and sat on the verandas of Collector's bungalows and strove to preserve our respectability by listening to gramophone records of the London music halls instead of living Indian singers—we learned to sit on chairs and eat with spoons and to adorn our walls with German oleographs and our floors with Brussels carpet : and then we thought to save our souls by taking shares in some Swadeshi company for making soap.

I tell you that Swadeshi is none of these things : it is a way of looking at life. It is, essentially, sincerity. Seek first this, learn once more the art of living, and you will

find that our ancient civilisation, industrial no less than spiritual, will re-arise from the ashes of our vulgarity and parasitism of to-day.

I do not think we fully realise the depth of our present intellectual poverty. If everything produced in India during the nineteenth century were to be suddenly, miraculously destroyed, the world would be very little the poorer. The creative force in us has died, because we had no faith in ourselves—we could only learn to be intellectual parasites ; to make, as has been said, of our country a mere suburb of Birmingham and Paris. It is imperative that we should recognize our real position, if we would reconstruct our national life. To this end, years of patient labour in the field of National Education is needed. So long as this education is based on the assumption that all true light and learning must come from Europe, so long will the restoration of industrial prosperity for India be impossible.

At present the most far-seeing and true Swadeshists are to be found amongst Englishmen, even amongst those whom we openly count as wholly the enemies of our country. No Indian has more consistently striven to achieve a truly Swadeshi ideal than Lord Curzon. I should like to remind you of his scathing but too true words spoken at Delhi seven years ago. He strove to prove, by that exhibition, that “ for the beautification of an Indian house or the furniture of an Indian home there is no need to rush to European shops in Calcutta or Bombay ” : but he could not help seeing that so long as the Indian princes “ prefer to fill their palaces with flaming Brussels carpets, Tottenham Court Road furniture, cheap Italian mosaics, French oleographs, Austrian lustres, German tissues and cheap brocades, there is not much hope.

Not less than forty years ago, Sir George Birdwood wrote : “ Indian native gentlemen and ladies should make it a point of culture never to wear any clothing or

ornaments but of native manufacture and strictly native design." How we should have scoffed at this idea then ! Even now there are Bengali gentlemen who bring home trunks full of English dresses for their wives after completing their studies at the English bar : and it is not ten years since the students of the Calcutta School of Art went on strike, and were strongly supported in doing so by the Bengali press, because an Englishman dared to think that real Indian art instead of second rate European might be made the basis of the teaching in the school. It is true that things have changed during the last ten years, and a change once begun progresses swiftly : but the amount of change is still insignificant, and we are only to a small extent less parasitic than the last generation. It is a marvel to me how many self-respecting people can endure for a day, not the system of Government,—but the system of education from which we suffer, a system which is a far deeper and more perpetual insult to our culture than any of the incidents in railway trains of which we hear so much. The Education Court at the present Exhibition, for instance, is little more than a gigantic advertisement of English schoolmasters and Messrs. Macmillan. There is practically nothing Indian about it. It is not surprising that the products of such education do not care for Indian art. It would be more surprising if they did.

Let me now briefly analyse the chief causes of decline in Indian industrial art.

Every one knows that architecture is a synthesis of all the arts and that their prosperity is bound up with that of the art of building. Modern Indian architecture, however, domestic or palatial, is at the very lowest ebb. The average modern house is a cross between a suburban villa and a Government barrack. The new palaces of most of the rulers of native States are, as Sir George Birdwood has remarked, like anything in the world except a habitation fit for kings. While European architecture is

nominally the model, in India, "the essence of European architecture" is supposed to consist in a reckless disregard of all recognized ornament and proportion."

It is very true, as Mr. Lockwood Kipling remarked in the first volume of the *Journal of Indian Art*—"It is on the architecture of to-day that the preservation of Indian Art semblance of healthy life now hinges." Yet so far, as I am aware, it has never occurred to any Swadeshist politician to demand from Government that in public buildings Indian architecture should be the rule, and Indian architect employed or that the State should again patronise and foster Indian artistic industries. These things are still done in some of the native States : but not in all of these (for Baroda affords a conspicuously objectionable example of Anglicisation and total disregard of Indian artistic tradition). Nearly everywhere in India there are still living hereditary and most capable working architects—but like other craftsmen they are being starved by neglect and forced to adopt menial or agricultural work for a bare living.

Living in pseudo-European homes naturally and logically involves and corresponds to the using of European furniture, clothes and finally, to an entire dependence on imported apparatus of material comfort and amusement—a dependence upon boxes of sardines and upon gramophones and on all that lies between them. In this process an accelerating touch is given by employing slightly educated Eurasian governesses to teach our daughters the use of knives and forks.

I should like to say in passing, that, in speaking thus, I do not mean in any way to disparage things European, as such. Nothing is further from my thoughts than that absurd notion which is expressed in the not uncommon saying, that *our* ancestors were civilised when Europeans were 'dressed' in wool. As a matter of fact early Celtic and Teutonic Europe was much more civilised in some respects than we are to-day—at least it cared more for creative and imaginative art. What I do wish to point

out is that *our imitations* whether in Swadeshi factories or in our lives, of things European are and must always be for ourselves socially and industrially disintegrating, and for the rest of the world wholly valueless.

Nor do I mean that we should never assimilate or adopt any foreign idea or custom. On the contrary, I believe that even in such things as music and the plastic arts, and still more in sociology, we have very much to learn from others, as well as to recover from our own past; only we do not show our progress in these things by taking to harmoniums, by buying German oleographs, or by adopting the crudest and least considered phases of a foreign culture. But let us recognise that by doing these things, we offend both against the higher and the lower ideal of Swadeshi—the higher which is in our hearts, and the lower in our pockets.

Let us now study the process of disintegration further, passing from architecture, the main setting of our lives, to all the lesser elements of our environment.

"Not in Benares only" says Sir G. Watt, "but throughout India the fine old art designs that have been attained after centuries of evolution, are being abandoned and models utterly unsuited and far inferior artistically are being substituted. The writer can confidently affirm that he found in at least 50 per cent. of the important silversmiths' shops in India, the illustrated trade catalogues of European firms and stores being employed as the pattern books, upon which their silver plate was being modelled." The natural result is that when you want Polo Trophy, you have to go to England for it—for we know that our Swadeshi imitations of European industrial art are never as good as the originals and are never likely to be. Perceive that Swadeshi as we now understand it—i.e., erecting factories for naturalising European manufacture—is simply accepting for ourselves a permanent inferiority of environment, and irremediably lowering the standard of living amongst us.

The modern amongst us can already tolerate an environment of cheap hideousness and tawdry, expensive discomfort, which would have disgusted the poorest in the days of Hindu or Moghal civilisation.

Take Benares brass. At Delhi "all but one or two pieces were bad in design and worse in execution."

Take enamelling. "Formerly every attention was given to effect, and a background or field colour was regularly employed, most frequently a rich creamy white. Within the past few decades this has been discontinued, and complex and intricate designs substituted in which it can hardly be said there is a field colour at all. The result is distinctly inferior and may be described as vulgar rather than artistic."

A Benares Kinkhab manufacturer, asked to show a treasured pattern book, produced a sample book of English wall papers—"This at once explained the monstrous degeneration perceived in the Benares Kinkhabs."—"The carpets of Masulipatam were formerly amongst the finest produced in India these once glorious carpets of Mauslipatam have sunk to a travesty and mockery of their former selves."

Punjab phulkaris are now made chiefly for the adornment of American drawing rooms: aniline dyes and two inch stitches replace former harmonious colourings and fine needlework.

The value of gold thread imported into India is now 44 lacs. It is much inferior to India handmade gold thread, now going out of use. The author of a monograph on Indian gold lace remarks. "In such seemingly minor and unimportant details, the true cause of the artistic degeneracy of Indian weaving is to be found."

Exactly the same conclusion may be drawn from the imports of aniline dyes. In such cases, we actually pay money out of our pocket to ruin our own industrial arts.

It would be useless to multiply examples now; those who wish may find them in the pages of all Indian or

English, writers, who have written upon the industrial arts of India ; I think no one will deny that these Industrial arts are in a nearly hopeless state. No one can ultimately deny that the main cause of this is our own deficient artistic understanding. It is far more necessary to cease our own boycott of the Indian craftsman, than for us to carry on a boycott of foreign imports.

In attempting to establish factories for the imitation of European imported goods, we overlook one thing—the relative value of men and things. True swadeshi would have attempted to preserve the status of our skilled artisans and village craftsmen, for the sake of the value to our country of men *as men*. Already it is being recognized in Europe that the general substitution of machines for men must invariably lower the whole intellectual and moral status of the working population : and we need not hope to avoid this result by tinkering at compulsory education. A false swadeshi does not object to crowding the craftsmen into factories, where drunkenness, physical degeneration and all other natural results of the factory system follow. One has but to read the reports of factory inspectors to understand—"The legal hours of rest for women are constantly exceeded": "sanitary arrangements are horrible": "children are often puny, probably owing to overwork," "Nearly every factory is a constant offender". Such are the facts recorded in the last report of the Director of Industries in the Punjab. The moral should be clear. Yet we find the members of the late Factory Commission lamenting the absence of a pure factory class, totally severed from village life, in Western India. The whole endeavour of a true Swadeshi should be to restore, not to destroy, the organic life of the village communities. It is not that we learn too much from foreign countries. We learn too little. If we learnt more, we should not want to repeat the experiments of early Victorian England in ' *Laisses-Faire* '.

To sum up our conclusions—

Who now are the natural patrons of our Industrial Arts ? Not tourists, I think you will agree. The sumptuary arts of India, the decline of which we are discussing, are those which naturally most depend, like architecture itself, on the tastes and patronage of the educated aristocratic and wealthy classes amongst us and of the courts and have always so depended : and unless we can restore the fine æsthetic culture which these classes in India once possessed, we cannot hope that our Industrial Arts will flourish. Mr. Burns, the other day, remarked that out of two hundred wedding presents which he had the opportunity of seeing at an Indian wedding, only some sixteen were Indian in point of character and origin : and the same state of affairs may be observed in the houses of almost all our prosperous lawyers and Deputy Collectors. An examination of the 'Ladies' Court' at the present Exhibition will convince you that not only the men of our country are to blame. Now the situation is this—that a mere desire to save money for our country will never remedy this state of affairs, neither will a wish to achieve political revenge. But artistic education, the setting of men before things in our own estimation, and the ideal of nationality as service, may achieve what lesser motives cannot. What is necessary is that we should let the real love of our country allow us to realize that her gifts are (with the rarest exceptions) really and intrinsically better than those which we can import—that our dyes, our hand made gold thread, our designs, our ways of dressing and building, our jewellery, our carpets and all that goes to make the daily environment of our lives are better than the things we import from Europe—more beautiful, more enduring, more vital in response and more a part of our real life. Then it will not be so difficult perhaps to spend a little more in the first instance on such things. But all this is not a matter of political platforms, it is simply and solely a matter of national

education, the sort of education that will help us some day to prefer a living singer to what an Indian friend of mine has very aptly called 'the voice of the living dead'. There we shall be saved not only the expense of importing gramophones, but all the bother of trying to make them in local factories, with indifferent success. This is a parable of all the other industrial arts.

Secondly, the great manufactures can take care of themselves. Businessmen will not fail to discover where money can be made. It is hardly necessary for us to assist them in becoming millionaires by bringing to their aid the whole weight of Swadeshi sentimentality. We have only to see that they injure as little as possible the physique and morale of the workers. Temporary cheapness is no guarantee of ultimate value from the standpoint of national evolution or even of private advantage on the part of the individual purchaser. Swadeshi does not consist in imitating new productions recently imported, this may be left to the speculative businessman, who has his due place—but in restoring the status and the prosperity of the skilled artisan and the village craftsman. It is these artisans who most need the help of our national idealism. It is these skilled craftsmen also whom we as a nation most need as members of our body politic. We have enough of agricultural labourers and are likely to have too many factory hands, and perhaps too many lawyers and clerks. To assist the skilled artisan and the village craftsman may seem too simple, too unromantic a thing for nationalists to undertake. Even national education requires half a century to bear its fruits. Yet it is assuredly only by such personal activity and gradual recovery of social co-operation that an end so great as the restoration of our status amongst the nations of the world can be achieved. Lastly it is almost a waste of time to work for ends that may or may not be achieved in ten or fifteen years, the greatest work is done by those who scarcely look to see its fruits within their own life time.

THE ECONOMIC BOTANY OF INDIA.

BY BHIM CHANDRA CHATTERJEE ESQ., B.A., B. Sc.

Electrical Engineer, Calcutta.

"If we could open and unbind our eye,
We all, like Moses, should espy,
Even in a bush the radiant Deity."

* * * *

"Upon the flowers of heaven we wandering gaze,
The stars of earth no wonder in us raise,
Yet these perhaps do more than they
The human lives about us sway."

In this short paper dealing with the applications and industrial (especially medicinal) uses of Indian plants, I have endeavoured to suggest and discuss some of the lines that may be profitably taken up in our present economic situation. The problem of independent livelihood has been assuming larger proportions, and nobody can deny that it is on the solution of this, that the success of our national activity in all directions depends. We have, in fact, reached the limit of our resources: until and unless there is a considerable increase in the sum total of our material capital, our enterprises and movements in literature and science as in education and industries are likely to be jeopardised. There has necessarily been a constantly growing cry for the opening up of new careers in Commerce, Banking and Scientific and Technical professions.

In response to this demand for new openings, people have of late been suggesting and trying unexplored fields, and considerable national energy has been devoted to the discovery of the possible lines of economic advancement. Industrial success, however, is not to be an accomplished fact with the mere suggestion of Industrial careers. It depends on a number of social conditions, both intellectual and moral, which are of slow and gradual growth. The story of the building up of an industry is the story of all developments; and economic movements, like other movements in human society, must pass through the initial and intermediate stages before they are crowned with success. We may

look upon all human endeavours as presenting the nature of a moral *series* of the Arithmetical or Geometrical order, of which every succeeding term is an improvement upon the one just preceding.

We have been conscious enough of our need to just commence our race, and are at present really at the first terms of our industrial series which will work itself out and evolve its real character in time. Commercial credit, the faculty of organisation, which can make the best use of the *things*, as well as the place of each man in his proper position in some concern, and business capacity which is always in command of capital—in short, those socio-economic virtues that constitute Industrial Morality are very imperfectly developed in us; and our education is not sufficiently scientific and technical to keep our intellect alive to the industrial possibilities of our country and the broad economic forces that sway the modern world. As a consequence, our efforts in the direction of the material developments of our country must bear the stamp of weakness and tentativeness which characterise the initial stages of all movements.

The process in every country must be the same. In the first place, the Industries have to be started, new commercial lines have to be worked, improved methods have to be introduced; for it is the undertaking of actual business that is the real schooling for business ability, and develops commercial morality and intelligence. But from the nature of the case, these are to be regarded as mere experiments which have very little chance of proving successful owing to want of technical knowledge and business habits. Yet these are necessary for national experience, and what are individual losses or wastes become ultimately the pillars of national success.

In the second place, arrangements for manual training and scientific, commercial and technical education have to be made. Here, again, from the nature of the case one cannot hope for success; for there can be no demand for industrial Education in a country in which there are few industrial fields. Technical and Scientific Education acts, upon Industrial and Commercial Development and is in turn acted on

by it. So that Schools of Commerce, Business Academies, Technical Institutes cannot be successful in an economically young country; but yet they have to be kept up by the community as experimental seminaries for diffusion of scientific and commercial knowledge.

In the third place, every community which is just entering on the threshold of a new industrial and commercial life must, in addition to the tentative efforts towards the development of industries and the organisation of Industrial Education, try to profit by other people's experience and learn what they have to teach. And for this, attempts have to be made for training competent scholars in foreign schools, and receiving the advice of foreign experts as teachers, organisers or managers of the home schools and factories. For, how otherwise can any infant community have a supply of the men who are to take charge of the newly started industries and educational institutions? But here, again, as in the other cases, we have to face disappointments and failures, for mere Technical Intelligence on the part of teachers and organisers is not the only thing that is to be counted upon for industrial success. Capital which seeks only the best investments cannot be attracted to them, who have yet to prove their ability. They cannot command the confidence and enjoy the 'credit' of the society which necessarily does not meet them half-way; for there can be no economic relations between the experts and the laymen so long as the business intelligence and technical skill are confined only within the small circle of a few scholars and experts who can be counted at finger's ends, and are not sufficiently diffused among, at any rate, the enlightened sections of the community. As a consequence, Capital must fight shy of new and untried fields; and these concerns are sure to remain inadequately manned and financed for long.

These are the three possible courses which may be taken together or one by one; and we have seen that the initial stages in any course are not encouraging and do not offer any bright prospects. Hence people who seek careers and are only attracted by hopes of success are not expected to look with favour upon the infant industries or experimental schools and foreign trained scholars; and as national

enthusiasm cannot last long without sympathy and encouragement, Industrial concerns and institutes are sure to be deserted when they appear to be waning, and people become despondent and pessimistic.

The question, therefore, is, how are new careers to be successful? How can secure investment and lucrative professions be built up in a country? There must be men who can afford to endure losses and can ungrudgingly spend their time, energy and money on what they find to be *prima facie* losing concerns. All capital, physical, intellectual as well as moral, is the result of abstinence, and sacrifice; and so those members of the community who can put off personal gains in the present, discharge a social function by helping in the growth and accumulation of capital which is to be the efficient cause of the things which are useful to the public in the future. Industry, like Religion, has its own martyrs, apostles and missionaries, who, devoting themselves wholly to it, can create something out of nothing. It is these men who not only open up new lines of industrial thought and activity, but also can make them successful in spite of the difficulties and oppositions natural to the initial stages. They feel the responsibility of making their ideas the ideas of the many and the ideal of the community, and of ushering in that stage at which nothing succeeds like success. Alfred the Great's literary and educational efforts in England and Peter the Great's pioneering work for Russian Industry are remarkable instances of such responsible idealism.

Time has arrived when in the future interests of the people at large our financial resources have to be lavishly spent, on the principle of the Paternal Government, to investigate the industrial and commercial possibilities of our country by organising academies, institutes, farms and research colleges, and by employing the best available men as scholars, organisers and experts. We are in need of educational, industrial and financial missionaries who can, without hope of success or the gratification of personal interests, apply their skill, intelligence and money to what are at present thankless tasks and seem to be mere wastes.

Under the present economic circumstances of our country

when we have to be on the lookout for the opening up of new careers and means of independent livelihood as well as new channels of industrial and commercial enterprise, we cannot over-estimate the importance of the field of Applied Botany in our country, which in the past had been the basis of its varied economic life by feeding its Agriculture, Pharmacy and Manufactures. Some of the old Botanical and allied Industries are still extant; we have only to revivify them by applying our modern knowledge. In some cases we have to restore old channels now dried up; and with the patience and application necessary in all inventions and discoveries we may be in a position to create new ones.

Then there is the educational consideration, which also points to the extreme need of general Botanical training as the most effective means of helping the objective study of learners and developing their faculty of observation. And if knowledge is to be estimated by its commercial value we may observe that Botanical Education is also the most paying, for as we have seen it is likely to be in high request in the country, the industries and occupations of which depend so largely on a knowledge of its Flora and the Botanical resources.

But when we think of Pharmaceutical Botany, we are studying not only an aspect of our economic life, we are concerned not simply with the medical professions and the medicinal drugs, some of the occupations and careers by which men can earn their bread, but we are concerned with the very conditions of our national health and vigour—the physical basis of our Industrial Efficiency. Ayurvedic Science, the result of investigations into the facts and phenomena of Indian medical system, and just suited to the life, climate, and surroundings of India, necessarily involves the question of our physical stamina and health; and when these considerations of the effective means of preserving and improving what Frederic List calls the "Productive Powers and Capabilities" of our nation are added to those of Production itself *i. e.* of new industrial openings and technical professions, we are forced to the conclusion that this Department of Indian Applied Botany

cannot be easily ignored, but must be retained at any cost, modified and improved upon, if possible.

Besides the Doctrine of Relativity on which the above conclusion regarding the maintenance of the Indigenous Medical System and the National Medical Science is based, according to which it is the duty of every nation to give full play to its individuality and develop its powers to perfection in every department of human activity, we believe, further that the restoration, according to modern methods, of the old Indian Learning, the Ayurvedic Theory of Medicine and Treatment of Diseases, is of great interest to theorists and scientists, and of extreme importance to the world which can scarcely afford to lose a type of the systems it has evolved through its history. Ayurveda, thus modernised, would be a contribution to the world's culture and add to its richness and variety.

SUGGESTIONS.

It is high time, therefore, for the Indian community to (1) institute an inquiry into the ancient literature and traditions on the subject of plants and to report on the modern researches about them; and (2) to organise a commission of experts to investigate the history and existing condition of the trades and industries and to suggest lines of industrial enterprise according to modern methods. The country can no longer depend on what individual thinkers and experts are doing out of their own literary curiosity or self-interest, though, no doubt, their efforts have suggested the possible directions of activity and the difficulties and failures that are to be guarded against. Time has arrived when responsible leaders should collectively organise all available skill and services and lay the foundations, however humble at the beginning, of Botanical studies and Research Societies of the future. And in the permanent interests of the nation statesmen with long views should not consider such inquiries and commissions as we suggest to be mere wastes and misapplications of the present national resources. The country expects that men should come forward, who, with the true missionary spirit, can waste their time, energy and money, and wait for the results of their

endeavours in the long run. Much will depend upon the industrial, educational and financial idealists of our country.

We offer here a scheme for work that should be taken up just now or in the immediate future, in connection with one at least of the Department of Economic Botany—*viz.*, Medical Botany:

1. The starting of factories for the application of Chemistry to the Indian Medicinal Plants with the object of preparing medicines according to the National Medical Science. This is the real Indian Pharmacy; whereas those workshops and factories which have taken up the preparation of medicines according to the European Pharmacopœia, though they have, no doubt, opened up new industrial careers and fields for the investment of National Capital, are really contributing to the foreign system, and cannot by any means be looked upon as national in its proper sense. It is necessary to recognise this distinction at the outset; for Indian National Pharmacy, while solving, like the other, the economic problem, presents a Medical System that has grown naturally on the Indian soil in harmony with the life of the people.

2. The laying out of Pharmaceutical Gardens for the cultivation of specimens, and the encouragement of Pharmaceutical Agriculture to supply the raw materials for the Pharmaceutical workshops and factories.

3. The foundation of Museums for drugs and specimens of genuine Ayurvedic medicines.

4. The Establishment of Academies and Research Societies—for the identification of, and experiments on plants, the promotion of Pharmaceutical learning in diverse ways, and the study of the commercial aspects of Indian National Pharmacy.

5. The preparation of books in Vernacular for the diffusion of Botanical and Pharmaceutical knowledge among the Sanskrit scholars and the masses.

6. The starting of Ayurvedic Colleges or, at any rate the opening of new classes for Ayurvedic Education after a stage in which a sufficiently broad basis of general culture through scientific, manual and literary training can be laid. These classes will offer Degree Courses in Ayurveda which

will correspond to the higher University courses in the Arts and Sciences leading to specialisation in the modernised medical science of India.

THE PLUMBAGO INDUSTRY

By B. VISWANATH ESQ., ASSAYIST AND ASSISTANT AGENT,

The Koppaka Graphite Mine of the Rajah of Tuni.

In this paper, which I propose to read before you, I shall set forth though in a cursory way the views I have formed in regard to the Plumbago Industry in the light of the experience, which I gained during my connection with the Koppaka Graphite Mine, which was opened and is being exploited by the Rajah of Tuni, in the district of Vizagapatam, Madras Presidency. Of late, there has been some loose talk in the air, that the Plumbago Industry, so far as the Southern Presidency is concerned, is a failure. But I have every reason to dissent from this opinion, inasmuch as the success of the industry depends on the professional skill and expert advice employed in the working of the mines. I do not, of course, pretend to the possession of the precise scientific knowledge of the subject, but all the same, I have tried to explain as far as possible, the geological, the industrial, the commercial aspect of the subject, and I shall feel that my humble labours in the field are not vain, if only those who are interested in the subject are stimulated to make fair and impartial investigations into the subject and give an impetus to the industry.

Plumbago, though not a metal, is a mineral of great commercial importance. Plumbago or blacklead or graphite is a mineral possessing metallic lustre with a dark steel grey colour and a black shining streak. The blacklead mining strata are generally found in slate rocks and gneiss rock. It is an allotropic modification of carbon and is plentiful in nature. It has a close resemblance to molybdenite, which can however be distinguished by its greenish streak. It occurs in many forms and Dana, in his mineralogy, enumerates six of them. 1. Foliated, 2. Scaly massive and slaty 3. Columnar, 4. Granular massive, 5. Earthy amorphous

and 6. in radiated concretions. It has a very interesting etymology preserving an old error. It was formerly believed that it contained lead, and hence the name Blacklead or Plumbago from the Latin Plumbum meaning lead. Since it is used in the manufacture of pencils with which we write it is named graphite from the Greek word *grapho* meaning to write. In 1779 Schule examined the mineral and he regarded it as a compound of iron and consequently named it "carburet of iron." By 1825, Vanuxem and Karsten came to the conclusion that iron existed only in the form of an oxide, and that it was not essential for the existence of the mineral. Since then it came to be regarded as a modification of carbon. Plumbago, formerly held a place in medicine. In 1709, a writer on Cumberland plumbago asserts. "It is a present remedy for colic, it easeth the pain of gravel stone and strangury, and for these and the like it is bought up by apothecaries and physicians."

During the last few years the commercial importance of the mineral has been enhanced so much that the bright lump which was sold at Rs. 620 a ton, C. I. F., London, during the 1st quarter of this year (1910) was considered dear at anything over Rs. 275 prior to the year 1894. In the year 1901 alone, Ceylon exported to Europe, Germany and America, Plumbago to the estimated value of Rs. 9,609,642. The great many uses to which Plumbago is put warrant a good market for it. India also has its own deposits, but they are not being worked. I have lately examined a few specimens from the Travancore State and some of them were very rich carrying 90% of graphitic carbon. Its rapid rise in importance, day by day, must necessarily claim the attention of capitalists. It is true that a few capitalists were baffled in their attempts to work up the Plumbago mines, on account of natural disadvantages, coupled with want of expert advice. In Ceylon this industry is shared both by Europeans and Sinhalese and they have been successfully working it for the last ten or fifteen years.

Very recently the enterprising Raja of Tuni has taken on lease some acres of land at Hill Koppaka in the Vizagapatam

District and the mine has been opened by an American mine expert. The quality that is excavated, though not very rich in graphitic carbon, carries about 67% and is calculated to pay to export. For commercial purposes Plumbago must be free from sulphur, the presence of which is considered an objectionable impurity. Very small traces of it may, however, be overlooked. The Plumbago after it is excavated from the mine has to undergo the process of hand-picking. It is a process by which a major portion of the useful and pure substance is separated by picking it over by hand and breaking away the adherent rock with a hammer. At the beginning picking may be found to be slow and tedious, but as the pickers get accustomed the work can be done with enormous rapidity. If the stuff that is excavated is found to be very rich in graphitic carbon or pure, it is packed either in bags or casks, and is then ready for transport. But if the stuff is not one of higher percentage and is not pure, recourse should then be had to concentration. The separation of the lighter and heavier portions of the ore is termed concentration. This process is useful inasmuch as it saves a lot of freight on useless and gritty matter. There are different varieties of concentrators on the market, and great care should be exercised in selecting the one suitable for the purpose. The well-known Hendy's concentrator in which the shallow pan that oscillates is constructed in a specially designed curve towards the centre. By this apparatus the heaviest matter may be made to sink to the bottom, while the lighter graphite may be made to flow through an outlet in the centre and collected in suitable receivers and dried. There is also another by name the Frue Vanner, the underlying principle of which, is the same as the one described. There are other concentrators in which the atmospheric assistance, gravitation and centrifugal force take part. It is indeed highly paradoxical, if I say, that Plumbago with an average specific gravity of 2.5 floats on water. On account of its great refractoriness plumbago floats over water for some time in a state of fine powder. The graphite may also be washed to get rid of the heavier impurities, in a set of tubs arranged on a gallery

and the graphite free from sand, etc, may be collected in the bottom tub. The tubs which are made either of wood or of cast iron are fitted with stop cocks, on their sides, at about two-thirds of their height from the bottom, and seven or eight and sometimes more are arranged one above the other on a gallery. The plumbago (crude) is well pulverised in a Lucops pulveriser or a disintegrator driven by power, and is then passed through a set of sieves. The topmost tub is then charged with the stuff and is almost filled with water. It is then vigorously agitated with a crutch, and allowed for sometime to settle. After it is settled the heavier matter goes to the bottom of the tub and the plumbago floats up. The water in the tub is then allowed to pass through the side outlet by turning the stop-cock into the one below that, carrying with it the floating plumbago. The process is repeated till the bottommost tub is reached where it is collected and dried. The value of graphite depends largely on the percentage of its graphitic carbon, and the absence of sulphur in all its forms is essential. While graphite of 97% was selling at \$63.0.0 per ton, F. O. B. London on the 3rd March 1910, graphite of 70% sold only at £27 on the same date. There are no refineries in India, to purify the inferior varieties of graphite, and in some cases, their export would not pay. Many an undertaking received a death-blow, as the terms of the manufacturers, or refiners abroad were not sufficiently encouraging to the miners to carry on the work when the enormous charges of transportation and the heavy duty were taken into consideration. The high price commanded by graphite is largely due to its extensive application in various industries.

The uses to which graphite is put are varied and many. It is very largely used in the manufacture of crucibles for metallurgy, for lubricants, greases, stove and other polishes, paints, for purposes of electrotyping, and filling electric batteries, foundry and blasting purposes, and for the manufacture of Pencils. On account of its refractoriness, it is used in the manufacture of crucibles. In crucible manufacture it is used in admixture with fire clay, the proportion depending upon the purity of graphite and they are the

most enduring. Crucibles thus made endure about 70 barss meltings, 50 Bronze meltings and about 10 steel meltings. In the electrotype process, it is used for coating wood, plaster of paris etc, and in making non-conductive materials conductive and where resistance of higher temperatures is required, it is used as a lubricant. The inferior varieties of graphite raised in India are used for blasting and foundry purposes.

It is indeed notable that Ceylon Plumbago though pure carrying 99% and sometimes cent per cent graphitic carbon is pronounced by common consent as unfit to be used independently in the manufacture of pencils, except in conjunction with other brands of Siberia and America. I have supplied some of our Plumbago to the Anakapalli Pencil Factory, and its Managing Director reports that the pencils, made of our Plumbago are good and that it does not require admixture with other brands. Those interested will find the pencils and the Plumbago in the Exhibition yonder. If the pencil makers in India are supplied with Indian Plumbago we shall then have pure Indian Pencils.

The percentage of carbon in samples of plumbago may be estimated by burning the mineral in a stream of oxygen and the carbon from the weight of Carbon-di-oxide obtained. The process of J. B. MacKintosh which consists in merely getting rid of the impurities and weighing the rest as carbon holds good only with samples which are pure and free from gritty matter.

As I have already pointed out the inferior varieties of graphite require to be refined before they are sent into the market, and there is no establishment in India for such a purpose. The establishment of a graphite refinery at a suitable centre would surely give an impetus to the industry, and capitalists should devote their serious attention. Surely India awaits another Tata for an enterprise in this direction and may that day dawn early !

The introduction of complex mining machinery or mining in the strict sense of the term are not necessary, and what I have now placed before you is a summary of what

we have been doing in connection with the Koppaka Graphite Mine. Samples free from sulphur, and carrying more than 50 per cent. of graphitic carbon (while crude) may with advantage be worked if only other conditions, such as, occurrence of the mineral, supply of water, cheap transport and labour are favourable. The mining enterprise in India by Indians is not satisfactory. Up to 1904, the mining leases which may be considered as really profitable were as follows :—Leases held by Europeans cover 67403.40 acres of land. I do not say that the European element should be excluded from the field. What we have to do is to win them over to our side and work hand in hand. The area of land under European leases is already too much, and every inch of profitable land that is now remaining shall have to be leased by Indians.

Are we to miss our opportunities, waste our energies, and depend upon our rulers, when they themselves are outstripped by Germany, Japan and America, and look bewildered? We cannot depend upon the Government for everything. The Government does not put a crowbar in our hands, and ask us to dig out pure gold in lumps. We shall appeal to the Government for foundations, and we shall have to raise the structures ourselves. Tennyson says "self-reliance, self-control and self-respect, lead to sovereign power."

The rising generation should turn its attention towards scientific and commercial education and ascendancy in the ladder of science and commerce should be its goal, and the Zemindars and wealthy men should supply the young men with the field for action.

We should rouse ourselves to consciousness of the urgent needs which India stands in, of scientific and skilled labour, to be obtained at any cost. As Sir Thomas Holland has said, at the present day a man with technical dexterity is of more value to the country, than the skilful cross-examiner or the vehement writer of editorials.

WATER WIRELESS TELEGRAPHY

BY HABIBUL RAHMAN KHAN, ESQ.

Deputy Superintendent of Telegraphs, Allahabad.

Wireless Telegraphy is a mode of signalling through space without line wires.

We owe the conception of the propagation of electricity in waves to Farady, who detected currents in this form through long underground copper wires, insulated with gutta percha. It was Maxwell, however, who developed the general principle of undulatory propagation and placed it on a sound mathematical basis. Of the seed thus sown, Hertz reaped the fruits. He inserted suitable conductors in the path of such waves, conductors adapted for the occurrence in them of induced electric oscillations and to the surprise of every one, himself doubtless included, he found that the secondary electric surgings thus excited were strong enough to display themselves by minute electric sparks.

Although this method of signalling to a moderate distance through walls or other supposed non-conducting obstructions by means of Hertz waves was practised by several persons in Great Britain and other European countries, it was not applied by them to actual telegraphy.

Dr. Alexander Muirhead foresaw the telegraphic importance of this method of signalling immediately after hearing Dr. Oliver Lodge's lecture on June 1st--1894, and arranged a siphon recorder for the purpose. Captain Jackson, also, at Davenport, made experiments for the Admiralty and succeeded in telegraphing between ships in 1895 or 1896. It was also developed in the same direction with many most interesting results by our worthy countrymen Prof Dr. Jagdish Chandra Bose of the Presidency College, Calcutta, the premier Indian Scientist to whom we wish a long life of usefulness to the country. Prof. Rigby of Italy also made a large number of experiments which he has since described in an Italian treatise "Optice Elettrica," and it appears that it was from them that Signor Marconi learned about the subject and immediately conceived the idea of applying it to commercial telegraphy. He appears to have

worked at the subject for a short time in Italy, aiming at getting the Receiver to be more satisfactory and dependable, and improving the early form of Brauly filings tube by greatly diminishing its size and replacing the coarse borings for fine filings, he also sealed them up in a vacuum. Apparently finding absolutely no help in his own country Mr. Marconi brought his new instrument to Dublin, where he was advised to take it to the Chief of the Government Telegraphs at Great Britain, Mr. Preece; and accordingly he took his, at that time, crude apparatus to the English post office in a sealed box. With the powerful aid of the post office, Signor Marconi proceeded to develop his system of Telegraphy on a large scale and sometimes failing, sometimes succeeding, he gradually increased the distance over which signalling was possible and specially began to develop from unpromising beginnings his special method for long distance. The pertinacious way in which Mr. Marconi and his able co-operators have at great expense, gradually worked the method up from its early difficult and capricious stage to its present great distances and comparative dependableness is worthy of all praise.

After giving a brief account of the genesis and gradual development of the Aetheric Wireless Telegraphy, I now come to the discovery of the water wireless Telegraphy.

It was the first month of the new year (1908), when the Dak from India had not arrived for 4 or 5 days owing to the heavy snow fall over the Lowari Pass, on the Chakoara Chitral Road (Indian Frontier) and telegraphic communication between India and Chitral *via* Gilgit and Srinagar had also been interrupted for some days, owing to the breakage of the Telegraph line over the Burzil Pass, that the officers and men of the Chitral and Gilgit garrisons were anxiously looking forward for the communication being restored.

As the Head of the Telegraph branch of the service in that isolated corner of the Indian Frontier, Mr. Habibul Rahman Khan, Deputy Superintendent of Telegraphs was naturally the more anxious for the speedy restoration of telegraphic communication and to devise means of keeping up communication even in the case of interruptions so

frequent in the winter. The conception of the propagation of electricity in waves through Dielectrics (Aetheric Wireless Telegraphy) made him think that the fresh snow-fall over the hills would prove as a badly insulated line with abnormally high resistance (note fresh snow is a bad conductor while the hills playing the part of insulators), and made some experiments with success to show that a snow-fall while closing roads for travellers over the hills and interrupting telegraphing communications, affords means of keeping up communication on the Wireless Snow System, but owing to the comparatively insignificant electric waves obtained with the available transmitting instruments he had to give up the idea.

But as necessity is the mother of invention, it struck him that owing to the insulating nature of the soil (generally composed of several layers of concrete or hard clay), a river was sure to answer better. Having no instruments at his disposal, he started his experiments with the medical Electric (Induction Coil) box taken on loan from the Chitral Dispensary, and Ader's Telephone as a Receiver, but soon afterwards got two spare sets of Cardew Vibrators with Melhuish's pattern-key, and about 20 dry cells from Gilgit, and made exhaustive experiments, a summary of which he has given in his recently issued pamphlet termed "River Wireless Telegraphy" and it is very notable that with the small power available from the ordinary Cardew Vibrator he was able to communicate well by means of river between Drosh and Chitral, a distance of 25 miles.

At the beginning of the pamphlet, a Demi Official letter No. 6065 T, dated 27th October 1910, from the Director of Indian Telegraphs to Mr. Khan is published and it is a matter of great satisfaction that the Hon'ble the Director-General of Telegraphs in India has congratulated him warmly on the results of his original and well thought out experiments and the Electrical Engineer-in-Chief of the Indian Telegraphs considers that Mr. Khan's system is, a conductive kind of wireless Telegraphy differing from that of the Aetheric wireless system, and is of opinion that it is well worthwhile experimenting further on this system and that the method indicated in Figure 2 of the pamphlet,

as proposed by Mr. Khan, of using high frequency oscillations and tunings suggest possibilities for consideration. In support of his statement that, irrespective of the geological formation of the soil, a river, or sheet of water, viz, sea or lake may be utilized for long distances without erecting high masts as is done nowadays and placing the wires into the water instead, he calls attention to the fact that electric waves are transmitted more readily over sea than over land, this is because the capacity of the water, owing to its conductive nature is greater than the air, and like Faraday's Gauze bag or metals when charged shows the existence of electricity as always outside on the surface, the electric waves glide over the surface of the water instead of penetrating through it and has therefore a little chance of diffusion through earth, whereas when travelling over land there is much greater penetration through the air and therefore heavy leakage.

The advantages of the river or water Wireless Telegraphy are that an electric wave required in the ætheric system (owing to the Dielectric strength of air being 30,000, i.e. it requires 30,000 volts to rupture a centimetre length of air with that sudden vehemence which produces explosion, a short-snap, and a brilliant flash) for 5 miles will work several hundred miles in the water system, atmospheric disturbances will be avoided, the interposition of high hills and mountains will not absorb the waves and thereby diminish the range of signalling, and the necessity of using high masts with Antenna or net-work (an expensive item) for increasing the capacity of the ether of space will be dispensed with.

It is hoped that with the liberal aid and encouragement of the Department which Mr. Habibul Rahman Khan has the honour to serve, these experiments will, in the near future, prove that river or water Wireless Telegraphy will be a system of signalling of great practical value not only in India itself but between different stations situated on the coasts throughout the world, and will facilitate trade and industry by economising time and money on account of its simplicity and cheapness.

RESOLUTIONS

Resolutions were next taken up, each being properly discussed by persons who by their qualifications and experience were thoroughly capable of dealing with them. The debate was on the whole very brisk and lively and constituted the most important item in the programme of the Proceedings of the Conference which was dissolved after a vote of thanks to the President proposed by Pandit Gokarna Nath Missa and seconded by the Honourable Sir Vithaldas Damodar Thackersey.

The full and authentic report of the discussion on the resolutions, is given below and will be found interesting.

THE FIRST RESOLUTION

*Vote of sorrow for the death of His Late Majesty King
Emperor Edward VII*

The President put the following resolution from the chair, and it was carried in solemn silence, the whole audience standing.

"That this Conference places on record its profound sorrow at the death of His late Majesty King-Emperor Edward VII in whom the people of India have lost a most sympathetic and warm-hearted well-wisher and supporter, the Empire a wise and benevolent sovereign and the world a powerful promoter of peace and general amity, and respectfully tenders its condolence to Her Majesty Queen-Empress Alexandra and the members of the Royal Family."

THE SECOND RESOLUTION

Homage to His Majesty King Emperor George V

The President then put from the chair the following resolution which was carried amidst acclamation :—

"That this Conference begs to offer its respectful and loyal homage to His Majesty King-Emperor George V on his accession to the throne of the British Empire and expresses the hope that His Majesty's gracious sympathy for the people of this country and interest in their well-being will effectively promote their prosperity and advancement."

THE THIRD RESOLUTION

Technical and Industrial Education

Sir Bhalchandra Krishna Kt. of Bombay in proposing the third resolution said :—Mr. President, Ladies and Gentlemen, the third resolution has been entrusted to me and it runs thus :—

“(a) That while gratefully acknowledging the grants to technical and industrial education made by Government in recent years, this Conference places on record its firm conviction that for effectively promoting the industrial progress of this country it is essential that the Government should establish in this country at least one fully equipped Polytechnic college for imparting the highest kind of instruction in the applied sciences and industrial arts and further urges that the visit of His Majesty King-Emperor George V and Her Majesty Queen-Empress Mary should be commemorated by the foundation of such an institution.

(b) That this Conference also invites business, scientific and technical experts to form themselves into a working organization for the creation of a scientific technological and commercial literature in the Indian Vernaculars for the dissemination of information on industrial and commercial subjects amongst the people of India.”

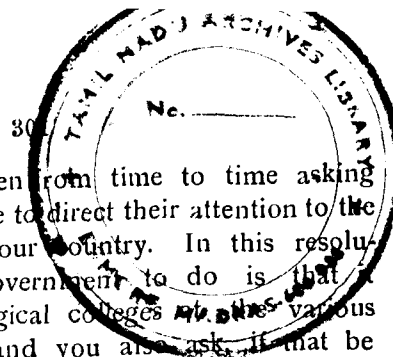
This resolution does not require many remarks from me, especially as my Honourable friend, the Chairman of the Reception Committee has eloquently expressed to you what is to be done in connection with this matter. So also, the esteemed and illustrious President of this meeting has pointed out in the first part of his excellent speech, the way in which an institution of this nature will be useful and lastly the energetic and ever-working General Secretary, the Hon'ble Rao Bahadur R. N. Mudholkar has explained to you the paramount necessity of a Polytechnic College. I shall, therefore, be simply repeating the arguments which all these eminent gentlemen have placed before you in regard to the institution of such a college. In the whole of India, there are several institutions for technical education, agricultural and engineering colleges and also scientific institutions. Formerly when the Education Commission was appointed, this subject was not before them, as they had not at the Head-quarters any

gentleman to advise them on the spot. Now, however, circumstances have changed considerably and it was Mr. MacDonnell now Lord MacDonnell and formerly Sir Anthony MacDonnell, your Lieutenant Governor, who placed it pointedly before the Government that the institution of technical colleges and technical schools was a great necessity, as instruction in Commercial and Industrial education would be of the greatest value to the moral and economic progress of India. There is an excellent Technical Institute in Bombay called the Victoria Jubilee Technical Institute. There is one Scientific College also and there is an Engineering College ; besides, there is going to be a science institute very soon established in Bombay owing to the generosity of such men as Sir Cowasjee Jehangir, Sir Currimbhoy and others. It is a misfortune that Bombay should have lost the honour and opportunity of having the Tata Research Institute, established there. It was at Bombay that the first idea was conceived and was brought before the public by the great and generous man, the late Mr. J. N. Tata, contributing over 30 lakhs of Rupees out of his estate. It was there that the preliminary meeting was convened amongst whom were men like the late Mr. Justice Ranade. (Cheers). They all conceived it and they all brought it forward but owing to lack of funds especially from Government, the institute had to go to Bangalore, as it found a more congenial soil there. However, I hope and trust that the institution will flourish there under the auspices and care of the Maharaja of Mysore. Then there is a Technical Institute in Madras and there is also an institute in Bengal. There are minor technical institutes in different parts of the country and altogether up to now, there is an expenditure of over 16 lakhs of rupees over these institutions. But the instruction imparted by them is not of such a high character as is required in the interests of the people of this country and it is, therefore, essential that they should have

a special technical college in one centre. A Polytechnic College will mean an expenditure of about one crore of rupees and if opportunity of the visit of Their Majesties be taken advantage of, I am sure the whole of India in a body will subscribe to the idea of having a technological institute in one centre. My friend, the Honourable Pundit Madan Mohun Malaviya referred to the All-India Victoria Memorial. Now it is gone and dead. Whether the institution will come out and will be established or not, is not known. Further, it is not likely that many would subscribe to it. There will be a great deal of opposition. I am strongly in favour of a good cause like the establishment of a Polytechnic Institute. Even now our worthy President will be able to induce members of that committee to transfer a large portion of the money so collected to such an excellent cause. If it is not possible, let us hope that the occasion of His Majesty's visit to India, will be availed of by this Conference, by the Rajas and Princes of India as well as by the general public to subscribe to such an exceedingly useful cause and with the assistance of Government to establish a Polytechnic College. It will materially contribute to the advancement of India. I need not take up your time, gentlemen; I think it is quite enough for me to say so much. With these few observations, I shall commend the proposition to you.

Pundit Gokarnath Misra in seconding the resolution said :—"Mr. President, Ladies and Gentlemen. I have much pleasure in seconding the resolution which has just now been proposed by Sir Bhalchandra Krishna. The resolution as has already been referred to, deals with the questions of technical and commercial education in this country. Five years ago the idea of starting an industrial conference was thought of by the people of this country, when Swadeshi had got its hold on the minds of the people. Ever since that time, you have been holding industrial conferences only at those places where you have got annual meetings of the Indian National

Congress and you have been from time to time asking Government and the people to direct their attention to the industrial regeneration of your country. In this resolution what you ask Government to do is that it should establish technological colleges at the various capitals of the provinces and you also ask, if that be not possible, to establish at least one fully equipped technological college at a central place to be decided hereafter and you have very opportunely taken advantage of that happy announcement which has been made and known amongst us all of the intended visit of Their Majesties King-Emperor George V and Queen Empress Mary. Gentlemen, I am not at present going to relate to you, because it has been put before you times out of number, in what state our industries are. Once upon a time we were a manufacturing country. Now we have been reduced from a manufacturing to an agricultural country. Times out of number we have seen that our misfortunes know no bounds, whenever a famine comes with its devastating effect on our land. The reason is not far to seek. The Famine Commission of 1889 said that what was now wanted in India was that various occupations should be provided for the people of this country and that the attention of the great mass of the population should be diverted from agricultural pursuits to industrial and technical lines. How, is that to be done? That is the question which we have been putting so often. Now you know that all the European countries, Germany, France, England, Austria,—they all have been devoting their attention, for more than a century, to industrial education. You have also seen what rapid strides have been effected in America in this direction. Polytechnic colleges have been provided in every State in the United States of America. Private endowments have also been given for the help of these institutions. I would only point out to you three institutions, which must be known to you all. You know



the great Institute at Bosten which imparts education to no less than 2500 students, the one at Chicago to no less than 2000, and the one at New York to no less than 1500. And last but not the least, you know that the victories of Japan were not only confined to the battlefield but also to the Industrial and technical development of their country. That is the state of affairs in foreign countries. Gentlemen, what are you asking, what is it that you are demanding Government to do in this direction? You are asking that various technological institutes, as I have just now mentioned, should be started at the capitals of the various provinces or at other suitable centres. I must not, however, allow this opportunity to pass without thanking our present Lieutenant Governor, Sir John Hewett, for the interest, he has taken in the industrial development of this province. You know that when he came to this province, he at once convened an industrial conference which sat at Naini Tal and the exhaustive report which was submitted by that conference was accepted by Sir John Hewett and he sent up the recommendations of that conference to the Government of India, which also backed up those recommendations. These were finally submitted to Lord Morley, the Secretary of State. Many of those suggestions were agreed to, but the main suggestion of starting a technological college at Cawnpore was not accepted. It was decided by the Secretary of State that the scheme should be postponed for further consideration. Now, gentlemen, I say that the decision of the Secretary of State causes a great deal of disappointment to the people of this province. I say that a protest should go from the platform of this Industrial Conference that the time has come when we should press upon the attention of the Imperial Government as well as the Secretary of State that this long looked for technological college which we thought would be established in this province should be established as soon as possible. This is what I say ought to be done so far as my provinces are concerned. The same has to be said with regard to Madras as

well as with regard to Bombay, where we have already got some existing institutions and about which my learned leader the Honourable Mr. Mudholkar said they wanted a little bit of co-ordination and correlation and a little more help from Government. If that is done, you can get a small technological institute, in every one of the provinces where there is none at present. But, gentleman, what will be the reply that will be given by our Government to our requests and to our prayers? The same plea of financial inability; that the financial condition of the country did not admit of the starting of these technological institutes in the various centres of this country. With all his ability, my Hon'ble friend Mr. Mudholkar pressed this question, you will remember in the early part of this year in the Imperial Legislative Council and the result is well-known to you. Gentlemen, on this occasion, therefore, we say that this ought to be done: that technological institutes should be started at the various centres; if that may not be possible, at least one central technological college should be started at one place. This is what we ask Government to do. You know the motto of self-help. Self-help must be taken as the watchword from which we are to get our inspiration in all our actions. I, on behalf of this Conference, implore the princes and people of this country that on the occasion of the intended visit of Their Majesties, they will subscribe a sum which my friend Sir Balachandra wanted—a sum of rupees one crore—which will go towards the founding of a technological institute where the children of this country will be able to obtain technical and industrial education to enable them to earn their daily bread and bring back contentment and prosperity to this land. (*Cheers*).

Mr. Lakshmi Chand in supporting the resolution said:—Mr. President, Ladies and Gentlemen. There is one outstanding fact in the history of modern times that should not be without great significance to the

people of India. I mean the rise of a nation in the far East from a comparative insignificance to a premier position not only in the politics of nations, but also in the Industrial progress it has achieved, in the great men that it has produced. You have simply to remember that the great work of the finding of plague bacillus was done by a Japanese scientist. The resolution as it stands here naturally divides itself into two portions. First of all, there is an appeal to the Government on reasonable grounds to come forward and see that the poor struggling people of this country, are given proper sustenance and this appeal is founded on reason, and there is not one man who will deny it. I know, and you all know, that the success of Japan is not only due to enthusiasm, but that it is due to deep thorough-going research and scientific spirit that goes deep into things and that finds out systematically and scientifically the rationale of everything. The cause of her success lies in thorough-going research and the practical solution of things. I know from personal experience that the students who go abroad to foreign countries begin their real work of progress, when they take to the research of those questions that are of vital interest to the progress of the country, and on this ground it is very natural and reasonable that the struggling people of this land should approach the Government to consider what has been done in other countries. It was only the other day that the Kaiser appealed to Germany to found another college, another University, where research work could be done. You all know that the present phenomenal success of foreign countries is due not only to enthusiasm and National patriotism of those people but it is also due to wide research and thorough-going spirit that have brought those people so prominently before the world. We think that it is not at all improper that the ensuing visit of Their Majesties should be commemorated by founding an institution which might undertake a thorough-going research work. Much more important than

that is the appeal to yourselves, the appeal to all those great Rishis and those great men who have even now given us the privilege of standing before the nations of the world with a high head and with a feeling of pride that we belong to this land. Materialism has become the reigning power in the West. When we consider that our old spirituality has been endowed to us, we must not forget that we are sure to lose our hold on our heritage, if we do not also proceed materially in the march of events. It is therefore, gentlemen, that there is another clause added to what had been before in the resolution, *viz.*, that the people of India should take upon themselves the work of the re-generation of the country. I am not a man who simply theorizes. I have very great personal experience. I can suggest improvements by ourselves, not by the grants of millions of money but by simple effort on the part of those excellent Indians who had gone abroad and returned with foreign culture and with foreign knowledge of commercial and technical education. (*Cheers*). The scheme is on foot and has already been inaugurated by one whose name should be dear to all in India—I mean Mrs. Besant who suggests that a society should be formed for the propagation of scientific truths for the benefit of the people of India. To those who do not know enough of technical matters, it may not be evident that only scientific education of the highest kind is not the only thing that is necessary but it is also necessary that people should know a large amount of facts, a large body of matter which can be very easily disseminated to them by simple explanations of these things in the Indian Vernaculars. I want to lay before you seriously this fact. As the time is very short, I shall simply end my remarks by saying that there cannot be any progress unless we practice self-help, and all these appeals to Government are simply valueless if we are not prepared to take practical schemes in our own hands. (*Hear, Hear, and Cheers*).

Babu Thakur Prasad having further supported the resolution in Hindi, it was put to the Conference and carried unanimously.

THE FOURTH RESOLUTION

Commercial Education

Mr. C. Gopal Menon of Madras in moving the Resolution said :—

Mr. President, Brother delegates, Ladies and Gentlemen. The resolution which I have been called upon to move runs as follows :—

COMMERCIAL EDUCATION

RESOLVED—(a) That in the opinion of this Conference the time has come for the Indian Universities to create faculties in commerce and institute degrees in commerce and to affiliate Commercial Colleges which will prepare candidates for University degrees in commerce :

(b) That there should be established one college of commerce in each provincial capital and that it should include provision for the training of teachers for commercial schools in the mofussil.

Gentlemen, 25 years ago it was considered that commerce was a profession which required no training, but this opinion no longer exists now as the capacity of those who embark their capital on business must be of a highly specialised character with a wider culture which is required to adapt training and knowledge to the varying demands of modern commerce. Commercial education must, therefore, be something more than the bare teaching of commercial subjects and must be of more than commercial value and importance. Modern commerce is complex, intricate and scientific, and it has already been realised that the capacities of those who engage in commercial pursuits must be of a very high order. The question then is what is meant by commercial education ? What is the sort of the schools required and what should be the qualifications of the professors in those schools ? Commercial education may be defined as the training which prepares future business-men for com-

merce. I suggest three kinds of schools to meet the varying conditions of India. We want men for mercantile offices in the subordinate positions, and we want men with academic qualifications equivalent to those attained by the training imparted in the higher universities of commerce established in the great industrial centres of England and on the continent. I, therefore, divide commercial schools into three classes. They are professional colleges, higher commercial colleges and training schools. The training schools are what are called schools in which such subjects as Book-keeping, Correspondence, Shorthand and Type-writing of an elementary character are to be taught, and professional schools are those somewhat akin in aim and importance to the training required for the diploma in commerce of the Madras Government Examinations. They are professional or Secondary Schools of Commerce. The third class of schools is that where academic education is imparted. Elementary Schools of Commerce, Secondary Schools of Commerce, and Higher Colleges of Commerce may be the names. We are just now concerned with the higher colleges of commerce. Two years ago I sent up a paper to this Conference. It has been asked why it is considered necessary that commercial men should be quite so well educated as doctors, lawyers, or professors. The old notion that commerce requires no training no longer exists, as it is proved beyond all doubt and is beginning to be realised that the future business-men must be able to understand the new situations and should be able to manage the men working under them and to move forward in the right direction. Education of such men must be made as liberal in character as possible, and such subjects as the History of Commerce, Commercial institutions, Commercial Geography, the Study of Statistics, the Theory and Practice of Accountancy should be of general interest, while the study of Commercial Law, Economics, the History and Theory of Political Science, Banking and

speculation supply a liberal course of education, especially adapted to the needs of those who intend to engage in any kind of business administration. Such a course would constitute what is called the Science of Commerce. By that I mean a systematic study of all branches of trade, the buying and selling of different commodities, mercantile agencies, especially railways, insurance, finance and speculation. Such a study would constitute a proper faculty in the Science of Commerce. The education should be such as to enable a man to understand the mysteries of the trade factors in the course of a short experience in business, to gauge correctly the course of daily market, to glance over current prices and to regulate the value of crops such as wheat, corn, jute, and various other products outside his own mercantile operations. Such should be the merchant of the future and his education must to some extent be specialised to business needs. The question then, how far should university education be specialised to business needs or should it be independent of these needs? As I have already pointed out to you, the university is the nursery of the statesman, the lawyer, the officer, or the clergyman, as may be proved by the fact of the establishment of Universities in the great industrial centres of England and the Continent. It is a development which will be looked upon with keen interest. There is also another fact to prove that modern commerce with its complexities and its high organisation requires highly trained powers of thought. I have to bring to your notice, gentlemen, that in commerce as in any other profession no man not equipped with recent methods of modern commerce can hope to achieve a career of success as honourable if not lucrative as any other profession. But, gentlemen, it must be observed that in commerce, whatever may be your capacities, or whatever may be your education both at school and college, when you enter business line you will find that you have still a great deal more to learn, and though the

return which you get in the first instance may be an inadequate one, you are not to be dissatisfied, as you are bound to achieve eminence and success gradually if you possess business knowledge and reliability. It is, therefore, absolutely necessary to establish faculties of commerce in our Indian Universities if our future business-men should be equipped with the necessary qualifications to successfully carry on their business. With these words, I place the resolution for your acceptance. (*Cheers*).

Mr. Gulab Chand Javeri in seconding the resolution said :—Mr. President, and gentlemen, It is with very great pleasure that I appear here before you to second the resolution which has been so ably moved by my predecessor. I think he has spoken very ably on the subject and therefore he has left very little for me to add. At the same time, the resolution itself is so very clear that it requires nothing by way of explanation. But still a few more words will not, I believe, be counted upon as superfluous. The imperative necessity of commercial education has been very keenly felt long since, and that which ought to have been done hitherto has not been done. Now the time has been almost overdue, if I do not exaggerate it, when a great movement ought to have been started in that direction. Commerce does not mean the mere teaching of shop-keepers to sell their articles in their shops, but commerce is that which is carried on between one nation and another. Therefore it has some higher functions to perform than what shopkeepers have to do. It was about the year 1817 when a great revolution in our foreign commerce took place. About that year, English traders were allowed to carry on private trade by an Act of Parliament which was till then monopolised by the East India Company. It was from that date that our commercial situation has taken its turn. Since then, our foreign trade with other countries has been carried on, on a vast scale. It amounts annually to some tens of crores of rupees. Only five per cent of that

trade is in the hands of Indians. What is it due to? It is simply due to want of commercial education among our commercial men. Therefore, commercial education ought to be very vastly diffused among our people. In the particular business, in which I am engaged, tradesmen in that commodity pay annually something like 30 lakhs to foreigners by way of commission, merely because of their incapacity to found an agency in foreign countries. This is simply due to want of commercial education on modern and improved basis. If this be the condition of our commerce, I think so far as its development is concerned, we shall not be able even after a long time, to make that progress which shall really be beneficial to the interests of our country. It was Germany, and America which first took the lead in Commercial education and several other European countries followed them up. But so far as my knowledge is concerned, we here in India started a movement in that connection earlier than in England too, but England has been able to do more than ourselves. Why? Because the help of Government was there ready which to us is not as liberally extended as it ought to have been. With these few words, I commend the resolution to your acceptance.

The resolution was put to the Conference and carried unanimously.

THE FIFTH RESOLUTION

Excise duty

The Hon'able Mr. Gokuldas K. Parekh in proposing the resolution said :—

Mr. President, Ladies and Gentlemen. The proposition I have been asked to move runs as follows :—

This Conference again records its emphatic protest against the continuance of the Excise duty on Indian mill made cloth as an unjust and unnecessary impost which presses heavily on the industry and prays that it should be abolished at the earliest opportunity.

The Excise duty is a very unjust and unnecessary impost and I must first tell the Conference the way in which it came into operation. Some years ago, Government for revenue purposes and not for purposes of protection prepared a tariff, meaning a set of taxes on foreign goods which are imported into the country, and this tariff included a tax of $3\frac{1}{2}$ per cent. on certain cotton goods that came from Europe. By this tariff, the manufacturers of Lancashire were considerably troubled and they raised a big agitation. You can very well understand, gentlemen, that these manufacturers have great powers in their hands. They can send members to Parliament and they are in a position to set up or set down the Government and their agitation proved successful. In the name of free trade, a tax was imposed upon goods which came in competition with the English manufactures and goods that were manufactured in India to the same extent as the tariff on the Lancashire goods. This is the excise against which we complain. You have heard, gentlemen, both from the President and the Chairman of the Reception Committee the necessity of having protective duties for the purpose of setting up and helping the industries of our country. The theory of free trade which has been brought forward by those people who want to do harm to the people is a theory which has long ago been exploded by the learned articles from the pen of our great statesman, the late Mr. Justice Ranade, and you have seen it in practice that all the big countries of the world such as Germany, France and Japan have been trying to help their industries by large bounties, by cartels and high tariff walls. Thus, for the prosperity of Indian Industries, it is necessary that this ought to be done. India ought to be governed in the interests of India, and where the interests of the Government of the country conflict with the interests of the people, I should think the interests of India ought to be preferred. But in this case we are not asking Government to protect our industries by bounties

by cartels or by tariff walls. All that we want is that our rising industries are not to be hampered by a very heavy and unjust imposition. All that we want is that this impost should be removed and that our industry ought to have a free scope. And I think that there cannot be a juster prayer than that the Excise duty which weighs heavily on our industries and which prevents it from competing with foreign goods ought to be abolished. Gentlemen, we have seen not only in the markets of Japan but even in the Indian markets, Japanese Mill made cloths are trying to compete with ours. They are purchasing our cotton and still are able to bring in goods which can compete with our Indian manufactures. This is the condition of things. They are able to bring in goods here and they receive protection in their own country and even then we do not ask for protection, and when we only ask that any unjust impositions which restrict the progress of our industries ought to be removed, I think we cannot make a juster prayer. With these observations I place the resolution before you. (*Cheers*).

Mr. Mathuradas Ramchand Javeri of Sind in seconding the resolution said :—

Those of you who remember the source and the history of the imposition of this tax, need not be told that it is only on the mandate theory that this imposition was put in Calcutta in 1894. Every member of the Indian Government, official and non-official was against it. But the members of the Council could not help complying with the mandate from England, and that mandate was that the Indian cotton industry should not have protection. Even Lancashire and Manchester are showing a desire to have protection in the form of tariff reform which is nothing but an imposition of tax in England. That is a great obstacle in the way of introduction of tariff reform and it is Lancashire and Manchester that desire that we should not get the same protection. The time is ripe when we can successfully ask the Government of

India to remove the excise duties. You know that the Hon'ble Mr. Dadabhoy has given notice to the Imperial Legislative Council of a proposition to be moved by him for the abolition of these duties, and if you accept this proposition you will greatly strengthen his hands. As far as I read from newspapers, the proposition should receive support from Government officials. Government officials should be allowed to vote in council as they like, and if they are permitted to vote according to their conscience, Mr. Dadabhoy's proposition will be crowned with success. You have been told that this duty was imposed in India simply to satisfy the Lancashire and Manchester cotton dealers, but at present you can see whether our industries can be compared to the industry of Lancashire and Manchester. There, they have got skilled labour and the advantage of machinery whereas our labour is unskilled. We require special protection and this unjust impost must be removed. I, therefore, second the proposition that the excise duty be removed. (*Cheers*).

Mr. Mavjee Govindjee Shet supported the resolution in the following words :—Mr. President, ladies and gentlemen. Of all the propositions placed before you and the resolutions adopted by the Conference to-day, there is none of a more vital importance than the present one. The excise duties on cotton goods form one of the main planks of agitation of Indian leaders in and out of season. It has harrassed the industrial capacities of the various provinces so much so that in times of bad season, they have found it very irksome, inconvenient and very unprofitable to in any way countenance such duties. We have heard that the Hon'ble Mr. Gokhale so often in the Viceregal Council protested against this duty but in vain, and we must make a very bold stand and resolutely but gently place our demand before the Government and make our claim felt. If we urge upon Government our prayer vehemently and resolutely, I am sure we will be able to carry our point sooner or later. Recently when the duty

on tobacco was talked of, the merchants of England protested but the Government both at home and in India very wisely decided that there should not be any duty on indigenous tobacco. I have one more point. From the Excise duty 40 lakhs of revenue accrue to the Government every year and if that amount is utilised for the technical education of the country, that will be a great gain. There has been a proposal, gentlemen, put forward by the tariff reformers of England to Mr. Chamberlain and Mr. Bonar Law particularly that India should be included in the Tariff Reform Scheme put forward by the Conservative leaders of England, but that proposal is fraught with mischief and disaster to India.

In this way, it is that the present excise duties harm only the consumers of foreign goods, and at the same time by the imposition of duties on foreign cotton goods, a flood of them will come into the country and that will be disastrous to the interests of the indigenous industry. With these few words, I request you to support this resolution with all your might and main. (Cheers).

The resolution was carried unanimously.

THE SIXTH RESOLUTION.

Indian Factory Bill.

The Honourable Sir Vitaldas Thackersey of Bombay in moving the Resolution said :—

Mr. President, and Gentlemen, I beg to move the following resolution on the Factories' Bill :—

This Conference is of opinion that the provisions of the Indian Factories Bill of 1909 involve a serious, unnecessary and uncalled for interference with the rights of adult male labour and an unjustifiable restriction of the right over property and urges that as such interference and restriction will affect injuriously the growth of the nascent industries of the country and in view of the serious crisis through which the cotton manufacturing industry is passing, the Government will be pleased to drop the proposed legislation,

Gentlemen, my reasons for moving this proposition before you are that two years ago a Factory Bill was introduced at Simla in which amongst many other things, it was provided that all Factories in India shall not work more than 12 hours under single shaft and that machinery should stop and that all adults also should not work for more than 12 hours. So far as the humanitarian object of the Bill is concerned we are all at one with it. There are many sections of the Bill such as the protection of children, protection of young persons, the protection of women, better sanitary conditions in the Mills, Factories and so on. All of these sections have for their object the improved conditions of mill hands in factories, and I think we are all at one with the amendments relating to them. But there is one part of the Bill which provides that an adult labourer shall not work more than 12 hours. Now, this is a very serious restriction. It takes away the right and liberty of the individual to work as long as he likes, and the only possible conditions under which such a restriction could be placed, are when either such adults are not able to take care of themselves, or that they have suffered under the present conditions of work or they are overworked in actual factory life. I will take up certain quotations from the report of the Factory Commission in order to prove that none of these three conditions exist in the Indian Factories. I am not venturing to give my personal opinion or the impression of any irresponsible individuals, but I give you the deliberate opinion contained in the report of the Factory Commission—a Commission that was appointed by Government towards the end of 1907 to report upon the condition of Factory labour in India. The report goes on to show what the habits of our Indian operatives are. I will read short passages not to take up too much of your time. The report says :—“The Indian operative is, in general, independent of factory work, to the extent that he does not rely exclusively upon factory employment;

"in order to obtain a livelihood, at most seasons he can command a wage sufficient to keep him probably on a somewhat lower scale of comfort by accepting work on the land; and there are also numerous other avenues of employment, more remunerative than agricultural labour, which are open to every worker in any large industrial centre." We cannot understand why proposals are brought forward to protect them still further. The report goes on to prove that the Indian operative, although he may work for 12 or 13 hours, takes one and a half or two hours daily in going about the compound on various pretexts and does not remain in the factory all the time that he remains there. In addition to this, he takes three or four days every month, and also takes an annual holiday of one or two months and takes complete rest. It is this habit of going home to look after his agricultural operations and family that protect him from overwork. As regards the health of the operatives the report says "Comparing the weavers and spinners in Bombay Mills with the dock labourers, general labourers and domestic servants in that city, the mortality among the mill hands, year by year over a period of 7 years, is considerably less than among the general labourers. The average mortality per thousand of the population for the seven years from 1900 to 1906 is :—

	All causes.
"General labourers	31.58
"Factory operatives	18.45

These are important statistics, given in the Factory Commission Report and of that commission I had the honour of being a member as a representative of the Bombay Chamber of Commerce and the Bombay Mill-owners' Association. We have the opinion of Lieutenant Colonel Mactaggart, a doctor of a very high standing. And what is his view after the examination of mill hands? He says, gentlemen, that the "Physical condition of the factory operatives in Bombay is in every way excellent and that

"it compares favourably with that of agricultural labourers, and men of the cooly class generally". These passages in the Commissioner's Report conclusively show that the operatives are not over-worked, that there is no deterioration of health and that instead of being helpless, they are masters of the situation.

With regard to the restriction to be placed on the adult labour, the report of the commission has emphatically protested against it. It says :—"We are strongly opposed to any direct limitation of adult working hours because we consider that there is no necessity for the adoption of this drastic course, because we are convinced that it would cause the gravest inconvenience to existing industries most of which have never worked long hours and because we think that such a measure would seriously hamper the growth of industrial enterprise."

The proposition I am placing before you is for protesting against any action that it would be taken to hamper our enterprise, in the face of the official report of a commission appointed by Government of which the Chairman was Mr. Morison and to which a member was also sent out specially by Lord Morley. He was the Chief Inspector of Factories in Great Britain. He also signs this report and says that to put restriction on adult labour would hamper the growth of industrial enterprise. In spite of this, gentlemen, it has been proposed in the Bill, I do not know for what reason, that there should be a direct limitation of the hours of adult labour to 12 hours. I do not know how this idea of 12 hours originated in the minds of some people. The only ground on which the Hon'ble Mr. Harvey, who moved the first reading of the Bill at Simla based the proposed measure was that if they followed the commission's report it would cause administrative difficulties. Now, gentlemen, there is an Act in England. There is a class of young persons in England but there is no proposal there to directly restrict labour in order to avoid

administrative difficulties. Is it consistent with reason that administrative convenience should rule supreme over the interests of industries in the country? Have you ever heard that in England, direct restriction on labour would be considered advisable because of some administrative difficulties and inconveniences? Gentlemen, I am sure you will not consent to that proposition to-day. Then, there is another question. Long before this present commission there was a commission in 1881, appointed as the effect of the agitation from the same source, and that commission reported in 1891. The commission recorded "The operatives desire that the present working day, daylight to dusk, should be continued." Lord Lansdowne said:—"We believe that the effect of our measure will be to place factory labour in India on a proper footing, and our Bill will be accepted here and at Home, not, as the Hon'ble Mr. Nugent would have us believe as a mere prelude to still further restrictions, but as a settlement as final as any settlement of such a question can be." Mr. Harvey also quotes this and says that the condition of Indian Labour has changed, because in some mills electric light has been installed. But what about the majority of the mills which at present work during day-light hours and where there is no electric light?

Out of 224 cotton mills in India only about 100 are fitted with electric light while 124—the majority—are working under natural day-light. According to the restrictions proposed in the Bill all the mills will have to provide themselves with electric light installation, and Mr. Harvey himself says that in his opinion if electric light is not installed there would be no cause to interfere with adult labour. Then what about the 124 mills? Is it necessary that adult restriction should be placed on all mills, because a few are working with electric light? Gentlemen, such restrictions will compel even the mills which work under natural light to put up electric light. My personal opinion is that

the proposed measure would instead of reducing administrative difficulties increase them. In all small factories, under the new conditions, electric light will have to be provided. In places where there are no Inspectors, the mills may work even after lights are lighted. That is so far as the Factory Commission Report is concerned. I now come to a very important note of dissent appended to the Factory Commission Report, and in that note of dissent I said:—"On all occasions in Ahmedabad and in Bombay, the President kindly invited me to accompany him whenever the operatives had to be examined. We minutely questioned them and their spontaneous reply was always that they did not wish to be worked by electric light. We then explained to them that in that case the longest day came in the hottest part of the year and shortest in the cold weather, and, further more, that Government may not be willing to legislate for a changing day. In spite of this explanation, Ahmedabad operatives to a man stuck to the natural day, and expressed their opinion in a decided way to the following effect:—"If it is a choice between 12 hour's fixed day all the year round and an average of 12 hour day, shorter in winter and longer in summer, then we are all in favour of the average 12 hour day because we do not wish to work by electric lights at any cost."

The operatives want a natural day and yet the Government comes forward and proposes a measure restricting the adult labour in factories. I have said sufficient to prove that it is neither in the interests of the mill hands nor in the interests of the industry that this measure is proposed, and neither is it the case that the operatives suffer under the present conditions. We have therefore now to protest against this adult restriction provided in the Bill. The object may be humanitarian and so far as we know that protection is required, we are quite prepared to support the proposed provisions in the Bill, but wherever we find any restriction which will hamper the

growth of the industry in the country we ought to protest. I hope you will pass the resolution. (Cheers).

Mr. Dinshaw Eduljee Wacha in seconding the resolution said:—Gentlemen, not many words of mine are required after the very elaborate manner in which my friend has gone into the whole question of the Factory Bill. The curious thing is this ; the Government proposed a commission and there was a preliminary committee of enquiry that led to the commission. The Government appointed the commission and perhaps spent about two and a half lakhs of rupees and came to what? a conclusion absolutely illogical, absolutely inconsistent with the whole recommendation and report of the Factory Commission itself ! (Cheers). My friend has pointed out to you that as far as the crux of the whole Bill is concerned, *viz.*, the restriction of day-light hours, the report says that it is disastrous to the industry. Government says no, and that they are going to have it. I have never known of a Government which proposes a commission in the first instance and when the commission makes a report which is adverse to its foregone conclusion, will put it in a corner after having wasted two and a half lakhs of rupees. This I say, gentlemen, is the result of the Factory Commission. (Shame). You need not cry shame because as far as fiscal matters are concerned there is always shame connected with the Government of India proposals. This Factories Bill is, as we all know, not the result of any legitimate cry on the part of those interested, that is to say, the large number of operatives in the 225 Mills in India. They employ nearly over a lakh of people which means that nearly four lakhs of men, women and children are fed who would otherwise be like the day labourers not even eking out one anna a day. 225 mills are an economic good to the country. The Government wants that our economic development should proceed, and yet what is the result ? They impose this Factories Bill. It will be found that when this bill is passed in the Council in

the form in which it is proposed now, the economic condition of your operatives will suffer and many mouths will have less food than they are getting now, because the hours of labour being reduced, the produce which they turn out will naturally be less and they consequently will get less wages. I do not know whether you call it a development of industries or an arrest of industries. When the screw comes the screw is always the other way. The Government is behaving inconsistently. Here is an industry started by Tata which the Government is helping. In the sugar industry the Government is taking very great interest, and in the exhibition you will see how it is expanded and developed with the Government co-operation. Why in this particular industry—cotton industry—which is very prosperous, are they going the wrong way ? Philistine Manchester is the only answer. India is always handicapped wherever the interests of Manchester are concerned. Any Government, be they Liberal or Tory, have got 57 votes from Manchester in the House of Commons and no ministry can afford to sacrifice those 57 votes. They have been doing this not to-day, not yesterday, but ever since 1876 when the Government of Lord Salisbury sent a mandate to Lord Northbrook to say that he must abolish altogether the five per cent. duty on Manchester goods which was then in vogue. Lord Northbrook says "It is for revenue purposes only and I will rather resign than obey the mandate" and he resigned. That is the correct attitude which any Viceroy having the interest of India at heart will take. In 1876 I do not think there were more than 20 mills in India. We have so far developed now that our production of yarn is something like sixty five crores of lbs. Manchester gets alarmed. "What is India doing ? Here is Swadeshi movement on one side. Where shall we be ? and India is our best customer ? We give something like 17 crores of rupees worth of goods. Our Industry suffers. We shall put a screw on the Secretary of State, on the Government of India, to say thus far and no

further, and let India be crippled and the best way to do it is to introduce a Factory Bill." This is Philistine Manchester. Government of India is helpless; no doubt it is acting with the best of intentions and it really wishes that we should progress, but the Government of India is tied down where the powerful Manchester is concerned, and that is the reason of the introduction of this Factory Bill. This is the genesis. The Government of India are inspired by the "Times of India" which is the general oracle that says that slavery goes on in the mills. The report of the Factory Commission speaks of no slavery, nor does it mention any thing about the emaciated creatures or skeletons. The mill operatives are better housed than all the labourers under the sun. However, India must be curbed and therefore the Factory Bill should be passed. It is to our best interest that our stalwart members in the Imperial Council should fight their battle and persevere and convince the Government of India that they are doing the greatest injury to the industry of cotton in India by passing the Factories Bill. I hope you will all pass this resolution of Sir Thackersey by acclamation. (Cheers).

Mr. A. C. Ukil said :—Even the seconder of the resolution has pointed out that the Government must have been actuated by very good intentions in introducing the Factories Bill and if that is correct then the only reason for introducing such a backward legislation which will certainly throttle the nascent industries of India must have been due either to ignorance or to super-abundance of sympathy for Indians. It is not for me to enquire into the motive of Government, but it is a fact that there are factories and factories. Legislation is necessary not for the regulation of the best factories in the land where workers' comforts, their benefits and their education and physique are properly taken care of, but only for those delinquent factories whose managers do not pay proper attention to these very necessary matters. Do you believe that four lakhs of population who are working in the mills

of Bombay will not be better people, if recreation is provided for them? Do you think it absolutely necessary for the wealth of the country that a large number of the citizens of your nation should be condemned to working hours by the will of the proprietors of the mills and by the will of the association of the mill-owners? Profit is their intention. It is not the workers' benefit which is in their minds. I do not discourage the mill owners: they have been finding food and employment for innumerable people, and the country must be thankful to them, but at the same time can you forget the integral difference in the interests, the conflict of interests between the employer and the employed? There are very well-intentioned men among mill-owners, but their humanitarian intentions cannot prevail if there is only one person in the mill who will undersell his manufacture. Do you think that these men whose interests have been sacrificed know of the selfishness of the mill-owners? It is with this intention that the Government has been moved to introduce this measure of giving protection against such exactions, against undue treatment and not against the good treatment for which we are prepared to admit that mill-owners are entitled to credit. But those who may not be giving such kind considerations owing to the competition outside do exist, and in order that they may do their primary duty to their workmen, this Bill has been introduced. I still insist on the general principles which should guide factory legislation, being very clearly understood and laid down and those principles I have placed before you. It is a very patent fact that these mill-owners should go on working as long as they can and leave their operative in the lurch. These labourers work for 50 or 60 years and in their old age what have they to fall back upon? In England, Lloyd George has introduced a very important measure of providing old age pensions, and people aged above 70 are given bonuses at a cost of 20 million pounds and there is another provision

of compulsory insurance. Do you think that those would be unnecessary provisions in our country? Are our workers so well provided for and so well protected as not to need these protections against possible exactions of those persons whose interests are diametrically opposed to those of the workers? The more the mill-owners pay to them the less will be their profit. Without troubling you any more I still submit that you support this amendment of mine and carry this proposition which I have laid before you by universal assent. My amendment is therefore in favour of the proposed legislation not only to protect adult males but also the children working in the mills.

Mr. J. P. Cotelingam said :—

Mr. President and gentlemen, the case for the mill hands has been put before you by the mover of the amendment. The voice of the mill hands is not heard in this conference. Lest the case for mill hands should go by default, I have risen to second the amendment that has been placed before you. It requires a little more than ordinary courage to oppose a proposition that has been moved by so influential a mill-owner like Sir Vithaldas Thackersey and seconded by so shrewd a financier as Mr. Wacha, but the claims of humanity do not pay attention to such considerations, and if I can be heard on behalf of thousands upon thousands of mill hands all over the Bombay Presidency, I shall have done my duty as a delegate to this Industrial Conference. Sir Vithaldas has placed great stress on the opinion of a certain doctor of very great eminence that he has quoted, but gentlemen we know from common experience that doctors, however high their standing, may differ and therefore I do not see why we should attach so much importance to the evidence given by any one particular doctor. Again, Mr. Wacha said—with due deference to him and his experience in these matters—he said that the Factory Commission was appointed by Government, and Government was not prepared to accept the findings of that commission. It stands to reason that the

Government is not bound to accept the findings of the Factory Commission. They may differ from the findings of the Factory Commission for reasons best known to them. Perhaps the legislation may not be in the interests of the mill industry, but I make bold to say that the proposed legislation is undoubtedly in the interest of humanity—in the interests of thousands upon thousands of men, women and children who are employed in these mills. Then again there is another point. There are not mill-owners all over the country like our generous friend Sir Thackersey who may make conveniences so that life may be pleasant for his mill hands. There are hundreds of factories where there are not sufficient conveniences for the various mill hands that have to toil all day in the mills. If we extract labour from these mill hands we reduce them to mere animals and make them go through a machinery of work from morning till 9, and therefore in the best interests of the mill hands, and I should say in the interests of the mill industries and the mill-owners so that efficient work may be obtained from the mill hands, I think that the amendment proposed by my friend Mr. Ukil may be accepted by this conference.

Dr. A. K. Kumaraswami in proposing another amendment said :—

Gentlemen, I have been tempted to say a few words to you in the way of proposing a compromise. I propose another amendment which I will read out to you :—“that the following words be added to the resolution as proposed :—‘that the mill hands be recompensed by grant of a higher rate of wages after certain hours.’” Although I am entirely in sympathy with those who speak for the labourer and in sympathy with the humanitarian aspect of the question, nevertheless the question of the restriction of the hours of labour and the protection of women and children has not been raised and need not be introduced this afternoon. The mover of this resolution is himself entirely prepared

to recognise such protection, and we are only discussing the restriction of the hours of labour so far as the adult male labourers are concerned, and the finding of the Factory Commission is that the present measures are sufficient for them. Whether that is the case or not, I am not sure. What I should like to propose would have been that instead of the actual restriction of the hours of labour the natural day should have been accepted and higher rate of wages should be awarded for work after the natural day. Sir Vithaldas has told you that the hours of labour are not restricted in England, but that is true with the exception of mining. In all trades there are fixed rates of payment for overtime work. I think the same thing exists here but I only propose that this indirect and economic check on over-labour should be recognised.

Dr. Kumaraswami's amendment was seconded by a delegate.

The Hon'ble Rao Bahadur R. N. Mudholkar said :—Gentlemen, I had absolutely no intention to speak on this resolution and till I heard the last two or three speeches I never thought that any necessity would arise for my intervention in the discussion here. I know I would have to speak to almost every clause of this bill in another place. But there seems to be very great misapprehension in regard to the scope of this proposition. In the name of humanity that word which would go straight to the heart of every Indian—in the name of humanity, in the name of mercy for the poor and helpless, you are called upon to give your assent to a position which is fraught with serious consequences to your country. Let me at once make it clear that I am absolutely no believer and no supporter of sweating. I say we have no right, and those who have got money have no right to over-work any person, man or woman, simply because he or she is not born with a silver spoon in the mouth and are obliged to work from dawn till midnight for food. I certainly deplore the conditions under which our labour classes have to

live, but what I have to ask you is whether legislative interference is called for and whether the aid of the strong arm of the law is necessary to be invoked and whether the Bill which is proposed is, in the first place, based upon really disinterested and humanitarian grounds, or proceeds from some self-considerations and self-interest? That is one point. Secondly, you have to see that when you lay down conditions in regard to labour of one kind, it will be incumbent upon you to lay down conditions also for labour in every branch and in every sphere of industry. I suppose my friend Mr. Ukil hails from Bengal. I believe he knows that there are agricultural labourers there, and that there are also small holders of land. I suppose he has visited the other parts of the country and if he has not, I would ask him to go to the Konkan, and he would see there men with small plots of land getting up at three or 4 o'clock in the morning and working from that time till 7 o'clock in the evening with barely an hour's interval. And the work is carried on by men, women, as well as by children. Then I suppose my friend has got some servants of his own. I presume when he is asking for insurance on behalf of the mill hands and is also asking for restrictions of the hours of labour by the mill operatives, it would not be out of place to enquire does he apply these methods to his own home? (Mr. A. C. Ukil :—I do). If so, he belongs to one of the Messiahs. You have got to see that in domestic service you work people from 5 or 6 o'clock in the morning till 10 o'clock in the night. (Mr. A. C. Ukil :—It is not daily) Domestic servants do not get even holidays. In fact on holidays they are worked more. So that you are called upon to sanction legislative interference with labour of a particular kind. The adult labourers in the mills are not children, and are not helpless people. Those who know anything of the condition of the people will know that it is not the mill-owners who dictate terms. Will my friend Mr. Ukil look at what is published almost every fortnight in the Government

Gazettes as to the wages of these labourers? At present they are hundred per cent more than what they were ten or fifteen years ago. Will my friend again see that in very many places there is not enough labour available for carrying on the industry, the development of which you have all been asking for and striving after. If you want that your country should have various industries, why do you want to put such very heavy chains on the one industry which is showing some signs of life? Children wanted protection and it was given to them in 1881. And protection was given to women by the Amendment Act of 1891. When the Act of 1891 was passed it was said that the amendments were introduced for the purpose of finally settling this question. It was then said that the changes which were made in the Act would render any further changes unnecessary and that there would be no occasion of imposing any further restrictions on the factory system. Gentlemen, as my friend Mr. Wacha has pointed out, the Act of 1881 came after the starting of the agitation in Manchester for putting down the mill industry of Bombay. First came the cotton import duties and then came this Factory Law. They found that by the boom of Swadeshi in 1904, 1905 the Indian trade was expanding. Then our friend the *Times of India* sent round his men to go round the mills and after that appeared those inspired articles in that paper. Lastly the Government takes up the Factory Bill. That is the genesis of the whole thing, and you ought not to forget that it is the people, whose interest lies in the suppression of the mill industry of Bombay who have got up this agitation and forced the hands of Government. If you are Indians, and if you care for the industries of your country, do not play into the hands of those interested people. There are provisions made for the protection of children and for the protection of women. Let me tell you as one who has experience of mofussil labour and mofussil conditions of labour that even there the conditions are easier,

and whenever we have to give extra work to labourers in the ginning factories, the hands are paid extra wages. Labourers themselves wish to work extra hours and demand extra wages. So that if they work 16 or 17 hours it is because such work puts more money into their pockets. What right has the state to interfere with the freedom of contract between the adult labourer and the mill-owner? Who are we to say that the labourers shall not work for 14 or 15 hours, if they themselves choose to do so for the purposes of earning more money? Is there any law to protect us against being over-worked? Factories are far superior to the bastis of Calcutta.

Mr. D. E. Wacha said :—You have heard of the sweating Industry in England where young girls, particularly girls from the age of 12 to 15 sweat and sweat. They are made to work for their own subsistence for fully 17 hours year in and year out without Sunday or any other holiday. There was a great scandal on the subject. Eventually Manchester held an inquisition and Sir, the scandal was so great that there was legislation. Agitation is still going on to protect those sweating girls working in damp, dark places on two pence a day. I want to point out the moral, and it is, as I said, we have got no fiscal or economic independence. Supposing we had that independence that Manchester has and suppose we move the Government of India and say "Look here in Lancashire and London and other large centres of trade, there is Sweating Industry going on where young girls are made to work without holiday." Will the cabinet at Home accept the mandate of the Government of India and introduce legislation in Parliament? (Cries of no, no). Then there is one set of legislation for one protected class and another set of legislation for another class. This is the logic of Government.

Sir Vithaldas Thackersey, gentlemen, as the mover of the resolution I am asked by the President to make clear the points of the two amendments placed before you to-day

At the same time I do not want to make a speech. So far as the amendment of Dr. Kumaraswami is concerned personally I would heartily support it, but I do not think that it is right even by over-payment to sweat hands. If at any time there is over-work the hands are paid extra and there is, therefore, no necessity to bring forward an amendment. As regards the other amendment it is divided into two parts. One is for women and children. If you read the Bill you will find that there is no necessity for that part of the amendment. When we know that they are provided for it is ridiculous that we should ask for the same provision. The second part of the amendment relates to insurance for the workmen but that is not part of the Factory Bill. If insurance is wanted for workmen, let there be, if necessary, a special Act of insurance, but that is not a part of the Factory Bill. Therefore, as I say, the two amendments are not necessary. We say that we do not want adult restriction and I put it on the ground that such legislation is not necessary. If you read the report of the Factory Commission you will find that not one mill hand is sweated.

The President put the amendment of Mr. Ukil to vote and it was lost.

Dr. Kumaraswami's amendment was next put to the Conference and it was also lost.

Sir Vithaldas Thackersey's original resolution was eventually put to the Conference and carried by a large majority amidst cheers.

THE SEVENTH RESOLUTION.

Merchandise Marks Act.

Mr. M. B. Sant in proposing the resolution said :—
Ladies and Gentlemen, the resolution which has been entrusted to me runs as follows :—

This Conference draws the attention of Government to the use, on several articles manufactured outside India, of misleading descriptions, impressions, or marks calculated to cause the belief among purchasers and consumers that the same were made in India and urges that steps be

taken by legislation, if necessary to prevent such and similar fraudulent practices by requiring in every case the indication of the country of origin.

I am not at all prepared to inflict a very length speech in the course of this evening. The suggestion of rather the order to move this resolution was received by me almost at the eleventh hour. The necessity of bringing forward this resolution has arisen in this way. Certain articles appeared in the *Pioneer* a few months ago and a representation was also made by the Bengal Chamber of Commerce pointing out that several well-known foreign firms are in the habit of falsely describing their goods, by omitting the country of origin and in various other ways, thus deluding the public into the belief that they were actually manufactured in India, whereas they were not. This kind of delusion leads to unnecessary drain of public money as well as it cannot consistently help the carrying out of the vow of Swadeshism which has been taken by so many of our countrymen. The extract as it originally appeared in the *Pioneer* is very interesting and I shall just quote some passage from it:—

“The power of the Swadeshi propoganda to injure their trade was long ago realised by European Manufacturers, some of whom have adopted not altogether creditable devices to maintain the Indian market in face of the demand for country made articles. A little sidelight is thrown on this subject in the report on the maritime trade of Bengal for 1909-10, recently issued and it goes to show that the part of the Indian Merchandise Act which deals with the application of false trade descriptions or other indications in respect of the country in which goods are made is not sufficiently explicit.”

The Swadeshi preacher as well as the purchasers of country made goods is continually exposed to the danger of being misled by the false trade marks and other devices, and it behoves all the lovers of the Swadeshi movement to agitate for the necessary legislation in this important matter.

Mr. J. P. Cotelingam said in supporting the resolution:—Mr. President, Ladies and Gentlemen. A few minutes ago, I was called upon to second the proposition that has been placed before you. I gladly consented to do so. I am not a merchant and therefore I have not out of motives of self-interest come forward to move this resolution. I am like most of you a purchaser, preferably of Swadeshi goods and naturally I would like to see that the articles that are given to me are of genuine Swadeshi origin, and both in the interests of the honest Swadeshi merchant and the interests of the true Swadeshi, it is very necessary that there should be some such safeguard as proposed in the resolution. I am an old Swadeshi, I was a Swadeshi long before the so-called Swadeshism was born. I have been a Swadeshi for nearly three or four decades and naturally when I want genuine Swadeshi articles, I would like to place some faith in the person that sells to me the particular Swadeshi article that I want. I have been told from time to time, ever since the spirit of Swadeshism was born throughout the length and breadth of the country, that there are many articles said to be Swadeshi and not really so, sold in the market. I don't think I need detain you over a long list of examples. Those who framed the resolution have evidently had before them a number of cases in which articles placed before them as Swadeshi were palmed off as such. Any how, I shall refer to an example from my own experience. I have gone to certain shops in Madras for Swadeshi piece-goods, and by the merchant I have been shown certain articles which by touch and by the look did not appear to be Swadeshi. He sometimes told me that the particular piece of cloth that I wanted was Basel Mission Cloth. I have been accustomed to Basel Mission Cloth for thirty years, and this particular piece of cloth, seemed to me to be very much like washing tweeds by which name certain articles that come from Europe have long been known. It is not fair that upon the purchaser who does not examine the article that he

wishes to purchase, English-made or European made goods should be palmed off for Swadeshi articles made in our own country, in the Basel Mission.

It is absolutely necessary to protect the interests of the genuine Swadeshi and the honest Swadeshi merchant that some such legislation should be enacted. Gentlemen, legislation in this direction is bound to come. I, therefore, would recommend this resolution to your acceptance.

The resolution was carried unanimously.

THE EIGHTH RESOLUTION.

Weights and Measures.

The Honorable Rao Bahadur R. N. Mudholkar in proposing the resolution said :—Mr. President, and gentlemen. This is of course not one of those resolutions which carry the same importance as the resolutions on Factories Bill or Technical Education or the Merchandise Marks Act. The subject however is all important to traders, and more than traders, to consumers. It is a question about standardisation and unification of weights and measures. In regard to this, you will remember that the Magna Charta has an article which insisted, as far back as 1216 in England, upon their having the same weight and the same measure in the country. This is the thing which we are now asking for in the interests more of consumers and in the interests also to no small extent, of inter-provincial traders in the country. I shall explain to you what I mean. Most of you who have to deal with, for instance cotton seeds, find that a maund is considered equivalent to 40 seers; whereas in some places it is considered equivalent only to 14 seers; That is, what is called a quarter of a hundred weight. In other places it represents only 30 seers. It is really very confusing; you find, for instance, in the case of oil, a maund is considered equivalent to 38 pounds in one place; 50 miles from there where oil is manufactured, it is equal to 34 pounds. In a third place it

is 31 pounds. The result is that not merely in making calculations but in making purchases, especially where traders make large purchases, they are put off on the wrong basis and very often are deceived. In some cases you find fraudulent practices. In some cases advantage is taken of the purchaser's ignorance, and they fall into serious mistakes which bring about serious pecuniary complications. It is therefore for the purpose of inter-provincial trade and for protecting consumers that this measure is necessary and what is now asked for is not quite new. The attention of Government is not drawn for the first time to this matter, but it is a question which was before the Government very many years ago. Opinions were invited on the suggestions of certain official bodies. Opinions were asked by Government as regards the necessity and afterwards the feasibility of standardisation and unification of weights and measures. From some places, I know for certain, opinions which went were strongly in favour of that proposal. From other quarters, however, there was an equal amount of opposition, and with this kind of conflict and division, Government have refrained from taking action. To my mind, it appears that, anxious as we are to develop our inter-provincial trade, it is very necessary that there should be both standardisation and also unification of weights and measures. It is on these grounds, gentlemen, that I commend this proposition to your acceptance. (Cheers).

The resolution runs as follows :—

This Conference re-affirms resolution No. VII of last year's Conference and again invites the attention of the Government of India to the desirability of introducing uniform weights and measures to facilitate trade among the different towns and provinces of India, and remove the present inconveniences arising from a multiplicity of weights and measures and from a want of uniform system and standard.

Mr. Goswami Brijnath seconded the Resolution in Hindi. It was put to the Conference and carried unanimously.

THE NINTH RESOLUTION.

Agricultural Banks.

Mr. G. K. Deodhar in proposing the resolution on agricultural banks said :—Mr. President, Ladies and Gentlemen. The resolution which I am asked to move sets forth one of the great needs of the agricultural industry and economic advancement of our country, and that resolution runs as follows :—

This Conference notes with regret that the Secretary of State has not sanctioned the scheme drawn up by some of the leading financiers of Bombay of an Agricultural and Industrial Bank, though the same had received the support of the Government of Bombay and of the Government of India ; and again urges upon Government its conviction that for securing an amelioration of the economic condition of the peasantry and the land-owning classes, it is necessary to establish agricultural banks for assisting the existing co-operative credit societies and for advancing loans direct to agriculturists wherever such societies do not exist.

The first part of the resolution states a fact which is really modern in its character. Some of the leading financiers of Bombay, one of whom we have the honour to have in our midst this afternoon, I mean our leading citizen Sir Vithaldas D. Thackersey and the other gentleman, the Hon'ble Mr. Lallubhai Samaldas think that it is necessary to establish what is called a Central Agricultural Bank in Bombay for affording facilities so as to secure loans for the sake of trade as well as for the improvement of agriculture. But unfortunately this scheme has not yet been crowned with success. Our very popular Governor Sir George Clarke who is always willing to devote his energies to the interests of his people has with his usual liberality sanctioned in an enthusiastic manner the proposal made by Sir Vithaldas D. Thackersey and the Hon. Mr. Lallubhai Samaldas and you will be glad to hear that the Government of India also have felt it necessary to give its enthusiastic support to that scheme. But anyhow there seems to be a kind of fatality to such

proposals because the Secretary of State has not been able to find his way yet to accord his sanction. I am reminded here of a similar fatality to a scheme which was proposed by Sir William Wedderburn nearly 30 years ago. Sir William Wedderburn when he was in Bombay wanted to establish an Agricultural Bank in a small village near Poona called Saswad which received a very hearty approval at the hands of the leading citizens then in Poona. The Government of Bombay as well as the Government of India approved of the proposal, but then it was chucked out by the Secretary of State. Here again you see another scheme launched for a similar purpose has not been accorded the necessary sanction. But even if there be such a fatality to this scheme, we ought to remember that we are not fatalists, and it is, therefore, our duty and it is, therefore, the duty of this Conference to urge on the attention of the Government with as much force and with as much vehemence as we possibly can, the necessity of sanctioning this scheme which is so essential for the growth and development of agriculture in our country. The latter part of the resolution deals with the necessity of such agricultural banks. Most of you, here, must have heard of a very powerful and miracle making movement so to speak, called the movement of co-operation. This movement is working wonders in all European countries. I have no doubt that during the short time or immediately in the future this movement will march with rapid strides in our midst. You can see that during the last six years it has made a very great headway. There are more than 2008 co-operative credit societies organised and the membership of the societies comes to 1,88,000. The total amount turned out is 88 lakhs of rupees. Only during last year the membership has been doubled and the amount of business done by the societies has also been doubled. Now these societies are one of the series of methods adopted by the Government to improve the

condition of the agriculturists. You all know that there was the Deccan Agriculturists Relief Act. Government found that for various reasons the Agriculturists Loans Act and the Land Improvement Act did not meet the purposes for which they were intended ; and therefore they thought it necessary and it was Lord Curzon who has given us this very useful measure by passing an enactment in 1904 and by bringing into existence a very powerful movement or a very powerful new organization called the Co-operative Credit Societies. Now, if these societies have really to be successful and do their business properly and in a proper manner, there is a great urgency for a central bank which has been proposed and for which necessary funds have been found by Sir Vitaldas Thackersey in Bombay. But the great obstacle in the way of this scheme is the want of a central organisation. I myself am an humble worker in the cause of co-operation on a small scale, and whenever I go about to organise small societies the great difficulty is finance. I have at present before me the instance of a society where the only want is something like 50 or 60 thousand rupees. But those friends there have only got 5 or 6 thousand. Now if they really want to do their business well, they certainly cannot do it with 5 or 6 thousand rupees. They have to borrow necessary funds. There you find the necessity for a central bank in order to get the necessary capital. Unless a central bank comes into existence it will be difficult for agriculturists to carry on their operations successfully. Therefore this Conference has thought it necessary to urge upon the attention of Government the urgent need of sanctioning that scheme. I will say in a word that if that scheme is sanctioned and if the movement of co-operation gets that strength which it is bound to get, it is sure to prove a boon and a great blessing to the agriculturists and small traders who inhabit our motherland.

Mr. Mahesha Charan Sinha seconded the resolution in Hindi.

Mr. Ambika Charan Ukil suggested the following amendment :—

“ This Conference urges upon the Government its conviction that for securing amelioration of the economic condition of the peasantry and the land owning classes, it is necessary to establish peoples’ banks on federal principles for assisting the existing co-operative credit societies and for advancing loans to large proprietors of lands and farmers for improving their lands.” In moving the amendment the speaker said :—I consider it unnecessary to introduce the words “ agricultural banks ” because co-operative credit societies as provided in the Act of 1904 recognise two different classes of co-operative credit societies.

The President :—What is proposed is not an amendment.

Mr. Ukil :—If the President will give me time I am prepared to prove that what I propose is a substantial and necessary amendment. The amendment was lost and the original resolution was carried unanimously.

THE TENTH RESOLUTION.

Joint Stock Companies.

Mr. J. K. Mehta said :—Mr. President and gentlemen. The resolution I have been entrusted with runs thus :—

“ This Conference considers that it is desirable to bring the law regulating Joint Stock Companies in India in a line with the law in England as laid down in the recent Companies’ Consolidation Act, with such modifications as will suit the circumstances of this country.”

The Industrial and Commercial Revival in India has expressed itself in the formation and development of Joint Stock Companies. In 1888 we had only 400 Joint Stock Companies. In 1908 we had more than 2000 Joint Stock Companies. There is one difficulty we are labouring under. While the Indian Joint Stock Companies Act was framed on the model of the British Companies Act of 1886 it has still remained the same though some 24 years have

elapsed since then, except for a few slight modifications. The British Companies’ Act however was altered last of all in 1908, and is called the British Companies Consolidation Act of 1908, and this Act provides vast safeguards for the interests of investors and the shareholding public. The attention of the Government was drawn to this serious and important question by the colossal failures which occurred in Bombay last year, and to the ruin of thousands upon thousands of investors from the effects of which they are still suffering. Most of the provisions in the British Consolidation Act of 1908 should be introduced in this country with such modifications as may suit the peculiar conditions of our country. That is the resolution which is before us. Just recently there were two heavy failures in England, viz. of Crossly and Birch which have drawn the attention of the public and Government to the heavy responsibilities which the shareholders are under without having any knowledge of the same. Heavy frauds are being practised by the directors and agents of companies. While such is the condition of things in England, is it any wonder that we in India who are still plodding on with the Act of 1882 should wish to have our Act modified in accordance with the needs of the times? Well, gentlemen, time is opportune also for such modification, because an industrial revival is going on in the land and more and more new companies and new banks are being started every day. We know remarkably well in regard to the formation of Joint Stock Companies that though there are a large number of companies with a large amount of nominal capital, the amount of paid-up capital is very small. Herein lies our danger. This danger is specially intensified when we reflect upon the recent disclosures in Bombay. Take caution in time, and let the Government of India at their next session of the Legislative Council introduce amendments in the present Companies Act on the lines of the British Companies Consolidation Act of 1908. (Cheers.)

Mr. B. F. Karbari in seconding the resolution said :—
Mr. President and gentlemen, The resolution is for the amendment of the Indian Companies' Act. We know that some agents are found who keep bogus accounts and it is found necessary in order to bring them to book that a stricter law ought to be passed, and this law ought to be on the basis of the English law. With these remarks I second the proposition.

Mr. A. C. Ukil :—Mr. President and gentlemen, I beg permission to move an amendment. When you will hear me you will perhaps change your opinion. My amendment is this :—“ That considering the paucity and the struggling condition of Joint Stock Enterprise in India it is not only unnecessary but actually prejudicial to the industrial development of the country to have a Companies Act in India based on the same footing as that of England”.

The President :—The resolution says that the alterations should be according to the circumstances of this country and not that the English law should be bodily introduced into India.

Mr. A. C. Ukil :—You have told us in another connection that legislative interference throttles your industries. We are just learning the methods of Joint Stock Enterprise.

The President :—Yours is a negative of the resolution before the Conference and not an amendment. If you are going to oppose the resolution you may vote against it.

Mr. A. C. Ukil :—I know of no logic which distinguishes amendments from opposition. Opposition may be partial and opposition may be complete. People want to see how this industry of Joint Stock Companies will prove, and if you ask the Government to introduce legislation you will have legislation with a vengeance. You ought to consider the subject well and then vote.

Mr. Ukil's amendment not having been seconded the original proposition was put to vote and carried *nem con.*

THE ELEVENTH RESOLUTION.

Abolition of the Department of Industries.

Mr. C. Y. Chintamani in moving the Resolution said :—
Mr. President, and gentlemen. The resolution I have to move before you is as follows :—

That this Conference records its sense of deep regret at the action of the Secretary of State in directing the abolition of the department of Industries in Madras and lodges a protest against the policy laid down by him that the state should not pioneer new enterprises, as unduly limiting state help in industrial development.

As we are pressed for time, and it is a late hour in the evening, I have decided not to make a speech. The circumstances of the case must be familiar to all. It was recently that the despatch of the Secretary of State to abolish the department of industries in Madras was published and the circumstances are fresh in your minds. I therefore ask you to pass it.

Sir Vitaldas D. Thackersey :—Mr. President and gentlemen, I second the resolution. I think it is necessary that the department started in Madras ought to be continued. There is special reason why you should have such a department so that new industries could be helped and encouraged in India.

The proposition was put to the meeting and carried.

THE TWELFTH RESOLUTION.

Duty on Sugar.

The Hon'ble Rai Bahadur Ramanuj Dyal moved the following resolution and spoke in Hindi in commending it to the Conference.

That this Conference is strongly of opinion that it is essential that the Government should impose an adequate impost duty on foreign sugar in order to enable the indigenous industry to hold its own.

Mr. J. P. Cotelingam :—Mr. President and gentlemen, After the lucid exposition that you have heard upon this subject in the admirable speech of the Hon'ble Pandit Madan Mohan Malavya at the opening of this Conference, I do not think it is necessary that I should detain you

with any further words of mine except to recommend this resolution to your acceptance. If the Sugar Industry of your country is not to decay and die out ultimately, it is absolutely necessary that some such protection as we ask for should be given us, and therefore with much pleasure I commend this resolution to you, that this Conference is strongly of opinion that it is essential that the Government should impose an adequate import duty on foreign sugar in order to enable the Indigenous Sugar Industry to hold its own.

Mr. A. C. Ukil :—Gentlemen, I beg to move that the following words be added at the end of the resolution:—“That a duty should be imposed to an extent not exceeding the bounty on foreign made sugar.” Government have to decide whether they should adopt the policy of protection out and out or the policy of free trade. They can adopt free trade by imposing such duty as not to exceed the bounty.

The above amendment not having been seconded, fell through, and the original resolution was put to the Conference and carried.

Abolition of Octroi Duty.

Mr. Narotam Das :—Mr. President and gentlemen, I beg to move the following resolution :—

That this Conference is of opinion that the octroi duty levied in some parts of the country hampers trade and industry and prays that the Government will be pleased to order its abolition at an early date.

Those of you gentlemen, who have come here from Bengal or from Madras would not probably know what is meant by octroi duty. Gentlemen, it is a duty which is levied in the Bombay Presidency, the Punjab, in these Provinces, in the Central Provinces, and those of you gentlemen, Bengalis and Madraseds, who have ever come down to these parts must have felt the difficulty, the trouble and the inconvenience you have been put to. It came to my memory the other day when I was coming from Sind to Allahabad and when

I got down at Delhi outside the station a person asked me where I would stop, and when I told him that it was no business of his to interfere with my movements, he said “put down your saman.” When I asked him what it was for, he said that it was to collect octroi duty. The difficulty is this. Probably you want to convert paddy into rice and when you have got paddy you have got to pay octroi duty. The position is this. Taxation is direct or indirect and this octroi duty is said to be an indirect taxation. The Agra people have moved in this matter and I hope you will all accept this resolution.

The Honorable Sir Vitaldas D. Thackersey in seconding the Resolution said :—Gentlemen, this is an important question and it affects individual towns and villages. Government are giving more and more power to the local bodies and we ask for still more and more power. It is not right that this Conference should pass a resolution asking Government to limit that power to the local bodies. They impose duty on water, etc., to meet the local needs. I strongly protest against this Conference now asking Government to dictate to individual towns and villages whether octroi duty should be levied or should not be levied. I think that on a consideration of the fact that local self-Government is expanding, we ought not to ask Government to interfere with the powers of local self-Government. I hope that on this ground we shall not pass this resolution at this Conference. Let individual towns come forward and take steps to abolish octroi duty, and until that time we ought not to pass this resolution asking Government to interfere with the power of local bodies.

Mr. Purushottam Das Tandon :—Gentlemen, it seems to me that Sir Vitaldas is not very well conversant with the affairs about octroi duty prevailing in this part of the country. Octroi duty as payable in this part of the country is a positive nuisance. (Hear, Hear). It is hampering the trade and industry of a number of towns in our province and from a

number of places and associations petitions have gone up that octroi duty should be abolished. It is not a question of hampering the powers conferred by Government on Municipalities. A number of municipalities have as a matter of fact memorialised the Government for an abolition of this duty, and the Government has not complied with their request. With these words, I beg to submit that this is a resolution which ought to be passed.

The Hon'ble Rao Bahadur R. N. Mudholkar :—Gentlemen, I would offer a few observations on this resolution. This is a question on which I find there is very great inconvenience and hardship experienced in these provinces, and my friends who have been explaining to me the circumstances attending the levy of this duty have shown reasons which establish a case for serious consideration. The only question on which we are not agreed is, whereas in our parts of the country Municipalities and some of our most popular leaders have been themselves asking Government to confer upon Municipalities the power of imposing octroi duty, shall we be doing a proper thing in this Conference which takes into consideration the interest of All-India to pass a resolution which is very correct in regard to one part of the country but not so in regard to another part? I would, therefore, vote for the resolution as regards these provinces. I do not know what the policy of the United Provinces Government is, but elsewhere octroi is not allowed unless an exceedingly strong case is made out, and Government are against the imposition of octroi on the ground that it interferes with certain articles which have a tendency to flow to the west, that is to say, certain persons who are interested in export trade say that octroi hampers export trade. I must tell you that on this matter opinion is divided. The matter came before us only yesterday, and I would advise you not to pass the resolution from the platform of this Conference but in a Provincial Conference and then give us time till next year when we shall be in

a better position to deliberate upon it, I propose that the consideration of this resolution be postponed for one year.

This proposal was agreed to.

THE THIRTEENTH RESOLUTION.

Appointment of office bearers and appeal for funds.

The Hon'ble Pandit Madan Mohan Malavia then moved and the Hon'ble Babu Ganga Prasad Varma seconded the following resolution which was adopted by the Conference unanimously.

That this Conference re-appoints the Honourable Rao Bahadur R. N. Mudholkar as General Secretary and authorizes him to appoint an Assistant Secretary with suitable establishment and appeals to the public for a sum of Rs. 5,000 to meet the expenses of the next twelve months.

Vote of thanks to the Chair.

Pandit Gokarnath Misra.—Gentlemen, I have not stood up at this time before you to inflict a speech. I ask you to accord a vote of thanks to the chair. (Cheers). The sound business capacities possessed by our President have stood him in good stead even in the deliberations of this Conference, and we have seen with what admirable tact he has guided the deliberations of to-day. The capacities and the qualifications of Mr. Mookerjee as a business man are well known to you all and the speech which we have heard to-day from him will I hope inspire all of you that in matters relating to industrial progress of our country, everything has to be done in a business-like way and the suggestions which he has given to us in various directions are such as we should all try to act upon. With these few words, gentlemen, I propose a hearty vote of thanks to the Chair. (Cheers.)

Sir Vitaldas D. Thackersey having seconded this proposition, the Hon'ble Pundit M. M. Malavia put it to vote and it was carried amidst acclamation.

The President before dissolving the Conference said:—Gentlemen, I thank you heartily for the reception you

have given to me especially by your attendance. The discussions conducted at the Conference to-day show how every one of you is earnest. I only hope that whatever I have said and done has not been for nothing and I earnestly hope that you will consider them carefully. (Cheers).

The Conference dissolved at 7 P. M.

APPENDIX I.

RESOLUTIONS OF THE FIRST INDIAN INDUSTRIAL CONFERENCE

HELD AT BENARES ON THE 30TH DECEMBER, 1905.

I

Resolved that this Conference urges the Government of India and all Provincial Governments and administrations, as also the people of India according to their powers and opportunities,—

- (1) To found Technical Schools in all large centres for the Industrial education on an adequate scale of the Indian people,
- (2) To encourage and help Indian manufactures,
- (3) And to foster and extend the use of such manufactures in India in preference to foreign goods.

Proposed by the Honourable Munshi Madho Lal (Benares).

Seconded by Mr. A. Chowdhri (Calcutta).

Supported by Mr. N. Subbarao (Rajahmundry).

II

Resolved that this Conference urges all Provincial Governments and administrations as well as the proprietors and managers of private schools and colleges to add commercial classes, and industrial classes like those of weaving, dyeing, carpentry, &c., to the existing educational institutions where practicable.

Proposed by Mr. G. Subramania Iyer (Madras).

Seconded by Mr. Ali Mahomed Bhimji (Bombay).

III

Resolved that this Conference specially invites the attention of Indian capitalists to the great importance of introducing the use of improved hand-looms among the weavers of India, and recommends the establishment of weaving schools, where boys may learn the use of such looms, with a view to their more extended use among the towns and villages of all Provinces in India.

Proposed by Mr. Prabhas C. Mitra (Calcutta).

Seconded by Mr. Babulal Govika (Aligarh).

Supported by Mr. Fazlal Hassain (Aligarh).

IV

Resolved that this Conference urges Indian capitalists to establish at their own cost schools for spinning, dyeing, pottery, carpentry, and the manufacture of ironware and brassware, in order to afford facilities to boys of all castes and classes to learn such useful industries as a means of their livelihood.

Proposed by Rai Bahadur Lala Baij Nath (Allahabad).

Seconded by Pandit Rambhaji Dutt Chowdhri (Lahore).

Supported by Mr. L. R. Das (Calcutta).

V

Resolved that where it is possible to raise large funds for Industrial education, this Conference recommends the placing of such funds in the hands of trustees with a view to the establishment of Technological Colleges on the most modern methods adopted in Europe, America and Japan for the training of large numbers of students in the various industries which are profitable in India.

Proposed by Sir Bhalchandra Krishna, Kt. (Bombay).

Seconded by Rai Saheb Lala Girdhari Lal (Delhi).

Supported by Mr. Lakhbir Singh (Muzaffarnagar).

VI

Resolved that Provincial Committees be established in Bengal, Bombay, Madras, the United Provinces, the Punjab, and the Central Provinces and Berar consisting of the members named below for giving effect to the above recommendations, generally encouraging industries and making an industrial survey in their several provinces and compiling useful facts and suggestions for submission to the next Industrial Conference in December 1906. In order to carry out these views each Committee is requested to raise suitable funds, appoint trustees, frame rules for the conduct of business and lay their accounts before the next Industrial Conference.

Resolved that the following gentlemen be the members of the Provincial Committees for the year 1906, with power to add to their number :—

BENGAL.

T. Palit, Esq.

The Honourable Mr. J. Chaudhary.

R. N. Mukerji, Esq.

BOMBAY.

D. E. Wacha, Esq.

The Honourable Mr. Vitthal Das D. Thackersey.

Lallubhai Samaldas, Esq.

MADRAS.

N. Subbarao, Esq.

The Honourable Mr. L. A. Govindaraghava Iyer.

V. Krishnaswami Iyer, Esq.

UNITED PROVINCES.

Rai Bahadur Lala Baij Nath.

The Honourable Pandit Madan Mohan Malaviya.

Munshi Ganga Prasad Varma.

THE PUNJAB.

Rai Bahadur Lala Ganga Ram, C. I. E.

Shaikh Umar Baksh.

Lala Harkishenlal.

Lala Lajpat Rai.

Lala Mulkaraj.

CENTRAL PROVINCE AND BERAR.

Rao Bahadur R. N. Mudholkar.

G. S. Khaparde, Esq.

M. V. Joshi, Esq.

Proposed by Lala Lajpat Rai (Lahore).

Seconded by Rai Bahadur Ganga Ram (Lahore).

Supported by the Honourable Mr. L. A. Govindaraghava Iyer
(Madras.)

VII

Resolved that this Conference appoints Rao Bahadur R. N. Mudholkar as General Secretary, empowers the President to appoint a permanent Assistant Secretary and establishment on suitable pay and allots a sum of Rs. 5,000 for meeting the expenses of the next twelve months.

Proposed by the Honourable Pandit Madan Mohan Malaviya
(Allahabad).

Seconded by Mr. C. Vijayaraghavachariar (Salem).

BENARES,
30th December, 1905.

R. C. DUTT,
President.

R. N. MUDHOLKAR,
General Secretary.

THE INDIAN INDUSTRIAL CONFERENCE

Resolutions passed at the Second Indian Industrial Conference held at Calcutta on the 29th and 31st December, 1906.

I. TECHNICAL AND COMMERCIAL EDUCATION.

RESOLVED—That this Conference re-affirms the Resolution passed at the Conference of last year on the subject of Technical and Commercial Education, and requests the Government to establish a sufficient number of Secondary Technical and Commercial Schools, a superior Technical College for each Province, and one fully equipped first class College of Technology for all India. And that a Committee consisting of the President, the General Secretary, Messrs. R. C. Dutt, D. E. Wacha, G. V. Joshi, G. Subramania Iyer, Lajpat Rai, P. N. Bose, A. C. Sen, Deva Prasad Sarvadhikari, and Dr. Nil Ratan Sircar, be appointed to prepare a Memorial on the above lines for submission to Government by the President and the General Secretary.

Proposed by V. Krishnaswami Iyer, Esq. (Madras).

Seconded by Deva Prasad Sarvadhikari, Esq. (Calcutta).

Supported by Babu Ambica Charan Maitra, (Pabna)

" G. A. Natesan Esq. (Madras).

and carried unanimously.

II. THE INDIAN STORES COMMITTEE.

RESOLVED—That this Conference conveys its thanks to the Government of India for appointing a Committee for making recommendations for the use by Government departments of indigenous articles in preference to foreign goods, and requests that they be pleased to direct the early publication of the Report of the Committee, so that the public and the trades in India may have an opportunity of considering it before final orders are passed on the subject.

Proposed by Sir Bhalchandra Krishna, (Bombay).

Seconded by K. Natarajan, Esq. (Bombay).

Supported by Moulvie Mahommed Nizamuddin Hassan (Lucknow) and carried unanimously.

III. INDUSTRIAL SURVEY.

RESOLVED—That in view of the importance of having an Industrial Survey of India made by Government, and having regard to the recommendation made by the Committee on Industrial Education to that effect, this Conference requests Government to make such a survey and empowers the President and the General Secretary to submit a memorial on the subject.

Proposed by Rao Bahadur R. N. Mudholkar (Amraoti).

Seconded by Bipradas Pal Chowdhuri, Esq. (Calcutta).

Supported by S. C. Mookerjee, Esq. (Calcutta).

and carried unanimously.

IV. SUGGESTIONS TO THE PUBLIC.

RESOLVED—That this Conference specially invites the attention of the public to the great importance of introducing the use of improved hand-loom among the weavers of India, of promoting technical education by the establishment of schools and classes, and of starting laboratories for the purpose of determining the industrial value of Indian products.

Proposed by Dewan Bahadur Ambalal S. Desai, (Ahmedabad).

Seconded by Vishwanath P. Vaidya, Esq. (Bombay).

Supported by Dr. Nil Ratan Sircar, (Calcutta).

Supported by Shet Damodardas Khivraj (Beawar).
and carried unanimously.

V. THE CONFERENCE PROVINCIAL COMMITTEES

RESOLVED—That the Provincial Committees already established be asked besides taking steps to promote industries in their several provinces, to compile useful facts and suggestions for submission to the next Industrial Conference, and to raise suitable funds for carrying on their work.

Proposed by Dewan Bahadur L. A. Govindarghava Iyer (Madras).

Seconded by Babu Ambica Charan Ukil (Calcutta).

Supported by A. Ramanna, Esq. (Mysore).

and carried unanimously.

VI. APPOINTMENT OF OFFICE-BEARERS AND PROVISION OF FUNDS FOR THE YEAR 1907.

RESOLVED—That this Conference re-appoints Rao Bahadur R. N. Mudholkar as General Secretary and Mr. C. Y. Chintamani as Assistant Secretary, and empowers the President and the General Secretary to appoint an Additional Assistant Secretary and establishment on suitable pay, so that the Assistant Secretary may be free to visit the different provinces and help the Provincial Committees in all matters in which they may require assistance. And this Conference allots a sum of Rs.10,000 for meeting the expenses for the next twelve months, and also for issuing a quarterly bulletin of Industrial information under suitable management.

Proposed by R. C. Dutt, Esq., C. I. E., (Baroda).

Seconded by Rai Bahadur P. Ananda Charlu, C. I. E., (Madras) and carried unanimously.

VITHALDAS D. THACKERSEY,

President.

R. N. MUDHOLKAR,

General Secretary.

RESOLUTIONS PASSED AT THE THIRD INDIAN INDUSTRIAL CONFERENCE

Held at Surat on the 30th December, 1907.

I. INDUSTRIAL SURVEY.

RESOLVED—That this Conference expresses its sense of satisfaction that an Industrial Survey has been carried out in the United Provinces and is being carried out in the Central Provinces and Berar, and in the Baroda State; and it would urge other Provincial Governments in British India and the Governments of other Indian States to carry out at an early date Industrial Surveys of the territories within their jurisdiction as exact and detailed information would afford facilities for the introduction of a sound system of technical education and the well-ordered development of indigenous industries.

(Proposed by Sir Bhalchandra Krishna, Kt., of Bombay, seconded by K. Natarajan, Esq., of Bombay, and carried unanimously.)

II. TECHNICAL AND COMMERCIAL EDUCATION.

RESOLVED—(a) That this Conference re-affirms the Resolution on Technical and Commercial Education passed at the last Conference.

(b) That this Conference thanks the Government of the United Provinces for the action taken by them with a view to introduce a fairly comprehensive system of Technical Education in those Provinces and would express the hope that other Provincial Governments will be pleased to convene representative conferences such as the recent Naini Tal Conference to devise measures for the spread of Technical Education in their respective provinces. And this Conference further expresses the hope that the Government of India would provide adequate funds for giving effect to the recommendations of the Naini Tal Conference and carrying out similar schemes in other provinces.

(c) That this Conference, while appreciating the action taken by the Governments of some Indian States to encourage Technical Education, urges that further steps should be taken in the same direction in all Indian States.

(d) That this Conference welcomes the growth of public interest in Technical Education as shown by the action taken by certain local and municipal boards and private associations in promoting it, and it strongly urges on the leaders of the people the necessity of taking practical steps for providing increased facilities for it by starting institutions and founding scholarships to encourage technical studies in India and abroad.

(Proposed by R. C. Whitenack, Esq., of Baroda, seconded by D. G. Dalvi, Esq., of Bombay, supported by Ishwar Das Varshini, Esq., of Aligarh and Professor Ruchi Ram Sahni of Lahore, and carried unanimously.)

III. AGRICULTURAL EDUCATION.

RESOLVED—That this Conference records its sense of appreciation of the action taken and contemplated by the Government in regard to the establishment of Agricultural Colleges in the several provinces, and would urge that in view of the importance of a wider spread among the cultivating and landholding classes of a practical knowledge of the principles of scientific agriculture and modern methods, Government would be pleased to establish Experimental and Demonstration Farms as widely as possible, and to start vernacular schools in connection with them one at least in every district.

(Proposed by G. Subramania Iyer, Esq., of Madras, seconded by Rao Bahadur Khandubhai Gulabbhai Desai of Surat, and carried unanimously.)

IV. AGRICULTURAL BANKS.

RESOLVED—That this Conference begs to call the attention of Government to the urgent need of promoting the establishment of Agricultural Banks to help co-operative credit societies and to advance loans directly to agriculturists at reasonable rates of interest, and further begs to suggest that the advice and co-operation of representative members of the Indian community may be enlisted in devising a suitable scheme to secure this object.

(Proposed by Rao Bahadur Lalshankar Umiashankar of Ahmedabad, seconded by Thakorram Kapilram, Esq., of Surat, and carried unanimously.)

V. THE MINING INDUSTRY.

RESOLVED—(a) That this Conference expresses its sense of satisfaction at the successful formation of the Tata Iron and Steel Company Limited, with the help entirely of capital raised in India.

(b) That this Conference invites the attention of capitalists in India to the urgent need of developing and fully utilising the mineral resources of the country and trusts that in view of the ultimately lucrative character of the industry they will make organised efforts in that direction.

(c) That this Conference is of opinion that special consideration should be shown to Indian enterprise and initiation by the Government and preferential treatment given to it.

(Proposed by Rao Bahadur R. N. Mudholkar of Amraoti, seconded by the Honourable Mr. Gokuldas K. Parekh of Bombay, and carried unanimously.)

VI. COTTON SPINNING AND WEAVING.

RESOLVED—(a) That this Conference records its sense of satisfaction at the stimulus the Spinning and Weaving industries have received from the Swadesi movement and it urges the bestowal of increased

attention on cotton cultivation, the erection of Spinning and Weaving Mills at suitable centres, and the revival of the Hand-loom Weaving Industry on a commercial basis, as essential to the success of the movement.

(b) That this Conference urges the Government to remove the restrictions retarding the expansion of the industry and to provide facilities for affording practical instruction in weaving by the establishment of Weaving Schools at every important weaving centre.

(Proposed by L. K. Tulasiram Esq., of Madura, seconded by S. B. Sankaram, Esq., of Ellore, and carried unanimously.)

VII. THE SUGAR INDUSTRY.

RESOLVED—(a) That this Conference notices with concern the increase in the imports of foreign sugar, and is of opinion that to arrest the steady decline of the indigenous industry, it is absolutely necessary to encourage the cultivation of healthier and more prolific varieties of cane, to employ greater care in cultivation, to use more economical processes for extracting the juice, and, above all, to adopt the most modern and efficient methods of refining.

(b) That this Conference urges the Government to provide more extensive irrigational facilities, to allow the utilisation of bye-products and, further, to consider the desirability of imposing a duty upon imported sugar in order to protect the indigenous industry.

(Proposed by the Honourable Pandit Madan Mohan Malaviya, of Allahabad, seconded by Mannabhai Nandshankar, Esq. of Baroda, supported by Lala Dharamdas Suri of Lahore and Chuni Lal Vrijbhukandas, Esq. of Bombay, and carried unanimously.)

VIII. APPOINTMENT OF OFFICE-BEARERS AND PROVISION OF FUNDS FOR THE YEAR 1908.

RESOLVED—That this Conference re-appoints Rao Bahadur R. N. Mudholkar as General Secretary and Mr. C. Y. Chintamani as Assistant Secretary, and it appeals to the public for a sum of Rs. 10,000 for meeting the expenses for the next twelve months.

(Proposed by Sir Bhulchandra Krishna, Kt., of Bombay, seconded by the Honourable Pandit Madan Mohan Malaviya of Allahabad, and carried unanimously.)

AMBALAL SAKERLAL DESAI,

Surat,
The 30th December,
1907

President, The Third Indian Industrial Conference.
R. N. MUDHOLKAR,
General Secretary, Indian Industrial Conference.

RESOLUTIONS PASSED AT THE FOURTH INDIAN INDUSTRIAL CONFERENCE

Held at Madras on the 26th and the 27th December 1908.

I. DEPARTMENTS OF INDUSTRY.

RESOLVED—(a) That this Conference is of opinion that these should be in every province of British India a Department of Industry under a Director of Industries to deal with industrial questions and to be in charge of technical and commercial education as well as industrial instruction; and that there should be an Advisory Board of qualified persons, not less than one-half of whom should be non-official Indians, who should be consulted on all matters of importance;

(b) that the functions of this Department should include (1) the supply of advice in regard to new industries, (2) the introduction of new or improved methods and processes, (3) the carrying out of investigation and experiments, (4) the development of selected industries, and (5) the organization of industrial and commercial exhibitions;

(c) that there should be an industrial museum and a bureau of information under the Department of Industry for supply of information to the public on industrial and commercial matters.

(Proposed by D. E. WACHA, Esq. (BOMBAY), seconded by Rao BAHADUR G. SRINIVASA RAO (MADURA), supported by R. V. MAHAJANI Esq. (AKOLA), and carried unanimously.)

II. TECHNICAL AND INDUSTRIAL EDUCATION.

RESOLVED—That this Conference re-affirms the Resolutions of the previous Conferences on Technical and Industrial Education, and urges (1) that the Victoria Jubilee Technical Institute, Bombay, and the College of Science, Poona, be enlarged so that they may between them supply for the Presidency of Bombay technological instruction in all the branches of mechanical and chemical industries; (2) that the Government of India may sanction the proposal of the Government of Bengal to add classes in Industrial Chemistry to the Sibpur Engineering College; (3) that the Government of Madras will be pleased to give effect to the recommendation of the Ootacamund Industrial Conference that the Madras College of Engineering should be expanded into an Institute of Technology; (4) that the Secretary of State might accord early sanction to the proposal of the Government of the United Provinces that a College of Technology should be opened at Cawnpore; and (5) that similar institutions should be established in the Punjab, Burma and Eastern Bengal and Assam.

(Proposed by the HON'BLE PANDIT MADAN MOHAN MALAVIYA (ALLAHABAD), seconded by the HON'BLE MR. GOKULDAS K. PAREKH (BOMBAY), supported by T. RANGACHARIAR, Esq. (MADRAS) and LALLA DHARAM DAS SURI (LAHORE), and carried unanimously.)

III. COMMERCIAL EDUCATION.

RESOLVED—(a) That in the opinion of this Conference the time has come for the Indian Universities to create Faculties of Commerce and institute Degrees in Commerce, and to affiliate Commercial Colleges that will prepare candidates for University Degrees in Commerce ;

(b) That there should be established one College of Commerce at each Provincial capital and that it should include provision for the training of teachers for Commercial Schools in the mofussil.

[Proposed by K. Subramani Aiyer, Esq. (Bombay), seconded by D. G. Dalvi, Esq. (Bombay), and carried unanimously.]

IV. AGRICULTURAL BANKS.

RESOLVED—That this Conference again invites the attention of the Supreme and the Provincial Governments to the urgent need for Agricultural Banks both to assist Co-operative Credit Societies and, in cases where Co-operative Credit Societies cannot or will not serve, to advance loans directly to agriculturists on easy terms, and urges them to take early action in the desired direction in conjunction with Indian capitalists who, the Conference feels confident, would be ready to co-operate with Government in any such scheme.

[Proposed by Lalubhai Samaldas, Esq., (Bombay), seconded by Rao Bahadur Khandubhai G. Desai (Surat), supported by Rao Bahadur V. K. Ramanujachariar (Kumbakonam), and carried unanimously.]

V.—COTTON EXCISE DUTY.

RESOLVED—That this Conference records its emphatic protest against the continuance of the Excise duty on Indian mill-made cloth as an unjust and unnecessary impost and urges that it should be removed without delay.

[Proposed by Uttamlal K. Trivedi, Esq. (Bombay), seconded by Pandit Rambhuj Dutt Chowdhuri (Lahore), and carried unanimously.]

VI. RAILWAY RATES ON GOODS.

RESOLVED—That this Conference calls the attention of the Government to the prevailing complaints about existing railway rates, and suggests that an enquiry should be instituted into their effect on indigenous industries especially in their competition with imported goods, and further submits that the rates should be reduced where their effect may be proved to be injurious.

[Proposed by Dewan Bahadur Ambalal S. Desai (Ahmedabad), seconded by Rao Bahadur Doorao Vinayak (Akola), and carried unanimously.]

VII. MINING, WEAVING AND SUGAR INDUSTRIES.

RESOLVED—That while expressing its satisfaction at the steady progress of the Swadeshi movement, this Conference, concurring with

the last Conference, calls the particular attention of capitalists and the general public to the necessity of developing the Mining, Weaving and Sugar Industries, and urges the formation of Joint-Stock Companies for working mines and erecting mills and factories.

[Proposed by the Hon'ble Sir Vitthaladas D. Thackersey, *Kl.* (Bombay), seconded by G. Subramania Iyer, Esq. (Madras), supported by the Hon'ble Mr. H. S. Dikshit, (Bombay), and carried unanimously.]

VIII. OFFICE-BEARERS AND FUNDS FOR NEXT YEAR.

RESOLVED—That this Conference re-appoints Rao Bahadur R. N. Mudholkar as General Secretary and Mr. C. Y. Chintamani as Assistant Secretary for the year 1909, and appeals to the public for a sum of Rs. 5,000 to meet the expenses for the next twelve months.

[Proposed by N. Subbarao Pantulu, Esq. (Rajahmundry), seconded by Babu Gunga Prasad Varma (Lucknow), and carried unanimously.]

MADRAS,	}	R. N. MUDHOLKAR,
The 27th December, 1908.	}	<i>President,</i>
		<i>The Fourth Indian Industrial Conference,</i>

RESOLUTIONS PASSED AT THE FIFTH INDIAN INDUSTRIAL CONFERENCE HELD AT LAHORE, ON THE 30TH DECEMBER, 1909.

I. DEATH OF MR. R. C. DUTT.

RESOLVED—That this Conference places on record its profound sorrow for the sad death of its first President, the late Mr. Romesh Chandra Dutt, C. I. E. The Industrial movement has lost in him one of its ablest and most zealous champions, and the country, one of her most accomplished, earnest and patriotic sons. That this Conference authorizes the General Secretary to convey the above Resolution to the widow and son of Mr. Dutt.

II. PURCHASE OF STORES BY GOVERNMENT DEPARTMENTS.

RESOLVED—That this Conference thanks the Secretary of State and the Government of India, for the orders, which have been recently issued in regard to the purchase by Government Departments of articles, made in India, in preference to those of foreign manufacture. The Conference while recognising the fact that these orders mark a distinct advance in the policy of Government towards the encouragement of indigenous industries and manufactures is of opinion that the report of the Committee be published for general information and guidance in the future.

III. TECHNICAL AND INDUSTRIAL EDUCATION.

RESOLVED—That this Conference regrets that the proposal of the United Provinces Government for the establishment of a Technological

College at Cawnpore, which was supported by the Government of India, has not been sanctioned by the Secretary of State. In view of this fact this Conference re-affirms the Resolutions of the previous Conference on Technical and Industrial Education and again urges :—

(1) that the Victoria Jubilee Technical Institute of Bombay, and the College of Science at Poona, be enlarged so that they may between them supply for the Presidency of Bombay technological instruction in all the branches of mechanical and chemical industries ;

(2) that the Government of India may sanction the proposal of the Government of Bengal to add classes in Industrial Chemistry to the Sibsport Engineering College ;

(3) that the Government of Madras will be pleased to give effect to the recommendation of the Ootacamund Industrial Conference that the Madras College of Engineering should be expanded into an Institute of Technology ;

(4) that the Secretary of State might accord early sanction to the proposal of the Government of the United Provinces that a College of Technology should be opened at Cawnpore ; and

(5) that similar Institutions should be established in the Punjab, Burma, Eastern Bengal and Assam.

IV. COMMERCIAL EDUCATION.

RESOLVED—(a) That in the opinion of this Conference the time has come for the Indian Universities to create Faculties of Commerce and institute degrees in commerce and to affiliate Commercial Colleges that will prepare candidates for University degrees in commerce ;

(b) That there should be established one College of Commerce in each provincial capital and that it should include provision for the training of teachers for Commercial Schools in the mofussil.

V. AGRICULTURAL BANKS.

RESOLVED—That the Conference again invites the attention of the Supreme and Provincial Governments to the urgent need of establishing Agricultural Banks for assisting the existing Co-operative Credit Societies and for advancing loans direct to agriculturists on easy terms wherever such societies do not exist, with the view of ameliorating the economic condition of the Indian peasantry.

VI. COTTON EXCISE DUTY.

RESOLVED—That the Conference records again its emphatic protest against the continuance of the excise duty on Indian mill-made cloth as an unjust and unnecessary impost which presses heavily on the industry, and prays that it should be abolished at the earliest opportunity.

VII. WEIGHTS AND MEASURES.

RESOLVED—That this Conference invites the attention of the Government of India to the desirability of introducing uniform weights and measures to facilitate trade among the different towns and provinces of India, to prevent fraudulent practices of traders and remove the present inconveniences arising from a multiplicity of weights and measures and from a want of uniform system and standard.

VIII. OFFICE-BEARERS AND FUNDS FOR NEXT YEAR.

RESOLVED—That this Conference re-appoints Rao Bahadur R. N. Mudholkar as General Secretary and authorizes him to appoint an Assistant Secretary with suitable establishment and appeals to the public for a sum of Rs. 5,000 to meet the expenses of the next twelve months.

RAMESHWAR SINGH,
President,

The Fifth Indian Industrial Conference.

Dated
30th December 1909. }

R. N. MUDHOLKAR,
GENERAL SECRETARY,
The Indian Industrial Conference.

APPENDIX II.

LIST OF DELEGATES TO THE SIXTH INDIAN INDUSTRIAL CONFERENCE

HELD AT ALLAHABAD ON 30th DECEMBER 1910.

(1) Elected by the Indian Merchant's Chamber & Bureau, Bombay :—

1. Mr. D. E. Wacha, Bombay.
2. „ J. K. Mehta, Secretary, Bombay.

(2) By Refah-i-Am Association, Lucknow :—

1. The Hon'ble Babu Ganga Prasad Varma.
2. Mr. A. P. Sen, Bar-at-Law.
3. Babu Ram Chandra, M. A., Vakil.
4. Pandit Ikbal Narayan Malsadam, Bar-at-Law.
5. Pandit Gokuran Nath Misra, M. A., L. L. B.
6. Mr. P. C. Bhattacharjee, Bar-at-Law.
7. „ H. C. Dutt, Bar-at-Law.
8. Pandit Jagat Narain, B. A.
9. Mr. Mirza S. Beg, B. A., L. L. B.
10. „ Syed Zahur Ahmad, B. A., L. L. B.
11. Babu Bisheshwar Nath Srivastavi, B. A., L. L. B.
12. Mr. Nawab Sadik Ali Khan, Bar-at-Law.
13. Munshi Mahomed Ehtisham Ali.

(3) By the National Fund and Industrial Association, Madras:—

1. Pundit D. Gopala Charlu, A. V. S.
2. Dr. U. Rama Raw.
3. Mr. P. R. Sundara Aiyar, B. A., B. L.
4. Rao Bahadur M. Adinarayaniah.
5. Mr. C. Gopala Menon.
6. " T. Ramachandra Raw, B. A., B. L.
7. " D. V. Hunumantha Rau Pantulu.
8. " A. C. Parthasaradhi Naidu.
9. Professor P. Lakshminarasu Naidu, B. A.
10. The Hon'ble Dewan Bahadur L. A. Govindaraghava Aiyar, B. A., B. L.
11. The Hon'ble N. Subba Raw Pantulu, B. A., B. L.
12. The Hon'ble Nawab Syed Mahomed Sahib Bahadur.
13. The Hon'ble T. V. Seshagiri Aiyar, B. A., B. L.
14. Mr. T. Ranga Chariar, B. A., B. L.
15. " G. A. Natesa Aiyar, B. A.
16. " V. Ryr Nambiar, B. A., B. L.
17. " G. A. Vaidyarama Aiyar, B. A.
18. " S. Kasturi Ranga Aiyengar, B. A., B. L.
19. Dr. M. Kristnasawmi Aiyer, M.D.
20. Mr. C. Vijayaraghavachariar.
21. " P. Ayyanna Chetty.
22. " Adinarayana Chetty.

(4) By the District Congress Committee, Seharanpur:—

1. Mr. Synyal Munserim Judges Court.
2. " B. Raj Rajeshwar Sahai, Pleader.
3. " B. Alakh Murari, B. A., L. L. B., Pleader.

(5) By the Millowner's Association, Bombay:—

1. The Hon'ble Sir Vithaldas D. Thackersey, Kt.
2. Mr. D. E. Wacha.
3. " Jehangir Bomonji Petit.

(6) By the Nellore District Congress Committee:—

1. Mr. T. V. Venkatarama Aiyer.
2. " M. Narsimhachariar.
3. " M. Changayya.
4. " V. Krishnaswami Row.
5. " V. Narasinga Row.
6. " B. Annaswami Aiyer.
7. " K. Narasinga Row.
8. " A. Hanumantha Row.
9. " N. Ramachandra Row.
10. " A. S. Krishna Row.
11. " K. A. Veeraraghavachariar.
12. " Batchu Venkata S. Chetty.

13. Mr. K. Adinarayana Reddy.

14. " P. Raghava Reddy.

(7) By Davar's College of Commerce, Bombay:—

1. Mr. S. R. Davar, Principal, Davar's College of Commerce, Bombay.

(8) By the Bengal Technical Institute, Calcutta:—

1. Dr. Nilratan Sircar.
2. Mr. Prankrishna Acharyya
3. " Indumadhab Mallik.
4. " P. N. Bose.
5. " Babu Satyananda Bose.

(9) By the Provincial Committee of the Industrial Conference, Berar:—

1. The Hon'ble Rao Bahadur R. N. Mudholkar.
2. Rao Bahadur R. G. Mundle.
3. Rao Bahadur Deo Rao Vinayak Digambar.
4. Mr. V. M. Mahajani, M. A.
5. " R. V. Mahajani, B. A., B. L., L. B., Pleader.
6. " M. V. Joshi, B. A., L. L. B., Advocate.
7. " B. R. Landge.
8. " R. B. Pethe.

(10) By the S. S. Jain Conference Office, Ajmer:—

1. Mr. Kunwar Magan Mulji, Ajmer.
2. " Bhaidas Becharadas Doshi, Rajkot.
3. " Becharadas Virchand, Ajmer.

(11) By the People's Association, Bellary:—

1. Mr. J. P. Kotilingam, M. A., Principal of the Wardlaw Institution, Bellary.

(12) By the South Indian Association, Madras:—

1. The Honourable Mr. Justice V. Krishnaswamy Aiyar.
2. Mr. C. P. Ramaswami Aiyar, H. C. Vakil.
3. " S. Srinivasa Aiyangar, H. C. Vakil.
4. " T. V. Gopalaśwami Mudaliar, H. C. Vakil.
5. " P. R. Narayanaswamy Aiyar, H. C. Vakil.
6. " T. R. Venkatarama Shastriar, H. C. Vakil.
7. " V. Ramesam Pantulu "
8. " N. Chandrasekhara Aiyar "
9. " P. Lakshminarasu Nayadu, Professor, Pachayappa's College.

(13) By the Shri Krishna Raja Krishi Shilpabhi Wardhak Samaja's Mysore:—

1. Mr. G. Subbaswamy Iyer, B. A., L. T. Superintendent of the Industrial School, Mysore.

(14) By the Punjab Chamber of Commerce, Delhi:—

1. Lala Panna Lal, Proprietor, Upper India Glass Works, Umballa.

2. Lala Harkishen Lal, Bar-at-Law, Lahore.
3. Rai Bahadur Ramsaran Das, Melaram Cotton Mills, Lahore
4. Lala Manohar Lal, Sub-agent, Allahabad Bank, Ltd., Amritsar.
5. Lala Harji Mal, Peshawar.

(15) By the Behar Landholder's Association, Bankipore :—

1. Babu Chandrashekhar Prasad Singh.
2. Babu Krishna Sahay.
3. Khan Bahadur Sarfaraz Hussain Khan.
4. Mr. Syed Hasan Imam.
5. Hon. Maulvi Syed Fakhruddin.
6. Hon. Maharaja Gopal Saran Narain Singh.
7. Babu Harihar Prasad Singh.
8. Hon. Mr. S. Sinha.
9. Hon. Mr. Mazharul Haque.
10. Babu Maheshwar Prasad.
11. Mr. Kumar Kalikanda Sinha.
12. Hon. Mr. Deep Narain Singh.
13. Hon. Rai Bahadur Siva Sankara Sahay.

(16) By Mining and Geological Institute of India, Calcutta :—

1. Mr. A. Mackay, Jamdoba, Jharia, E. C. R.
2. „ F. Scott, Bengal Coal Co.
3. „ H. Sheridan Sodepur, Sitarampur, E. I. R.
4. „ W. J. Rees, Bengal Coal Co., Barakar.

(17) By the Agra Trades' Association, Agra :—

1. Rai Bahadur Lala Baijnath, retired District and Sessions Judge.
2. Lala Prag Narain, B.A., LL.B., Vakil, High Court.
3. Lala Shyam Lal, Lohar Gate, Agra.
4. Lala Bankey Lal of Messrs. Jagannath Bhagwandas, Agra.
5. Lala Kokamal.
6. Lala Bhugwandas.
7. Pandit Goswami Brij Nath Sharma.
8. Lala Baij Nath.
9. Lala Safigram.
10. Lala Kashinath.

The following gentlemen also attended as Delegates :—

1. Pandit Ajodhiya Prasad, Pleader, Sitapur.
2. Mr. A. K. Bose. „
3. Pandit Kalka Prasad. „
4. Pandit Murlidhar. „
5. Pandit Chotey Lal. „
6. Pandit Ganga Prasad. „
7. Pandit Gangadhar. „
8. Pandit Sidh Prasad. „

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|--|---------|
| 9. Pandit C. Beharilal. | Sitapur |
| 10. Pandit Ram Adhin. | „ |
| 11. Pandit Ram Adhin Agnihotri. | „ |
| 12. Pandit Rudra Narayan. | „ |
| 13. Babu Madho Prasad | „ |
| 14. Mr. L. Ramji Das. | „ |
| 15. Mr. G. L. Joshi, Nagpur. | |
| 16. Mr. Radha Kumbud Mookerjee, Calcutta. | |
| 17. Professor Bhim Chandra Chatterjee, Calcutta. | |
| 18. Professor B. K. Sarkar, Calcutta. | |
| 19. Mr. Kali Prasanna Chakravarti, Benares. | |
| 20. Mr. S. N. Das-Gupta, Calcutta. | |
| 21. Pandit Vishnu Ditta Dwivedi, Allahabad. | |
| 22. Pandit Vijayanand Triwari, Benares. | |
| 23. Pandit Dew Dayal Bajpai, Benares. | |
| 24. Mr. Gawri Shankar Tiwari | „ |
| 25. „ J. N. Mehta, Bombay. | |
| 26. „ L. Banki Lal, Agra. | |
| 27. „ L. Sham Lal | „ |
| 28. „ L. Kokal Mal | „ |
| 29. „ B. Prag Narain, B. A., LL. B., Agra. | |
| 30. Rai Bahadur Baij Nath. | „ |
| 31. Mr. Gooswami Baij Nath. | „ |
| 32. Mr. L. Kashinath. | „ |
| 33. „ Bhagwandas | „ |
| 34. „ Panna Lal, Amballa | |
| 35. „ Hafiz Abdul Rahim Khan, Aligarh | |
| 36. „ C. Vijiaraghawa Chariyar, Salem. | |

REPORT

ON THE WORK OF THE

Indian Industrial Conference

INCLUDING A

RECORD OF GENERAL INDUSTRIAL ACTIVITY
IN THE TWELVE MONTHS

December 1909 to November 1910

MADRAS : G. C. LOGANADHAM BROS.
THE GUARDIAN PRESS, MOUNT ROAD

1911

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REPORT
OF
INDUSTRIAL CONFERENCE WORK
AND RECORD OF

General industrial activity in the country in the
twelve months ending with November 1910.

PART I.

INDUSTRIAL CONFERENCE WORK.

December 1909.

THE report submitted to the Fifth Indian Industrial Conference held at Lahore in December 1909, dealt with the period of twelve months from December 1908 to November 1909. The Conference Office was occupied during the months of November and December 1909, in compiling the Annual Report, going through the proofs of the 4th Edition of the Directory of Indian Goods and Industries and in making arrangements in connection with the last Session of the Conference. The Assistant Secretary, Mr. M. B. Sant, was sent to Lahore a few days before the meeting of the Conference to help the Local Reception Committee of the Industrial Conference in arranging matters relating to the holding of the Lahore Session.

The Conference was held under the Presidentship of Maharaja Sir Rameshwar Singh Bahadur of Darbhanga. The Resolutions passed and the papers read will be found in the Report. I was unable to attend the Conference owing to a domestic misfortune. It is a matter of great regret that owing to want of time, the resolutions were moved from the chair without any elucidation or explanation of their object and scope. It is to be hoped that such an

abandonment of one of the most important aims of the Conference will not be allowed hereafter.

The most valuable contribution to the cause of industrialism which the last Session rendered was through the highly informing and interesting papers, sent by persons, who are worthy of being called authorities on their respective subjects. These, supply knowledge and food for reflection, not only to those who are new to these subjects, but even to men of experience and practice. The grateful thanks of the Conference are due to the able and gifted writers.

January to November 1910.

By Resolution No. VIII of this Conference, I was re-appointed as General Secretary and was given power to appoint an Assistant Secretary with suitable establishment and an appeal was made to the general public for the sum of Rs. 5,000 to meet the expenses of the current year. Out of this sum, Rs. 2,840 only have been realised till now. This amount would not have sufficed to meet the office expenses, had the salaries been on the same scale as before. It was only through the present Assistant Secretary's pay being only half of that of his predecessor and to the post of 2nd Assistant being vacant for some time and to his salary being reduced that it was possible to meet the expenses out of the realizations.

This is a rather disquieting sign and raises fears about a waning of interest in our organization.

It need hardly be stated that when the funds were barely sufficient for the ordinary expenses of the Conference office, it was out of question to think of giving effect to the resolution (now standing on paper as a mere pious recommendation of the Conference of 1906) about the issue of a Quarterly Bulletin of industrial information which would have involved a yearly expenditure of Rs. 5,000 at least and a further considerable sum for initial outlay. There were appeals made over and over again to the great leaders of the aristocracy of the country and to the men of light and leading. It has to be regretfully stated that even from quarters where, from declarations made on paper and at public meetings, one expected enthusiastic support, there was a chilling response.

The only inferences which can be drawn from this indifference and apathy are that either the idea is too far in advance of the real needs and requirements of the country or that despite all fervent protestations, our public spirit is yet too weak in strength and too confined and restricted in its reach to supply the necessary impetus for vigorous action. I cannot bring myself to believe that a quarterly bulletin giving correct and up-to-date information is beyond the needs of the present hour. For a more widespread and stronger realisation of the principle of "*Noblesse oblige*," one can only trust to time.

The prime essentials for securing industrial regeneration are ; 1st, sound scientific knowledge and practical skill and 2nd, sufficiency of responsive capital. The Conference has from the year of its foundation been striving to obtain the establishment of a Polytechnic College for giving instruction in such departments, as Railway and Marine Engineering, navigation and naval construction, the various branches of industrial chemistry and mining, metallurgy and metal manufacture and instruction in the higher departments of mechanical and electrical engineering and textile manufacture. During the last four years, some high personages were approached more than once and sounded as to their willingness to give the weight of their lead and support for placing a scheme before the princes and peoples of India. It was intimated that if the proposal was influentially backed up, I was prepared to go to different parts of the country at my own expense. The answers were not encouraging and the idea remained where it was. In March last, two Resolutions were moved in the Supreme Legislative Council, the first asking for a Polytechnic Institute, for the country and the second supporting the demand of the United Provinces Government and peoples for a College of Technology at Cawnpore. At one time, there seemed reasons for hoping that the main basis of the resolutions would be accepted by Government. But this was not to be. And though the position taken up on behalf of the Government was not unsympathetic, the delay it advocated is such as cannot be accepted as necessary or desirable by the advocates of higher technical education.

After the lamentable and tragic death of His late Majesty King-Emperor Edward VII, there was, in connection with the universal desire to perpetuate his memory, an attempt made that the All-India Memorial and the Provincial Memorials should take the form, the first of a Polytechnic Institute and the second of institutions promoting and developing the particular industrial and technical knowledge and skill which would suit the conditions of each Province. The suggestion that the All-India Memorial should take the form of a Polytechnic Institute was after consideration, deemed not feasible by the authority to which it was submitted. Among the provincial memorials the idea would be given effect to almost in its entirety in Berar and partially so in the Central Provinces.

It is necessary for the Conference to concentrate its energy first on this question more than on others. It must be remembered that in technical education as in most spheres of action the beginning has to be made at the top. It is from mountain tops that the light descends down into the valleys and it is the full recognition of this principle by the rulers of British India and the Indian States in regard to scientific knowledge and industrial instruction that the Conference must address itself to.

Another matter which must be made clear is that the Conference does not pin its faith on any particular scheme and method of securing this object and does not insist on the location in one building or in one city of the facilities for instruction in the different departments, which are demanded by it. What has to be aimed at is the supply in this country of means of acquisition of the technical knowledge, mentioned above. In regard to some, there is absolutely no provision. In regard to others the instruction does not go sufficiently high. Whether the means of giving such instruction in all the different departments are concentrated in one place or distributed between the three or four leading industrial and manufacturing centres of India is a matter of detail. It is necessary that the consideration of the principle should not be clouded by objections on points of detail.

The bogey of expenditure need not frighten us. In Bombay, for instance, with the Railway Workshops of the G. I. P. Railway and the B. B. and C. I. Railway at Parel, it needs only some few thousands a month to provide a complete course in railway engineering and construction. And the same can be done with regard to marine engineering, ship construction and navigation, by making arrangements with the Government dockyard authorities. The facilities which exist in Bombay exist also in Calcutta and partially in other Presidency towns. The trunk Railways belong now to the State and the Companies which manage them, can legitimately be required to give facilities to educational institutions maintained or supported by the Government.

There are other departments of industrial activity, where instruction in principles and initiation in practice, of the youth of this country can be accomplished without any sensible burden on the resources of the State. It only requires correlation and co-ordination of work, a little adjustment of departmental practice, a slight relaxation of red tape, all moved and inspired by sympathy and the desire for helpfulness.

It was with this object that the Secretary of the Conference took advantage of the opportunity afforded by a seat in the enlarged and improved Supreme Legislative Council to invite the attention of the Government to the great deficiencies under which India labours and to obtain their removal or at least partial remedy. Though the first attempt was not successful, there is no reason to feel discomfited or discouraged. Even those members of Government who felt it their duty to oppose the motion, are aware of the justness of the demand. With the creation of the educational portfolio and the appointment to the Viceregal Council of an enthusiastic friend of industrial and scientific education like the Honorable Mr. Butler, there is every reason to expect the accomplishment before very long of the improvements in education this Conference has been asking these five years.

The reluctance and shyness of capital to flow to industries is due to natural causes and it is very necessary that the members of an organisation like the Industrial Conference

should have a clear conception of facts and should rid their mind of cant as well as of fallacies. It serves no useful purpose to hold forth in an official report a monograph or an essay on the iniquities of the Chetty, the Sahucar or the Mahajan. If these men can make a safe profit of 9 per cent. and 12 per cent. per annum from advances made on good, irreproachable securities involving no chances of loss, it is absurd to call them names because they look askance on enterprises, which even when successful do not yield more than 12 per cent. and which in numberless instances have proved abortive or have resulted in collapses productive of financial ruin and disaster to all concerned.

Leaving aside cases of bogus schemes launched by dishonest and fraudulent speculators there are numerous instances of failures due to ignorance, incapacity, miscalculation or carelessness on the part of the suppliers of capital or imperfect knowledge, inexperience, rashness, carelessness and incapacity on the part of the managers, foremen and supervisors of the technical and general departments. These deficiencies are capable of removal by giving suitable knowledge, special and general. The question of capital is thus to some extent dependent upon the spread of higher technical knowledge and commercial education.

But while one cannot find seriously fault with the professional money-lender, with his restricted mental horizon, for the preference shown by him to safer investments yielding surer and larger returns than risky industrial enterprises, one cannot do the same in regard to those who claim to be leaders, natural or real. Men of education, culture and position as they are, it is not possible to find justification for the cold shoulder they show to even legitimate and well-thought-out enterprises. The country expects men, who have been glibly talking of industrial regeneration, to translate into action at least a part of their precepts.

In connection with this subject, it might be mentioned that in February and March last, I made efforts to rouse the interest of some of the Indian leaders of Calcutta in the industries, which have been for years and are to-day carried on lucratively by European and Foreign merchants in and

near the city and in regard to which I had collected some figures by personal inquiries. At my solicitation a meeting of the provincial committee was called at the rooms of the Indian Association; it is painful to say that the attendance was poor and excepting two or three gentlemen the other well-known leaders were conspicuous by their absence. The efforts of the last Session will be renewed in the coming one.

I had to take the assistance of the Assistant Secretary Mr. Sant in no small measure in what was done at Calcutta.

I paid a visit in March last to the Sibpur Engineering College at the request of the Principal Mr. Heaton, and was shown by him over the whole college. The institution has been greatly enlarged and improved under Mr. Heaton and it is to be greatly desired that his suggestions about further additions and improvements are accepted by his superiors. It is proposed to remove the College to Ranchi. The contemplated step appears retrograde.

In the year under report, there has been very great increase in the demand on my time and energy for public work, imperial, financial and local, and I have found it impossible, even though I have withdrawn to no small extent from professional work to get as much time as I used to do, a year or two ago, for the work of the office of the Industrial Conference. The entire burden of ordinary office work has fallen on the Assistant Secretary, Mr. Sant. In connection with my other duties, however, I got opportunities to do some thing towards the furtherance of the industrial movement.

Immediately after the close of the last Calcutta Session of the Imperial Legislative Council, I had to attend a Conference directed to meet at Nagpur by the Local Administration to settle a scheme for the projected Engineering College at Nagpur. Later on in July, I had to attend another Conference summoned by the said Government to consider and deal with the report of Mr. C. E. Low, on the industrial survey of the Central Provinces and Berar. The deliberations of both these Conferences and the suggestions made by them, will promote materially the cause of technical education and industrial development in the combined territory.

A great portion of the second half of the year has been

taken up in the direction in my personal capacity, of the affairs of an industrial concern which, when fully developed as it soon will be, will possess interest to Indian industrialists generally. I fully confess that owing to the various demands abovementioned, I could not find time for giving lectures or writing papers. Whether the kind of industrial work I was doing was not at least as useful as lecturing or writing, I must leave it to the members of the Conference to say.

As usual letters making inquiries and asking for advice were received from various quarters and to them replies were sent to the best of my limited knowledge and experience.

In 12 months more, another opportunity will present itself for enlisting the enthusiasm, co-operation and help of the Princes and peoples of India towards the raising of one or more technological institutions of the kind mentioned above. The unprecedented and unique event of the visit to this country of Their Majesties the King-Emperor and Queen-Empress for the coronation must, it will be conceded on all hands, be commemorated, and the commemoration ought to be worthy of the grand and auspicious event and such as would remind all generations to come of the beneficent side of the British rule and typify the virtues of the august Sovereign and his sympathy for the people of India. All friends of England and India should heartily support a project which will associate the name of one of the kindest of British kings with the well-being and prosperity of the people.

The Assistant Secretary, Mr. M. B. Sant, could not much be spared for touring work during the year under review, owing to heavy pressure of office duties. He, however, sought the opportunity of visiting a few institutions and attending the Deccan Agricultural Conference, Poona and other meetings in the mofussil. An account of his tours is appended to this Report.

The resolutions passed at the Fifth Industrial Conference were, in consonance with past years' practice submitted to the Government of India, the Provincial Governments as well as to the rulers of the principal Indian States for information and necessary action.

It was deemed inadvisable to issue this year a fifth edition of the Directory of Indian Goods and Industries, until a few hundred copies of the Fourth Edition, which are on hand are sold out. The demand for this publication from the various departments of the Governments of different provinces and the Indian States, still continues; but it was not so brisk as last year which is probably due to the majority of offices having already been provided with the older editions of the book. Within about two or three months, it is expected that the copies now on hand will be disposed of and the fifth revised edition, which is under preparation, will then be issued.

A new compilation as useful as the Directories of Indian Goods and Technical Institutions is now on hand. It is designed to give information about the manufacturers and sellers of the machines, plants and appliances which are in general demand in India. A considerable portion is now ready and in type, but it appearing advisable to make greater additions and some alterations, the whole matter is being re-adjusted and re-set. Beyond laying down the general plan, and directing and supervising the work, my share is small. The main labour is contributed by Mr. Sant and his assistant.

There is a steady and encouraging demand for the Directory of Technical Institutions in India from the educational departments of the British Government and Indian States and the general public and a revised and enlarged edition of this book will be published as soon as the first edition is sold out.

During the year under review, Industrial Conferences, Industrial and Agricultural Exhibitions, Cattle Shows, &c., were held in many places in all parts of India, too numerous to be mentioned here. They will be found described in Part II under the respective provinces in which they were held. The grand events of the year have been the Lahore Exhibition opened in December 1909, and the United Provinces Exhibition opened on the 1st of this month.

The Conference notes with great pleasure that the proposals made by it in regard to general industrial surveys or investigations into any special branches of it, are receiving

an increased share of attention of the authorities in British India and the Indian States and since the meeting of the last Conference, exhaustive reports embodying the results of the surveys of some of the important industries have been compiled by capable officers specially deputed by their respective Governments. These compilations will be found noticed in Part II, Section A, appended to this Report.

For the purpose of giving practical effect to Resolution No. VI passed at the Benares Conference, copies of the printed set of questions to be answered were sent to the Governments of the several Indian States, who had not hitherto supplied any information in connection with industrial activity in their own territories. It is gratifying to note that in response to the requisition of the Conference office, the Indian States of Hyderabad, Bhopal and Gondal have kindly supplied information concerning their respective States and their replies are printed as appendices to this Report. The Conference office feels highly indebted to State authorities for the courtesy shown by them in readily responding to its request.

Part II, Sections A & B, are devoted to a detailed record of the general industrial activity in the country including an account of the steps taken by the Imperial and Provincial Governments in British India and the Indian States. This information has been compiled from official and non-official sources.

The lists of Indian Patentees and of new Companies registered during the twelve months ending with November 1910, are also printed as annexures.

I beg to repeat my sincere acknowledgments to the Supreme and Provincial Governments for the reports and other publications supplied by them to the Conference office. I also tender my thanks to the managers of those papers and periodicals who have been kindly giving their papers and periodicals gratis to this office, as also to those authors of new publications on Indian economic and industrial problems, who have shown similar kindness.

There is one important matter, which though it may not come strictly within the purview of an annual report of

the Conference, deserves to be mentioned here for want of a more appropriate authorised channel of communication. The Conference has till now been working without any constitution or settled rules. In 1906, a draft constitution was drawn up and circulated to some of the leaders of the Conference movement. An informal meeting of a few selected leaders was even called. But two such eminent men as the late Mr. R. C. Dutt and Mr. D. E. Watcha deprecated the formulation of a cut and dry constitution and on that occasion and again later on expressed their distrust of paper constitutions. Though I am myself as small a believer as either of them in paper constitutions, I think it my duty to bring forward the subject again, because I find that absence of rules affords an opportunity to a certain class of critics even in regard to acts, which have been done in strict accordance with the usage of the past five years. It is greatly to be desired that the adherents of the Industrial movement will always keep in view the fact that what is wanted for the cause we have all at heart is to bring about that activity which will revive our once flourishing industries, establish new ones, give more bread even to the poorest and competence to as large a number as possible. The real effective-
weapons are more capital, more knowledge. Formularies and Rules should be resorted to only if it is convincingly shown that they will promote the great cause. It is for the Conference to see whether any action is called for and if so to what extent.

I have in the foregoing paras made mention of the work, Mr. Sant has been doing. He is a willing and cheerful co-adjutor who does not grumble if the load on his back is increased and he is required to work extra hours. I feel that the remuneration which has been given to him is not adequate and greater justice ought to be done to him.

Statements showing the receipts and disbursements of the office of the General Secretary are appended.

R. N. MUDHOLKAR,
GENERAL SECRETARY,

AMRAOTI,
1st December, 1910.

Indian Industrial Conference.

Summary of Accounts of the Office of the Indian Industrial Con-

Receipts.	Amount.
	Rs. A. P.
From sale-proceeds of Directory of Indian Goods and Industries	764 9 0
Do Technical Institutions in India ...	439 6 0
From sale-proceeds of Surat Industrial Conference Reports	88 5 6
Do do Calcutta do do ...	61 14 6
Do do Madras do do ...	1,140 3 6
Do do Benares do do ...	35 15 0
Advertisements for the Lahore Industrial Conference Report	75 0 0
Do 5th Edition of Directory of Indian Goods and Industry	15 0 0
Received from the Reception Committee, Lahore Industrial Conference	500 0 0
Donations :—	
Maharaja Sir Rameshwar Singh Bahadur, Darbhanga ...	500 0 0
Lala Harkishen Lall, Bar-at-Law, Lahore	150 0 0
The Honourable Mr. Justice V. Krishnaswamy Iyerr Madras	150 0 0
The Honourable Mr. Gokuldas K. Parekh, Bombay ...	150 0 0
The Honourable Rao Bahadur R. N. Mudholkar, Advocate, Amraoti	100 0 0
Raja Prithvi Pal Singh, Surajpur	100 0 0

ference for the 12 months from December 1909 to November 1910

Receipts.	Amount.
	Rs. A. P.
R. N. Mookerjee, Esq., C. I. E., Calcutta	100 0 0
The Honourable Sir Vithaldas D. Thakersey, Bombay ...	100 0 0
Dr. Rash Behari Ghosh, Calcutta	100 0 0
Dr. Harold H. Mann, Poona	100 0 0
Sir Dorab J. Tata, Bombay	100 0 0
Dewan Rai Sahib Amarnath, Chief Minister, Jammu and Kashmir State	100 0 0
The Honourable Raja Pratab Bahadur Singh, Partabgarh	100 0 0
M. V. Joshi, Esq., Advocate, Amraoti	100 0 0
Messrs. Dharamsey Morarji, Bombay	100 0 0
Rai Bahadur Melaram Saran, Lahore	100 0 0
The Honourable Pandit M. M. Malaviya for 1909	50 0 0
The Honourable Mr. P. S. Sivaswami Iyer, Madras	50 0 0
Do. Mr. S. Sinha, Bar-at-Law	50 0 0
The Honourable Pandit Madan Mohan Malaviya, Allahabad for 1910	50 0 0
C. P. Ramaswami Aiyar, Esq.	50 0 0
S. N. Pandit, Esq., Bar-at-Law, Rajkote	50 0 0
Dr. Satish Chandra Benerji, Allahabad	50 0 0
Sir. B. K. Bose, Kt., Advocate, Nagpur	50 0 0
Dewan Bahadur L. A. Govinda Raghava Iyer, Madras ...	35 0 0
H. S. Dikshit, Esq., B.A., Solicitor, Bombay	25 0 0
Hansraj Pragji Thackersey, Esq., Bombay	25 0 0
Rao Bahadur Khandubhai G. Desai, Surat	25 0 0

Summary of Accounts of the Office of the Indian Industrial Con-

Receipts.	Amount.
	Rs. A. P.
Gulabchand Deochand Javeri, Esq., Bombay ...	25 0 0
D. E. Wacha, Esq., Bombay ...	25 0 0
K. Narayan Shastriar, Esq., Coimbatore ...	20 0 0
C. Vijiaraghavachari, Esq., Salem ...	20 0 0
G. A. Natesan, Esq., Madras ...	15 0 0
Rao Bahadur Deorao Vinayak, Akola ...	15 0 0
The Honourable Babu Ganga Prasad Varma, Lucknow ...	15 0 0
M. B. Sant, Esq., Assistant Secretary, I. I. Conference, Amraoti ...	15 0 0
R. A. Despande, Esq., Amraoti ...	10 0 0
Babu Maheswari Prasad, Allahabad ...	10 0 0
A friend from Madras ...	10 0 0
Rai Bahadur M. Audinarayana Iyah, Madras ...	10 0 0
Rao Bahadur V. N. Pathak, Satara ...	10 0 0
Rao Bahadur R. G. Mundle, Yeotmal ...	10 0 0
Professor Jogindra Nath Samuddar, Hazaribagh ...	5 0 0
Dewan Bahadur Krishnaswamy Rao, Madras ...	5 0 0
R. P. Karandikar, Esq., Satara ...	5 0 0
G. R. Kshirsagar, Esq., Industrial Conference Office, Amraoti ...	5 0 0
Receipts from the Lahore Reception Committee for miscellaneous expenses in connection with Lahore Industrial Conference ...	50 0 0
Total ...	6,060 5 6

ference for 12 months (from December 1909 to November 1910.)

Disbursements.	Amount.
	Rs. A. P.
Pay of Assistant Secretary and other Establishment ...	1,450 8 0
On Directory of Indian Goods and Industries account ...	991 10 3
Do Technical Institutions in India ...	23 1 0
Do Report of the Calcutta Industrial Conference account ...	4 2 9
Do do Surat do ...	2 5 9
Do do Madras do ...	55 10 0
Refund of the sale-proceeds of the Benares Conference Report ...	35 15 0
Typing charges of the Report of the Indian Industrial Conference including a record of the General activity for year ending with November 1909 ...	16 3 0
Advance out of the printing charges of the Lahore Report ...	200 0 0
Travelling expenses of the Assistant Secretary and other Miscellaneous charges incurred on tour ...	233 7 0
Printing (Miscellaneous) ...	48 5 0
Books and periodicals ...	63 3 0
Book-binding ...	3 6 0
Railway freight ...	14 14 3
Furniture ...	81 11 6
Postage ...	121 12 9
Telegrams ...	17 11 0
Stationery ...	53 10 6
Sundries (including repairs to Typewriter, &c.) ...	22 8 6
Advertising charges ...	33 15 0
Expenditure ...	3,474 2 3
* Balance ...	2,586 3 3
Total ...	6,060 5 6

* Out of this balance the following charges have still to be paid.

Balance of the printing charges of the Report of the 5th Industrial Conference, Lahore ... Rs. 775 0 0

Cost of printing Annual Report of the work of the Indian Industrial Conference ... „ 125 0 0

Total „ 900 0 0

AMRAOTI, }
1st December 1910. }

R. N. Mudholkar,
General Secretary,
Indian Industrial Conference.

REPORT SUBMITTED BY THE ASSISTANT SECRETARY

Before submitting a report of the work done by me since I joined my appointment in October of last year as the successor of Mr. C.Y. Chintamani, it is my first duty to tender my sincere and grateful acknowledgments to the Honorable Rao Bahadur R. N. Mudholkar, the General Secretary of the Industrial Conference, for having conferred the vacancy on me in consideration of the humble services that I rendered off and on to the Conference Office, during leisure snatched away with great difficulty from the arduous and exacting duties of my former service. The work of the industrial regeneration of my mother-land has during the last eight or ten years been uppermost in my mind and what little I could achieve in furtherance of this object has been to me a labour of love. It will now be my earnest endeavour to discharge conscientiously the duties entrusted to me, to fulfil the expectations that the General Secretary has so kindly formed about me and to deserve the confidence that he has reposed in me.

Owing to the unusually large number of papers—nearly double the number usually received at the previous Conferences—there was a proportionate increase in the amount of matter, which had to be prepared for submission to the General Secretary in connection with the Lahore Report. This together with the office routine duties did not permit me to proceed to important centres of industrial activity, cities, presidency towns, or district places to stir up the Provincial or District Committees or to found new ones.

Immediately after the close of the Lahore Session of the Industrial Conference, I visited the Lahore Exhibition. Exhibits of Industrial products and works of arts, were so numerous and varied that it is not possible to notice them here in detail. I shall only refer to a few models of machinery and appliances, which struck me most.

(1) *Turpentine Factory*.—Under the auspices of the Agricultural Department of the Punjab, a temporary building was specially erected within the Exhibition grounds for the practical demonstration of the mode of manufacturing Turpentine from Chir wood. A factory on a small scale like

the one exhibited at Lahore can be started by any one with a capital not exceeding five to six thousand rupees.

(2) Foster-mother and incubator of Messrs. W. Tamlin & Co., for poultry industry, apparatus for artificial Beeculture, machinery for Sugar manufacture, a small and simple contrivance for extracting *san* fibre, chaff cutters, pumps, winnowers of corn and other agricultural machinery and implements, presses for Baling Hay by hand power looms of different kinds, &c., formed a very instructive feature of the Exhibition, apart from the thousand and one articles of Indian workmanship and art.

(3) A small machine of the Eureka type for making quinine tablets was also on view which turned out automatically tablets uniform in size and weight.

Early in February last, I accompanied the Honorable Rao Bahadur R. N. Mudholkar, the General Secretary to Calcutta, when a great effort was made to arouse the Provincial Committee of the Industrial Conference in Bengal and accordingly a meeting was arranged in the Rooms of the Indian Association, for which invitations were issued to the leading gentlemen of Calcutta and especially those who are known for their active interest in industrial matters. The General Secretary in a very lucid speech pointed out the vast possibilities of the expansion of the jute industry which is almost wholly in the hands of foreign companies.

While at Calcutta I specially visited the Section of the Museum where all the important commercial products of India are kept on view. This Section is admirably classified and arranged and is a store-house of very useful information and deserves to be carefully studied by all who are anxious to start any new industry. Mr. Burkill, the Superintendent in charge of this Section, had the courtesy to ask his personal assistant to show me over the whole Section, which is very instructive.

I visited also the well-known Bengal Chemical and Pharmaceutical Works and was agreeably surprised to find the factory equipped with the latest machinery and appliances for the manufacture of a variety of articles which were probably never tried in India before. Great credit is,

indeed, due to Professors Bose and Roy for this successful venture. I visited the Pencil and Match Factory of the Small Industries Development Co. of Calcutta and suggested some woods which were more suitable for these purposes, in lieu of the material used by the promoters of the Factory. I accompanied in March last the General Secretary to the Sibpur Engineering College when through the courtesy of Mr. B. Heaton, the worthy Principal of the College, I had the unique opportunity to have a view of the several well-equipped laboratories, specimens and models of mining and other appliances.

During my stay at Calcutta, I had received an invitation from the Reception Committee of the Benares Industrial Conference, but owing to some urgent demands on my time, I had to deny myself the pleasure of attending that Conference.

In the month of April last, I proceeded on tour to Poona for the purpose of creating interest in the work of the Conference office, when I visited many leading gentlemen and succeeded in enlisting their sympathies with the Conference movement. While at Poona, I visited the Umbrella Factories of Messrs. Rajmachikar Brothers, and R. Y. Kamble, the Maharastra Metal Factory and two Envelope Factories. I received much valuable information from the managers of these concerns.

In the month of September, I attended the meeting of the Sangamner Agricultural and Industrial Association, when I was unanimously elected a member of the Association and deputed to attend the Poona Agricultural Conference held on 21st and 22nd September. I took part in the discussions on both days and read a paper on agricultural improvements, which is reproduced elsewhere.

AMROATI. }
1st December, 1910. }

M. B. SANT.

PART II

A brief account of industrial activity in India in the twelve months December 1909 to November 1910.

Section A

*The Governments of British India and Indian States,
and Industrial Development.*

BRITISH INDIA

Legislation.—Among the laws enacted by the Imperial Legislative Council the Electricity Act, the Indian Company's Act, Amendment Act and the Tariffs Amendment Act and the Paper Currency Act deal with matters affecting industry and commerce. The object of the first measure was to recast the law so as to afford greater encouragement to the flow of capital to enterprises using electricity and at the same time to duly protect the interest of the general public and the state. The second authorised under certain conditions the payment of interest out of capital. The third enhanced duties on imported liquors, tobacco, silver and petroleum. The enhancement on the first two articles was approved by an overwhelming majority in the country and in the Council. Non-official opinion was strongly against the enhancement in regard to the two latter.

Contemplated Legislation.—Bills have been introduced in the Imperial Legislative Council for regulating the working of factories and the labour employed there and for amending the law relating to patents and designs so as to bring it into line with the English Act of 1907. The first bill will, it appears, be strenuously opposed by the manufacturing interest in this country.

Legislation is also contemplated to bring up the law relating to Insurance Companies and that relating to Joint Stock Companies in a line with the English law.

Resolutions.—Among the resolutions moved in the Imperial Legislative Council two were connected directly with the Industrial movement.

They were :—

That this Council recommends to the Governor-General in Council that the Government of India do take early steps to establish a Polytechnic College for giving instruction in the higher branches of Mechanical Engineering, Electrical Engineering, Marine Engineering, Railway Engineering, textile manufacture, mining and metallurgy and different departments of industrial chemistry ; and that a committee of qualified officials and non-officials, European and Indian, be appointed to frame and lay before the Government by the end of August next, a scheme suitable for the requirements of the country and capable of being carried out in the immediate future.

A resolution was also moved for making primary education free and universal. This resolution and the one in regard to the prohibition of indentured Indian labour to Natal were also indirectly connected with industrial matters.

2. A very useful book has been compiled by Mr. R. S. Troup, F. C. H., the Imperial Forest Economist, entitled "The Indian Forest Memoirs." The volume describes the uses of 554 different woods, excluding bamboos, canes and the varieties used for fuel and similar purposes. The woods are ranged under 34 heads according to the various uses to which they can be applied ; viz., woods for agricultural implements, boat and ship-building, perfumery, matches, combs, pencils, Railway sleepers, building material, toys and for a variety of other industries, have been fully described, their natural order, vernacular names in different districts and other necessary information has been given.

3. The following important order has been issued by the Government of India in connection with the purchase of country made articles by the various departments of Government.

"The Governor-General in Council is pleased to direct that the following rule shall be substituted for rule 5 of the revised rules for the supply of articles for the public service

which were published with the Resolution dated the 14th July, 1909 :—When serious inconvenience to the public service would be caused by waiting to obtain an article from England through the Director-General of Stores, or when owing to the greater promptitude of supply, an economy can be effected by purchasing in India articles which, under the foregoing rules, should be obtained through the Stores Department, the purchase may be made in India, subject to rule 13 : provided that the articles are already in India at the time of order ; but in such cases, if the value of the articles exceed Rs. 50, the sanctioning officer should place on record the reasons which make the local purchase desirable. This record shall be available for the inspection of the Examiner of Accounts or the supervising officer when required."

4. The Government of India continue to give effect to their declared policy of promoting the cause of higher technical knowledge and as in previous years directed the award of one technical Scholarship in each Province, tenable in a foreign country provided the Local Government, has a deserving candidate to nominate, and that the industry to be studied is either already developed or in the process of development. The candidate selected must also have shown a practical interest in the industry for which he is selected and should give an assurance that he will continue to devote himself to the industry on his return to India. How the Scholarships have been actually awarded will be shown further on, in reference to each province separately.

5. For the purpose of placing the paper-making industry on a firm basis the Imperial Forest Research Institute is about to take steps for demonstrating the possibility of manufacturing wood pulp in India.

6. The Government of India Prize for the best paper contributed to the Mining and Geological Institute of India has been won by Mr. Ghose of Sandur, who has described in detail the extensive Manganese ore deposits of the Sandur State.

7. The revised Bill for amending the rules relating to

the grant of Patents and Designs in India was introduced in the Viceroy's Council on the 23rd March last. By this Bill the stages of obtaining a Patent for an invention will be as follows :—

- (1) Submission of the application with specification and the prescribed fee.
- (2) Acceptance of the application after complete examination within nine or twelve months.
- (3) Publication of documents after such acceptance.
- (4) Interval of 3 months for submission of objections to grant.
- (5) Grant of patent after disposal of objections, if any, on payment of prescribed fee.

8. The new bill aims at facilitating the grant of patents by keeping the application secret until acceptance and in several other ways.

9. A Conference of the Registrars of Co-operative Credit Societies in India, is arranged to be held at Allahabad from 7th to 10th January next to discuss several matters in connection with this movement.

10. The Government of India have sanctioned the award of a State Technical Scholarship to Mr. T. Kumaran Nair to enable him to undergo a course of study in England in metallurgy, arrangements will be made for his admission to the Birmingham University.

11. The Government of India have issued instructions for the compilation of a special schedule at the forthcoming census, showing separately the number of persons engaged in direction, supervision, and clerical work; the number of skilled workmen, unskilled labourers of over 14 and under 14 years of age. In the first class Europeans and Eurasians on the one hand and Indians on the other will be shown separately. The Schedule will be filled in by the managers or owners of the factories, mills, or other concerns where at least 20 persons are employed. It will also be stated whether any mechanical power is employed, if so, whether it is water, steam, oil, or any other power.

12. That there is much scope for the improvement and expansion of the agricultural industry in India will be

admitted by any one who has devoted the least attention to this subject. It is, therefore, gratifying to find that the results so far achieved in this direction are distinctly encouraging. From the proceedings of the Board of Agriculture at Pusa, it appears that a steady advance is being made in the following directions in almost all the Provinces in India :—

- (1) Gradual introduction of agricultural implements and machinery.
- (2) The issue of leaflets in different vernaculars on agricultural matters.
- (3) Adoption of new methods of agriculture.

13. The Council of Indian Institute of Science has framed bye-laws and rules for admission and regulation of students. The rules affecting the grant of diplomas of associates and fellows to successful students and the bye-laws have been submitted to the Viceroy for final sanction. Instruction is to commence in January 1911. The foundation stone of the Library which is to be the main feature of the building now in course of construction, will be opened by H. H. the Maharaja of Mysore.

14. The Government of India have issued a resolution on Provincial Agricultural Colleges and their diplomas.

These Colleges are to teach a three years' course which is to be as far as possible uniform in all the parts of India. A final examination is to be held at the end of the period with the assistance of Pusa Professors; successful candidates will be given the degree of the Licentiate of Agriculture which will be equivalent to B. A. Successful students may go through a two years' post-graduate course of study at Pusa.

15. The Provincial agricultural colleges except that of Poona, are not to be affiliated to provincial universities but are to remain under the control of the Director of Agriculture who should keep himself in touch with the Directors of Public Instruction.

16. We give below a complete list of the industries about which the Government of India have directed the collection of statistics throughout the Empire :—

- (1) Provision of food—Tea, Coffee, Biscuit factories, Flour, Oil and Rice mills ; Bakeries, Sugar factories, Dairy farms, Fish curing works.
- (2) Drinks, Condiments, and Stimulants—Salt, Ice, Opium and Tobacco factories, water Works, Crushing mills, Aerated water factories, Breweries, &c.
- (3) Light, fuel and forage—Gas and electric light works, Match factories, Oil mills, Collieries, Forage presses, Bulk Oil installations.
- (4) Building materials—Brick and tile factories, Stove, Marble and cement works. Lime works and kilns. Municipal work-shops.
- (5) Vehicles and vessels—Railway train and coach building factories and Shipyards, Dockyards, Port Commissioners and Port Trust workshops, Dredging and motor car works.
- (6) Supplementary requirements—Paper mills, Card board manufactories. Printing presses. Mica splitting factories, Telegraph and Postal work-shops. Games and Sport Works.
- (7) Furniture factories.
- (8) Arms and ammunition—(Factories for), **Arsenals**, Gunpowder and Gun carriage factories.
- (9) Textiles, fabrics and dress :
 - (a) Wool-carpets, blankets, woollen cloth and shawl factories, Felt and *pashm* factories.
 - (b) Silk filatures and mills.
 - (c) Cotton—Cotton ginning, cleaning and pressing mills. Thread glazing and polishing factories, Cotton spinning, weaving and other mills, Tent factories, Cotton carpet and rug making.
 - (d) Jute, Hemp, &c. Jute presses, Jute mills. Rope works, Hemp mills, Fibre cleaning works, Fibre matting and bag making.
 - (e) Dress—Hosiery and Umbrella factories.
- (10) Metals and precious stones.
 - (a) Gold, silver and precious stones—Mints, **Gold,**

- diamond and ruby mines—Jewellery work-shops.
- (b) Other metals, &c. Brass foundries, Iron foundries, Iron and Steel works, Machinery and Engineering workshops, Lock and cutlery works, Aluminium factories, Iron, mica and manganese mines.
 - (11) Earthenware and Glass Pottery works, Glass factories.
 - (12) Wood, cane, &c., Carpentry works, Saw mills, Timber yards.
 - (13) Drugs, Gums, Dyes, Cinchona and indigo plantations. Cutch, lac, soap and chemical factories. Saltpetre refineries, Dye works, Paint works.
 - (14) Leather, &c., Tanneries, brush and leather factories. Bone Mills.

17. A statement has been issued by the Geological Survey Department of India from which it appears that during the year 1909, the total number of licenses for working mines and minerals issued in the various provinces including Baluchistan was 693, showing a decrease by 123 as compared with the previous year's total. Of this number 395 were prospecting licenses, 143 exploring and 155 mining leases. The Central Provinces head the list with 389 of which 246 were prospecting licenses, 107 exploring and 36 mining leases, the major portion of the concessions being in connection with manganese ore.

BOMBAY.

18. The Government of Bombay has sanctioned two scholarships. One for a student to proceed to Europe to learn Sugar refining and the other for Electrical Engineering.

19. "History of Indian industries during the last century" is the subject of a Prize essay announced by the University of Bombay. The selection of the subject is eminently judicious just at a time, when there are signs of a genuine industrial awakening in all the parts of the country. The appearance of the successful essay is awaited with interest. The publication of this essay either by the

successful candidate or by the University for general information is highly desirable.

20. Under the auspices of the Deccan Agricultural Association, an Agricultural Conference was convened in the Agricultural College Buildings on 19th and 20th September, under the presidency of the Honourable Shrimant Baba Saheb, Chief of Ichalkaranji, one of the States in the Southern Mahratta country. The election of the Hon'ble Baba Saheb to the Chair was eminently happy as he has devoted his special attention to the study of agricultural and industrial problems of the country and appears to possess much practical knowledge of agricultural matters. The proceedings commenced on 19th September under very favourable auspices. About 200 delegates from the different districts of the Bombay Presidency were present. Much credit for organising the Conference is due to Mr. G. F. Keatinge, I. C. S., J. P., the Director of Land Records and Agriculture, Dr. H. H. Mann, Professor J. B. Knight, Rao Sahab G. K. Kelkar and others of the Agricultural College, Poona. The proceedings were conducted in Mahrathi and much useful and educative work was done, many cultivators took part in the discussions, placed boldly before the Conference their doubts and difficulties, and solicited the help of the Government Revenue and Agricultural Departments for solving them. The Conference was thus a successful affair and fulfilled its object. Rao Saheb V. A. Gupte read a carefully written essay dealing with the advantages of Agricultural Associations after the models of similar institutions in Europe and Japan and exhorted his educated brethren to help the ryot in the removal of his financial difficulties and stubborn opposition to the introduction of any new ideas. Messrs. Paregaonkar, Kamath and Kirtane read papers on various subjects. Mr. M. B. Sant, Assistant Secretary of the Indian Industrial Conference, Amraoti, read a paper making some extremely practical suggestions with regard to Agricultural improvements and took part in the deliberations of this Conference and brought to the notice of the audience the action taken by the Industrial Conference in the matter of the standardization of weights and measures and in various other ways.

21. The Hon'ble Messrs. W. M. Morrison, R. A. Lamb and M. B. Chaulbal, Members of the Council of His Excellency the Governor of Bombay paid a visit to the Paisa Fund Glass Works at Talegaon near Poona, and are reported to have been pleased with the arrangements at the factory and the articles turned out by it. The Superintendent of the Works has been informed that the Government have called the attention of the officers of various departments to the glass-wares produced at Talegaon and have desired that these articles should be purchased as far as possible for Government purposes.

22. The Bombay Government had selected Mr. A. Guthrie of Messrs. Cooper Allen & Co. of Cawnpore to institute a survey of the leather industry of the Presidency. Mr. Guthrie has studied chemistry of tanning at Leeds and possesses about seven years' experience in all branches of leather industry in India. He had been deputed to visit all the important centres of tanning and leather industry in the Presidency including Sindh for the purpose of investigating and reporting on the existing condition of these industries. Mr. Guthrie has now completed his survey and submitted a very exhaustive and thoroughly informing report. The Bombay Government in their Resolution on this report have directed the attention of capitalists to the scope that exists for the establishment of tanning extract factories in suitable localities, and are prepared to give careful consideration to any practical suggestion that may be submitted to them. The state of the leather industry in the Presidency is not on the whole very hopeful owing to the ignorance of the workers, their addiction to liquor and foreign competition. A marked improvement is observed in localities where Co-operative Societies have been started for the benefit of these men.

23. His Excellency the Governor of Bombay desires to nominate a candidate for training at the Imperial Forest College, Dehra Dun, with a view to his qualifying for direct appointment to the Provincial Forest Service.

24. The Bombay Government have invited applications for one or two State Technical Scholarships from candidates

in the Presidency, who are willingly to proceed to England to study Sugar refining or Electrical engineering. Each Scholarship is of the value of £150 per annum and is tenable for two years and may be continued for the third year, if necessary. The candidate will also receive his free passage to England if he proceeds there on certain prescribed conditions, and also travelling expenses for *bona fide* journeys in connection with his studies, while in Europe.

25. The Bombay Government have decided to transfer the control of the Bombay Veterinary College from the Director of Public Instruction to the Director of Agriculture.

26. The Bombay Provincial Co-operative Credit Conference was held in the Poona Town Hall in September last. His Excellency the Governor in opening the proceedings made some very valuable observations on the prospect and the expansion of the movement. According to His Excellency, the hand-loom industry of the country can still survive the foreign competition, if it is organised properly on the basis of co-operation.

MADRAS.

27. The second mill of the Coimbatore Spinning & Weaving Co. started work with 20,000 spindles from 1st March last, the first cotton being put in by the Collector of the District.

28. On the application of the Madras Glass Works, Ltd., supported by the Director of Industries, the Government of Madras have sanctioned a free grant to the Company of half the wood used in its furnaces during the first two years of its working.

29. To encourage technical education, the Government of Madras have sanctioned a grant of Rs. 6,000 to the Chungalvaroya Naicker Institute for the purchase of tools and machinery and Rs. 7,500 as an annual grant for the maintenance of the staff including a Superintendent from England.

30. It appears from the Madras Administration Report for 1908-09 that chief industries carried on in the Presidency by concerns not classed as factories were coffee curing, tile and rope making, tanning of leather, lace making, tobacco

curing, cotton spinning and weaving, printing, fish curing, oil pressing, cotton ginning and pressing. Owing to the introduction of shawl weaving and the improvement of labour supply, the working of the Salem Weaving Factory shows much progress.

31. The last Annual Report of the Madras Department of Industries shows that the Department worked successfully on the whole, although the financial results were not so encouraging. Well-boring operations were attended with much success.

32. The Government of Madras have decided to award a State Technical Scholarship of £150 per annum tenable for two years for the study of Glass-making.

33. Very interesting experiments are being conducted by Mr. James Hornell, Marine Assistant and Superintendent of Pearl and Chank Fisheries since April 1909. In spite of unfavourable and adverse circumstances, there has been a distinct net profit this year, owing to the advance in the knowledge of Chank Culture, mechanical dredging for shells, more extensive advertising and other business methods.

34. In the last year's Report reference was made to the proposed factory on the Nilgiri Hills for the charcoal (wood distillation) under the auspices of the Madras Government, but it appears that Government have now decided to take no further action in the matter to avoid undue interference with private enterprise.

35. The Madras Technical Institute which was under the management of the District Board for about 20 years has been made over to Government from the 1st April last. It is proposed to enlarge the scope of the institute by making provision for instruction in weaving and dyeing.

36. The Report of the Madras Agricultural Department shows that the experiments made in certain parts of the Presidency to grow jute have not been attended with success and will have to be eventually given up, as with high prices fetched by paddy there are no promising prospects for jute cultivation. Trials are in progress for the plantation of agave fibre but the prospects are yet uncertain.

37. With the sanction of the Local Government, the Director of Industries, Madras, has announced the grant of 199 scholarships of the aggregate value of Rs. 566 to boys of the artisan classes attending industrial schools, in the Presidency, which are under the supervision of the Director.

38. An informal meeting was convened at Madras in the office of the Director of Industries on the 5th and 6th of October, where gentlemen interested in industrial education had assembled to discuss various questions, *viz.*, the classification of Industrial Schools, the subjects to be taught, the curriculum to be followed and the separation of literary from industrial education.

39. A lengthy report has been submitted by Mr. R. L. Proudlock, Curator to the Government Botanical Gardens and Parks in the Nilgiris on the experiments carried out by the Government at Gairsoppa, Kadra, Belgaum, Thanna, Pelbar, Bassein, Victoria Gardens (Bombay) and at Ganesh Khind near Poona. The origin of the plantations is attributed to the suggestion of the Bombay Chamber of Commerce. The seeds experimented with were *Castillar Glaslica* from Ceylon, *Ceara*, *Para* and a few other varieties. The results of Rubber cultivation are not very hopeful. According to Mr. Proudlock the principal drawback of the Bombay Presidency is the long annual drought that is usually experienced. The best district in the Presidency is Kanara, especially the evergreen forest region from Bhabkal to Kadra, where the climate is hot and moist for the greater part of the year. The District of Thanna which comes next is fairly suitable for rubber.

40. The Government of Madras has opened a Distillery class for the benefit of subordinates of the Abkari Department. Arrangements have been made to give them a training in organic chemistry, distillery processes, brewing, &c. Subordinates from other provinces are also attending the class. There are 8 from Beluchistan, 8 from Rajputana, 7 from Burma and Ceylon each, 4 from Berar and 9 from Bombay. Some Indian States have also deputed a few students to attend the class.

41. It is understood that the Madras Government will

shortly undertake an industrial survey of the Presidency for the purpose of collecting reliable data with regard to the present position of the Madras industries.

42. A Resolution has been issued by the Madras Government sanctioning the proposal of the Director of Industries for the enlargement and development of the St. Aloysius's School at Vizagapatam, so as to provide for instruction in mechanical engineering, carpentry and blacksmith's work to students from the Vizagapatam and Ganjam districts. This action has been taken in response to the request of a deputation which was received by H. E. the Governor in February 1909.

43. The Secretary of State has abolished the Department of Industries and the post of the Director of Industries from 1st January 1911. Orders have accordingly been issued by the Madras Government placing the services of Mr. A. Chatterton at the disposal of the Educational Department as Superintendent of Industrial education. Industrial Schools at present under the control of the Revenue Department, will be transferred to the Educational Department.

BENGAL.

44. In an appendix to the Report of the Agricultural Department of Bengal for 1908-9, Mr. Bergtheil, Director of the Sirsiah Research Station, has published the result of his experiments in regard to the relative merits of the artificial and natural indigo which appear to prove that the natural indigo makes a more lasting dye.

45. The Bengal Agricultural Department, and in the Muzaffarpur district, the Behar Agricultural Department and the Behar Planters' Association are continuously making experiments for growing flax and other fibre plants. An expert has been brought out from Belgium under whose supervision it has been shown that a net profit of over Rs. 100 per acre can be obtained by the cultivation of flax.

46. The Agricultural Ledger in one of its recent issues gives an interesting account of the cultivation and preparation of Sann hemp in the Pabna District, with commercial valuation of the fibre in the Calcutta and London markets.

In the Sirajganj Division about 27,000 acres are estimated to be under Sann hemp. The value of the outturn per bigha is about Rs. 24. The expenses are calculated at Rs. 13 per bigha.

47. The Co-operative Credit Conference held at Calcutta came to the conclusion that District Officers did not take sufficient interest in the working of this movement and has suggested that definite orders should be issued by the Local Government on this subject and that Societies recognised by the Registrar of Credit Co-operative Societies may be exempted from payment of fees levied under the Registration Act.

48. The Bengal Government have sanctioned the removal of the Sibpur Engineering College to Ranchi, and that the Port Commissioners are to acquire the possession of the Sibpur site in May 1913.

49. Experiments in fruit-growing are being successfully conducted at the Pusa Research Station, and bulletins have recently been issued dealing with the methods of growing fruit trees, preservation and packing of fruits by modern methods. The success achieved at Pusa will make the growing of European fruits possible in various localities in India by adopting the methods, which have proved successful at Pusa.

50. From the Government resolution on the working of the Co-operative Credit Societies in Bengal for 1909-10 it appears that the movement is making a steady and on the whole a satisfactory progress, many new Urban Societies having been started without much direct help from the Registrar.

51. Under the auspices of the Bengal Government, a monograph has been compiled by Babu Mallinath Ray which contains a very interesting review of the "Wire and Tinsel Industry" of the Province. Mr. Ray has furnished ample details describing the decadence of the industry and its present struggle for existence in the face of foreign competition. According to the traditions in Patna and Calcutta, the original founder and inventor of this art was Biblical Joseph, the son of Jacob. Even to this day the young

apprentice makes his offering to Joseph when he begins to learn his art. It appears that this industry was brought to India by Mahomedans, as it is chiefly confined even now to that community. The industry is now in a very precarious condition and efforts ought to be made to revive and at least save it from total extinction. The implements employed and processes of manufacture of wire, tinsel, gold and silver leaves are almost the same throughout the length and breadth of India. Hence, the monographs prepared in other provinces, do not differ much from this Report.

52. Some important experiments are being conducted by Mr. Bernard Coventry at the Pusa Research Institute for growing different varieties of tobacco, which are watched with interest by those interested in the manufacture of cigars, cigarettes and other tobacco preparations.

53. The experiments conducted under the auspices of Government in semi-artesian well-boring in Muzaffarpur during the scarcity in that district last year have proved successful and afforded much relief.

EASTERN BENGAL AND ASSAM.

54. The Government Agricultural Department at Shillong is making experiments in canning and preserving of fruit. The process of canning pineapples has been attended with complete success. The net expense per tin of preserved apple was found to be 4½ annas in Shillong, the expenses will be less when the fruit and labour is cheaper, mangoes when preserved would also keep for a long time and fetch good prices.

The following is the process of canning the pineapple :—

Peel the fruit and carefully take away the eyes. Then cut it into pieces and put them in a tin can. Fill the can next with thin sugar syrup. Seal the tin carefully leaving a small aperture through which air in the tin will be driven out. The filled tin should next be put in a bath of hot water and boiled for a few minutes. This will drive out the least trace of air and kill any germ in the fruit and the sugar. The tins should then be sealed completely and allowed to cool.

PUNJAB.

55. A State Technical Scholarship of £150 has been awarded to Mr. Hashmat Rai, B. A., M. Sc., Demonstrator, Government College, Lahore, for the study of Technical Chemistry in England.

56. Colonel Davis, Commissioner of Jullundur Division laid the foundation stone at Faridkote of the Davis Model Agricultural Farm and Farmer's House, which aims at teaching the agriculturists the manifold advantages of modern improved methods of cultivation.

57. A new agricultural station at Gurdaspur has been opened to popularize the scientific methods of agriculture and for purposes of demonstration.

58. A lease of some 2,300 acres of land in Montgomery District has been granted to two Zamindars for opening a cattle-breeding farm with the object of improving the breed of Montgomery milch kine. The breeding operations will be conducted under the supervision of the Director of Agriculture.

59. Monographs on Punjab Industries are being revised and condensed into a popular form. Mr. Alma Latifi, I.C.S., has been specially deputed on that duty, under the supervision of the Director of Land Records, as Director of Industries.

60. For improving the date palm cultivation, the Jail ground at Multan famous for its date palms is to be utilized under the auspices of the Punjab Agricultural Department; 55 acres will be available for the present.

61. The experiment of planting eucalyptus trees having proved successful on the Simla Hills, the Conservator of Forests recommends its continuance. About Rs 4,000 have already been spent on the scheme. This industry is very paying and deserves to be tried in other provinces as well.

62. The Punjab Government have issued licenses in favor of Messrs. Bayram and Co. of Calcutta for mineral oils in the Mianwali District.

63. The Director of Industries in the Punjab is collecting information as to the openings of industrial development which promise success. He is ready to supply

information to capitalists and others interested in starting new industries. A library of industrial books will be placed shortly at the disposal of the public and Mr. Latifi's work embodying his results of an industrial survey and containing many valuable suggestions regarding probable openings in the Provinces is awaited with interest.

64. His Honor the Lieutenant-Governor has decided to offer the scholarship for training in Alkali manufacture and to invite applications for it from Punjab University graduates in chemistry. Applications should be made to the Director of Public Instruction, Punjab.

65. The local Government is devoting its attention to the improvement of fish industry, and has decided to depute Mr. A. Hawel, I. C. S., Assistant Commissioner, Kulu, to America to study fisheries in view to the introduction of new methods in the Province.

66. Two men from the Agricultural Station of Lyallpur were deputed to Gujarat in the Bombay Presidency to be trained in the method of straight-sowing and ploughing practised there.

67. An informing pamphlet has been compiled by Major G.K. Walker, C.V.D., Chief Superintendent, Civil Veterinary Department, Punjab, embodying the results of "A cattle survey of the Amritsar District." The statements appended to this Report, based on the cattle census of 1904 and 1909 clearly show that within the last five years there is a perceptible diminution in the number of cattle. Bullocks show a decrease by 12 and cows by 11 per cent. as compared with the figures of the last census. This is attributed to cattle pests, floods and starvation due to scarcity of fodder.

68. The Punjab Government have provided a sum of Rs. 20,000 for the purpose of fostering local industries, a portion of this sum will be devoted by Mr. W. S. Hamilton, Director of Industries to meet the expenses of a perambulating weaving loom exhibition. Mr. Hamilton has obtained Salvation Army looms and improved fly-shuttle looms, and arrangement will be made every cold season to exhibit these machines which will be in charge of experts specially appointed to explain their uses throughout the weaving districts.

THE CENTRAL PROVINCES AND BERAR.

69. It is proposed to construct laboratories for the Nagpur Agricultural College, on a site close to the Victoria Technical Institute of that place. A Botanical Garden also has been added which will be under the supervision of the botanist of the Agricultural Department.

70. A very exhaustive, informing and well-written Report on the industrial survey of the C.P. and Berar has been framed by Mr. C. E. Low, I.C.S., the distinguished officer of these Provinces assisted by a band of zealous and enthusiastic Indian officials. At the very outset of the Report, Mr. Low has admitted that the survey was undertaken as the result of the proposals made by the Indian Industrial Conference to the Government of India and on the lines suggested by its office. After referring to the four industrial tracts into which C.P. and Berar are naturally divided by their physical characteristics, Mr. Low proceeds to pass in review the following industries in the order of their importance :—

- (1) Weaving.
- (2) Pottery, Brick, and tile-making.
- (3) Tanning and Leather working.
- (4) Miscellaneous industries such as, Oil pressing, weaving of woollen fabrics and export of wool, Dyeing, Calico printing, Metalware manufacture &c.

According to Mr. Low, every part of the Province was self-sufficing in early times with regard to most articles and the only exporting centres were Burhanpur and Nagpur and its neighbourhood, where the patronage of an Indian State supported a large number of industries the most notable products being expensive articles of cloth. The coming of the Railway brought with it the influx of foreign and mill-made goods, which have seriously affected the indigenous manufactures and the recent attempts to revive on patriotic grounds the industries of the country come at an opportune moment.

We regret want of space prevents us from doing adequate justice to the contents of the Report. The conclusions and proposals of Mr. Low may be summarized thus :—

- (1) *Textile*.—The appointment of an expert to select and introduce the best type of loom and establishment of a small workshop and experimental weaving shed at head-quarters and of working factories &c.
- (2) *Tanning and leather work*.—The appointment of an expert for enquiry into the possibilities of the industries and of an instructor to teach town mochis.
- (3) *Pottery and Brick making*.—Expert should be appointed to report on the best type of clay, grinding and pugging mills and for improvement in the construction of the kilns now in use.
- (4) *Oil Pressing*.—Agriculturists should after inquiry introduce an improved Bullock power oil mill.
- (5) *Wool industry*.—Necessity of improvement of the breed of sheep by the Agricultural department and improved looms, for weaving of the wool.
- (6) *Brass and Copper ware*.—The schools of handicrafts in Nagpur should be brought in touch with workers throughout the province.
- (7) *Silk weaving*.—Mulberry silkworm to be introduced by the Agricultural Department.
- (8) *Basket making*.—To collect fibre samples and instruction to be undertaken by Missionary Societies.
- (9) *Toys*.—To introduce the manufacture of glazed toys and open up fresh markets.
- (10) *General*.—To form Co-operative Credit Societies for the regeneration of these industries and appoint an industrial Assistant Registrar who should be made responsible for the work.

71. It appears from the Report on the working of the Co-operative Credit Societies in the Central Provinces that during the year 1908-9, eighteen new societies were founded and provision has been made to finance the rural societies in Akola by the establishment of a Central Bank.

72. The Secretary of State for India has sanctioned a revised estimate amounting to nearly 18 lakhs of rupees for the Asola-Mewha Irrigation Tank Scheme in the Central Pro-

vinces as a productive public work. The Scheme will prove a great boon to the ryot and a source of revenue to Government.

THE UNITED PROVINCES.

73. The Government of the United Provinces have selected the following five industries in connection with the State Scholarships, tenable in England and on the Continent. Extraction of alkalies, manufacture of sugar by machinery; manufacture of vegetable oils; wool-dyeing industry; and mechanical engineering.

74. In the Annual Report, Mr. W. H. Moreland, the Director of Agriculture in the United Provinces brings out prominently the fact that during the last year, there has been a growth in the demand for labour-saving machinery for Agricultural purposes. The demand is partly due to increase in wages and partly to the efforts of the staff of his department to prevail on the people to adopt improved methods. There is thus much scope for the agricultural machinery manufacture in these Provinces. The implements in demand are water lifts, tillage implements and other miscellaneous articles. During the year 363 improved ploughs were issued.

75. The following Government of India Technical scholarships have been awarded to students in the United Provinces. The scholarships are tenable for two years and are valued at Rs. 150 each. The candidates selected are :—

(1) Mr. J. Newson, a B. Sc. student of the Manchester University who was born and educated in these Provinces.

(2) Mr. Ajal Pal Singh Yadav of Agra district, a student of the Victoria J. Institute, Bombay.

These candidates will be sent to England to complete their course in Mechanical Engineering.

76. The Government has decided to open a cotton Section in the Thomason Engineering College, Roorkee. This is the result of the visit of His Honor Sir John Hewett to the College in October 1909 last, when he was satisfied that there was a real demand for instruction in the Cotton industry. The course will extend to about three and a half years and

will prepare students for the ordinary second year and Honor's Examination of the City and Guilds Technological Institute, London in cotton spinning and the ordinary examinations in cotton weaving. The course is designed to turn out assistant carding and spinning masters and foremen of departments.

77. In connection with the United Provinces Exhibition, a request has been made to the Japanese Government to send certain educational models and specimens of art and industry of Japan. The Allahabad Exhibition for the holding of which the Governments of the United and other provinces have given unstinted help and afforded all available facilities by lending the services of very capable officers, and have secured to some extent the co-operation of the non-official element, bids fair to be one of the best held within recent years and will be of very great educative value to its visitors. As it would be too premature to give any opinion on this industrial exposition, before it is actually witnessed, we would reserve a review of the same in the next year's report.

78. Mr. S. H. Freemantle, Registrar of Co-operative Credit Societies in the United Provinces, has published a pamphlet explaining the nature and benefits of co-operative institutions suited to the varying needs of the different parts of India. The pamphlet though a small one gives a full idea of the principles and practice of co-operative credit.

79. The local Government has entered into partnership in poultry farm at Haldwani, with Colonel Ward, a well-known specialist in Poultry. Quarters for the accommodation of apprentices have been built. The courses of instruction will be free.

80. The Government has allotted funds for holding Poultry Shows at Lucknow and Bareilly during the coming season.

81. The Allahabad District Exhibition was closed on the 16th February last, Sir John Stanley, the Chief Justice presiding. The Hon'ble Pandit Sundar Lal read a short report reviewing the work of the Exhibition and dwelt on the utility of these undertakings. Prizes and medals were distributed. Improved methods of agriculture were displayed.

BURMA.

82. The Government Rubber Plantations at Mergui have been secured by Messrs. Mower, Cotterell & Co. for 22½ lakhs of rupees.

MYSORE.

83. The Government of Mysore have sanctioned the award of seven scholarships of Rs. 25 each to the sons of respectable Mahomedans, whose ancestors had rendered meritorious services to the State, or who are highly esteemed in the community.

84. The ceremony of laying the foundation stone of the Library of the Indian Institute of Science will be performed by H. H. the Maharaja of Mysore in February next. The main building of the Institute is now in course of construction. Instruction will commence in January 1911, the draft bye-laws and rules regarding the grant of diplomas &c., to the students having been submitted to the Viceroy for final sanction.

85. Mr. Bava Saheb Miyan, Superintendent of the Industrial School, Channapattica, who was specially deputed by the Mysore Government, has recently submitted a report of his inquiries into the Lac industry. He had visited the Imperial Forest Laboratory at Dehra Dun, where Mr. Puran Singh, the Imperial Chemist, explained to him the process of purifying and manufacturing commercial shellac and of making sealing wax. He proceeded to Bareilly, and saw the Kala Bhavan of Baroda and a few more places noted for lacquerware industry. The report of Mr. Mian is receiving due consideration from the Mysore Government. It is proposed to test at the Government Laboratory the practical experience gained by Mr. Miyan in lac manufacture and to put up a distillery for wood spirit.

86. Mr. Ananda Rao, C.I.E., the Dewan of Mysore has directed an industrial survey of the State. A set of questions has been framed and printed in English and Kanarese and will be distributed to a few selected Taluks, to see whether information sufficiently reliable would be forthcoming by the adoption of this method. This method, if successful would be extended to all other Taluks of the State. The results of

the project will be watched with keen interest and may lead other States also to follow the example of Mysore.

87. The annual Dasara Industrial and Agricultural Exhibition of 1910, the fourth of its kind has been admitted to be an unqualified success. About 2,500 exhibits were received. Many hand and power loom factories, industrial schools and other institutions had co-operated in the holding of this exhibition. As usual prizes and medals were awarded to deserving exhibitors. Perhaps the most practical feature of this show was the opportunity that it afforded to the cultivators to study the results of improved methods of cultivation as also the selection and improvement of seeds. Several varieties of quick-growing paddy from the Hebbal farm, varieties of imported maizes, sugarcane and other exhibits served as object-lessons to the ryot.

88. In his address delivered to the Dasara representative Assembly, the Dewan of Mysore stated that the year opened with 21 Agricultural Banks, but the working of 7 being quite unsatisfactory, they had to be closed and loans advanced to them had to be withdrawn. The number of Joint Stock Companies at the beginning of the year was 87. Out of these 7 were wound up, leaving 80 as the number of working concerns. The co-operative credit movement is progressing steadily; the number of societies increased by 25, the total number at the end of last June being 70.

89. The Fourth Annual Session of the Conference of Civil Engineers of the Mysore State was held on 14th November under the Presidency of Mr. Vishvesvaraya, the Chief Engineer, who delivered an able address, advocating the enlargement of the scope and usefulness of the Association.

TRAVANCORE.

90. The Government of Travancore have sanctioned the opening of a Silk Farm at Trivandrum. The farm will be attached to the Cattle Farm and will have a manager and a suitable staff.

91. An Agricultural Exhibition was held at Trivandrum in January last, under the auspices of H. H. the Maharaja in connection with the session of the Shri Mulam Popular Assembly.

92. The Ochira Agricultural and Industrial Exhibition was held in June last in Travancore. The following are among the recipients of Gold and Silver medals at the Exhibition.

Gold medals.—Mr. P. Raghunatha Rao of Messrs. R. P. Pandit and Son, Biscuit Manufacturers, Mangalore, Mr. K.C. Govindani of the Weaving Factory at Paravoor, Quilon, for the best lace work.

Silver medals.—South Indian Candle Works, Madras, for candles; The Chengauner Tanning Co. for tanned leather, Mr. B. Anantaram Iyer for soap; St. Joseph's Convent, Quilon, for lace, &c., &c.

PATIALA

93. The Maharaja of Patiala has awarded a handsome scholarship to Narayan Das, son of Mr. Dyali Ram, Director of Public Instruction in the State, to enable him to proceed to England for the study of Engineering.

COOCH BEHAR.

94. Tobacco growing experiments are being continued at Cooch Behar, three American varieties *viz.*, Yellow Prior, Bright yellow and white Barley being cultivated. Turkish and Cuban tobaccos were also tried in small areas and air cured and the results obtained from them were encouraging. The experiments appear to be on the whole promising.

GWALIOR.

95. Through the courtesy of Rai Syam Sundar Lal Bahadur, Inspector-General of Commerce and Industry, Gwalior State, we have received a few copies of a small brochure on "Gwalior Industries" and other publications, from which it appears that Gwalior is determined not to lag behind other sister states, in the matter of industrial progress.

The pamphlet is issued with the specific object of calling the attention of the general public to the central position of the State and the excellent quality of the articles produced by the local manufacturers. The following is a list of principal factories in the State :—

(1) The Gwalior Leather Factory, Morar, manufac-

tures Saddlery, Harness of all kinds, portmantous, trunks, hand bags, &c., with the aid of steam driven machinery of the latest type.

- (2) The Morar Tannery prepares leather suited for various purposes.
- (3) Gwalior Metal Works turns out padlocks, locks of various sorts, crests, badges and scales.
- (4) The new Electric Alijah Darbar Press is represented to be the most-up-to date press in India possessing facilities for rapid and economical printing of various styles.
- (5) The Scindia Type Foundry is fitted up with machinery for producing English and Hindi types, metal furniture &c.
- (6) The Scindia Paper Mill manufactures foolscap, white, printing, cartridge, cardboard, colored paper, blotting, brown, packing paper &c.
- (7) The Cotton Weaving and Spinning Mills, Ujjain, manufacture dhotees, bed covers, towels &c.; the goods of this Company are equal to Ahmedabad in quality.
- (8) The Gwalior Glass Works prepare glass of various colors suitable for bangle manufacture. Medicine phials, tumblers, glasses, chimneys, bottles, lamps &c. are also made in this factory.
- (9) The Gwalior Nib Factory makes steel and brass nibs in all varieties, and hand machinery for matches, lead pencils, soaps, tobacco cutting and candles, prepares also vacuum pans for sugar.
- (10) Carpet Factory, Central Jail, Gwalior, makes fast vegetable dye woollen carpets of beautiful designs and excellent finish.
- (11) Weaving of Sarees and Chunderi muslins, is also an important industry of the State.

The Technical Institute although a teaching body undertakes orders for furniture, cabinet making in all its branches, picture framing, iron safe and strong room making; tin despatch boxes, trunks etc. are also made here.

The Gwalior Workshop comprises various branches and

engages moulders, fitters, turners, carpenters, blacksmiths, coppersmiths &c., undertakes electroplating, die sinking engraving, and repair work of every description.

The Grass Farms at Sipri and Satanwara supply grass of superior qualities in bales.

BARODA.

96. The Annual Report of the Department of Commerce and Industry of the Baroda State for the year 1908-09 recently issued by Mr. A. N. Datar, Director of that department furnishes much useful information. Two important concerns were started during the period under review *viz.*, the Chemical Works, Limited, at Naosari and the Amreli Kathiawar Swadeshi Weaving Co.

97. The Geological Survey of the State from an economic point of view is being conducted by Mr. N. S. Samba Sheo Iyer whose report is awaited with much interest. China clay (Kaolin), sand suitable for glass making, salt deposits for the manufactures of several chemical products, soda earth and cement stone are abundant in parts of the State and only require to be worked on proper lines.

98. There are a few Agricultural Banks and Co-operative Credit Societies doing useful work for the ryots. The total number of factories worked by steam is 113, of which 65 are Ginning factories, a few cotton presses, 3 spinning and weaving mills, 5 Dyeing factories and 5 oil mills.

99. The Acting Minister of Baroda performed the ceremony of opening the Engineering Workshop of the J. N. Tata Industrial School at Naosari in January last.

100. The Eighth Agri-Horticultural Exhibition was held in the Public Park, Baroda, in February last. The Exhibition was in advance of previous years and evoked much public interest.

101. A scheme has recently been elaborated by Dr. Jackson of the Baroda College for founding a Science Institute in that State with the view of the ultimate creation of a Science University. The plans of the proposed Institute have been prepared by the State architect and sanctioned by the Maharaja. The estimated cost of the building amounts to about three lakhs.

JAIPUR.

102. An Agricultural and Industrial Exhibition was held at Jaipur in January last; demonstrations of different varieties of fly-shuttle and other looms sent in by the Principal of the Serampore Weaving Schools and the working of the Cuttack Hosiery Machines were the principal features of the show.

COCHIN STATE.

103. The Cochin State has opened a Central Training School for technical and industrial education of boys and girls in the State. Provision has been made in this School for teaching the following subjects :—

Industrial Section—Lacquer work, carpentry and sloyd, electro-plating and gilding, bell metal work, mat making, rattan and bamboo work, blacksmith's work, weaving, pottery, tannery, engraving, needlework, lace-making, embroidery and fancy work.

Technical Section—Shorthand and type-writing, precis writing and indexing, book-keeping and commercial arithmetic.

The course of study in the Industrial Section will be four years and that of the Technical Section three years.

104. The Darbar has thrown open 15,000 acres of virgin forest land in the Sholayar Valley for para rubber cultivation. The successful applicant will be entitled to the free use of the State forest tramway for a period of five years, at an annual rent of 8 annas per acre and for eight years thereafter at Rs. 2 per acre.

NIZAM.

105. H. H. The Nizam's Government have appointed a Factory Commission and the members of the Selected Committee of His Highness's Legislative Council are making a tour of inspection to Aurangabad, Jalna, and other places.

106. Seven students have proceeded from Hyderabad to England. Four of them are graduates and Government scholarship holders.

PART II

Section B.

INDUSTRIAL ACTIVITY OF THE PEOPLE.

GENERAL

The Hon'ble Rao Bahadur R. N. Mudholkar moved a Resolution in the Supreme Legislative Council on the 28rd March last to press forward the subject of Technical Education in India. The resolution asked for the establishment in India of a Polytechnic College for imparting instruction in the higher branches of Mechanical engineering, Electrical engineering, Marine and Railway engineering and Textile manufacture, Mining and metallurgy and the different departments of industrial chemistry. Sir H. Adamson opposed the Resolution on the ground that a Polytechnic College in India at this stage would be like a university without its feeders, *viz.*, schools, and that there was adequate provision made by Government to meet the existing requirements of the Indian students.

The American Consul in Bombay has set apart a room in his office, in Merewether Road, Apollo Bunder, where a number of American Trade Journals, Magazines and Catalogues of manufacturing firms in America may be consulted by the public. All who are desirous of obtaining information about American machinery, hardware, drugs and other goods should avail themselves of this excellent opportunity.

Some enterprising Indians are proposing to open in London, an Indian Emporium or a sample room of Indian goods, artware, raw products, &c., for the expansion of trade in articles for which there is already a large and growing demand in European countries. In the prospectus issued by them, they have pointed out that in the last Franco-British Exhibition, a large variety of Indian goods attracted the attention of the European visitors, the total number of diplomas, metals and honorable mentions being 236. There is thus a vast field in this line.

The Indian Guild of Science and Technology is the title of a new movement inaugurated at the University of Leeds in December last. The Guild has been started by the Indian students studying in Great Britain with the object of assisting its members to gain all possible experience in different branches of science or technology. The Guild will also give technical assistance and any other help to a prospective industrial concern in India. Prof. Arthur Smithells, F. R. S., Dean of the Faculty of Science of the Leeds University has been nominated Honorary President for the current year. The institution owes its origin to the untiring efforts of Mr. Paniker, M. A., B. Sc. (Leeds) who is its Honorary Secretary.

The total number of applications for patents for inventions during 1909, was 695, out of which natives of India filed 74 and other residents of India 164.

In co-operation with American, Japanese and German businessmen, "The Indo European Intelligence, Bureau" has been opened at 1, London Wall Buildings, London, E. C. for the purpose of supplying accurate and up-to-date information to Indian businessmen in matters relating to Western commerce, and industries. The Bureau undertakes to put the American and German manufacturers in direct touch with the Hindu, Parsee or Mahomedan shopkeepers in the Indian Bazaar, and promises to find mining and financial experts for Rajas and Zemindars. It will also suggest to the Indian chiefs visiting England the modes of increasing their income by sending the raw products of their states to foreign countries which are now lying unused and undeveloped. The Bureau is prepared also to advertise Indian goods in foreign markets and to render other help.

BOMBAY

The Ghaut scheme for the supply of hydro-electric power to Bombay is not forsaken, but it is likely to be taken in hand at no distant date by Sir Dorab Tata and others who are its promoters. The superiority of electric power over steam is quite obvious to any one, as it will free the city of the smoke nuisance, and also hasten the development of various industries which have at present to depend on steam power.

This scheme which is named "The Tata Hydro-Electric Company" will be registered within a short time after the legal preliminaries of the transfer of the License &c., have been completed. A capital of nearly a crore and a half has already been secured and this fact is sufficient to prove the soundness of the scheme and the confidence reposed by the public in its promoters. It is estimated that the initial plant will be able to deliver in Bombay 30,000 H. P.

Mr. G. K. Trilokekar, a passed student in Architecture of the Sir J. J. School of Art, Bombay, has succeeded in winning the first premium of Rs. 2,000 in the competition for reconstructing the Grand Hotel, Calcutta.

The Broach Industrial Cotton Spinning and Weaving Co.'s new mill has commenced work under the agency of Messrs. Lalgil Mulgi & Co. The mill will spin finer counts up to 80's warp and 100's weft from Egyptian cotton. The superior quality of the products of the mill bids fair to command a profitable market.

Mr. A. P. Patwardhan, an L. T. M. of the Bombay Victoria J. T. Institute, and a holder of the Government of India Technical Scholarship is reported to have achieved a remarkable distinction in the course of cotton spinning and weaving. He studied at the School of Technology, Manchester, taking a special course in textile chemistry and weaving during the sessions of 1907 to 1909. He not only passed all the school examinations in foreign countries, but has succeeded in obtaining "honour's grade" in cotton dyeing and cotton and linen bleaching and "ordinary grade" in the first class in "calico printing" at the City and Guilds of London Institute.

The Credit Bank of India, Ltd., is the name of another bank registered at Bombay with a capital of one crore divided into 2 lakhs of shares of Rs. 50 each.

Mr. K. R. Rane a past pupil and gold medallist of the Bombay School of Art has established workshops and started a school at Juvem, a small island close to Bombay. Mr. Rane is training the boys of the agricultural labourers in the arts of making Chinese and Japanese fans, lanterns, fancy baskets, carving, silk culture, and moulding in brass and iron and a host of other useful industries. Mr. Rane is reported

to have secured a market for his wares in Italy and intends to visit Japan, America and Europe in pursuit of business and further information.

The Meyer Sassoon Mills, Ltd., is the name of a new mill registered in Bombay with a capital of 10 lakhs for the purpose of acquiring the property of Naranji Mill, which was purchased by Messrs. E. D. Sassoon & Co. for 7 lakhs, a few months ago. There are at present 10,848 mule and 10,080 ring spindles in the mill and about 10,000 ring spindles and other machinery have been indented for.

It is very encouraging to learn that Messrs. D. Krishna & Co., of Bombay, have succeeded in manufacturing a purely Swadeshi Gramophone. This is probably the first attempt of its kind in the whole of India. This Gramophone is made by the company in their Brass Works at Dahanu, in the Bombay Presidency.

The opening ceremony of the Nawab of Cambay Mills was performed in February last. The building provided for the mills is fire proof and can accommodate 18,000 spindles, though only 13,000 have been set up to begin with. The capacity of the machinery installed is sufficient for working 20,000 spindles and 300 looms.

Mr. P. G. Dandawate, B. A., has returned to Poona after completing his two years' course of instruction at Tokio Technical School in glass-making.

The proposal of Sir Vithaldas Thakersey to establish a Central Agricultural Bank has reached the Secretary of State. The bank, it is reported, will have a capital of 20 lakhs and will confine its operations to the Bombay Presidency.

A district agricultural and industrial exhibition was held at Jalgaum in February last. The Exhibition was opened by His Excellency Sir George Clarke, practical demonstrations were given by members of the Agricultural Department and a number of exhibits of agricultural machinery and products was kept on view. The work of arranging, classifying and judging the cotton exhibits was undertaken by the Imperial Cotton Specialist with the assistance of local experts. Fine specimens of weaving, the agricultural implements, &c., were exhibited.

G. I. P. Ry. Mechanics' Institute Technical classes were held in Bombay for instruction in applied mechanics or mechanical engineering, machine construction and electricity. In all 30 lectures were delivered, the number of students enrolled being about 27.

Agricultural and Industrial Exhibitions were held also at Ahmednagar, Sholapur, Alibag, and several other places in the Presidency of Bombay.

Ranchorlal Chotalal Technical Institute, Ahmedabad, the foundation stone of which was laid about three years ago by His Excellency Sir George Clarke, the Governor of Bombay was formally opened in March last by Mr. R. P. Barrow, the Commissioner, in the presence of a large gathering of the leading citizens of Ahmedabad. The Institute has been established by Sirdar Chinubhai, the grandson of the distinguished citizen whose memory it commemorates. Most of the machinery for the workshop has been supplied by the firm of Messrs. Platt Brothers of Oldham at half price, as a mark of their sympathy with the institution. Messrs. John Musgrave and Sons of Bolton presented a steam engine and Messrs. H. M. Mehta & Co. gave free of cost leather belting and other articles valued at about Rs. 1,000. About half the cost of the management, viz. Rs. 7,600 and additional help to the extent of about Rs. 63,000, has been given by the Bombay Government. About three quarters of the cost of the site—half the cost of the building and machinery as well as an endowment fund of one lakh was given by Sirdar Chinubhai Madhavlal.

Two navigation companies have recently been started by some enterprising merchants of Bombay. The first is the Indian Co-operative Navigation Company, Ltd., with a capital of 30 lakhs divided into 3 lakhs of shares of Rs. 10 each. The credit of this enterprise is mainly due to Dr. V. N. Bhajekar & Co. who has secured the co-operation of a few leading merchants of Bombay. The second venture is the Indian and Peninsular Steam Navigation Company, Ltd. The authorized capital of this company is 50 lakhs with power to increase. The Directorate is composed of very prominent and experienced gentleman as well as the ruling princes and chiefs of some Native States. The Thakore Sahebs of Morvi

and Limdi, the chief of Palitana, the Maharajah Bahadur of Darbhanga are among the Directors. The majority of Hindus dislike and discourage foreign travel owing to caste prejudices. To obviate this difficulty, the company undertakes to make special provision by keeping Brahmin cooks on board and in general to cater to the wants and requirements of passengers of all races and communities. The company proposes also to open hotels at principal centres of commerce and study in Western countries. This concern bids fair to be one of the greatest assets of this country in its development and progress, social and industrial. Special concessions will be given to the purchasers of shares from Rs. 5,000 to 25,000.

The Khoja Mahomedan community of Bombay have subscribed Rs. 4,000 to form the nucleus of a fund for the encouragement of scientific education among Mahomedans.

A project is set on foot at Bombay to arrange for a sea voyage of a party of Hindus drawn from all the parts of India under conditions which would not in the least violate the scrupulous observance of Hindu customs and manners and religious practices. The project is already ripe for action and is being managed by Messrs. L. M. Tejpal and Co. of Bombay. It was Mr. Goverdhandas Gokuldas Tejpal who originally conceived the project and worked for its fruition. Several ladies have consulted to join the party. This voyage will furnish complete facilities to those who want to combine business with pleasure and mere sight seeing. The success of this tour will have far reaching effects from an economical and social point of view.

The Deccan Hosiery works have been started at Poona, for the manufacture of socks and other articles of cotton and wollen yarn.

The Bank Silver Company of Bombay has been started by Mr. V. B. Paranjpe for the manufacture of artistic silverware of high grade patterns generally turned out by European firms.

A large extension of the cultivation of American cotton in Sind has been undertaken during this season, the results so far attained being considered most encouraging.

The Ranade Industrial and Economic Institute, which

is raised to perpetuate the memory of the late lamented Mr. Justice Ranade was formally opened in September last by His Excellency Sir George Clarke, the Governor of Bombay. A large gathering of important citizens was present. The Hon'ble Mr. G. K. Gokhale to whose untiring zeal and unremitting exertions, the institution owes its origin and present success made a lengthy and impressive speech to explain the aims and objects of the institution and to indicate its programme of work. The objects of the institute were declared to be as follows :—

(a) To promote the spread of industrial, technical and scientific knowledge in the country.

(b) To collect statistical, historical and other information about other countries, which is likely to be of use for the industrial progress of India.

(c) To publish from time to time reviews by competent persons of the economic position, needs and prospects of India.

(d) To send as funds permit scholars well qualified in science, engineering or technical arts to foreign countries to learn the manufacture of those articles for which there is an abundant supply of raw material in India.

(e) To provide facilities to such scholars on the completion of their courses of instruction to demonstrate by experimenting on a small scale the possibility of success in those industries.

(f) To advance in other ways the industrial development of the country.

The objects (a), (b), (c) of the Ranade Institute are almost identical with the programme of work kept in view by the Industrial Conference since its formation in 1905 and are being since carried out. In view of this fact the Ranade Institute was well advised in confining its attention for the present to the following items only :—

(1) To the construction and maintenance of a Technical chemical laboratory at a cost of about Rs. 21,000 for the building and Rs. 10,000 for purchase of apparatus. The laboratory will be placed under an Honorary Director assisted by a full-time M. A. in chemistry

who will devote himself to experimental and Research work in connection with various suitable industries. The laboratory will admit students who have already obtained distinction in Science in their university course here. Each student will have to bear the cost of his training according to a certain scale to be fixed hereafter. The following industries will for the present be taken up for research work :—(a) Cement, (b) oils, soaps, candles, &c.; (c) matches, (d) sugar, (e) extract of myrobalans, (f) bone product.

(2) Bureau of information consisting of a library of literature on industrial and economic subjects and a small museum of specimens of raw materials and finished products will be also another special feature of the Institute. The information will be made available to the public on payment of a small fee.

(3) Scholarship fund for sending out students to well-known technical schools in India as well as in foreign countries.

His Excellency made a very impressive speech sympathising with the objects of the Institute, which was the most appropriate form of a memorial to Mr. Ranade. "That more than Rs. 80,000 has been contributed from the arid Deccan was in the opinion of H. E., a touching proof of the high regard which Mr. Ranade had won from its people.

Through the munificence of Sir Jacob Sassoon and Sir Kurrimbhoy Ibrahim, a science institute will shortly be established at Bombay, the land being provided free of charge by the Government. The progress of this scheme will be awaited with much interest by all who have realised the value of scientific and technical education and the want of adequate facilities for it at present in India.

A free school for the children of mill hands has been opened by Mr. Nare at Bombay. From the account of the biennial prize distribution of this school which has appeared in some papers it seems that the school is doing useful work.

Under the auspices of the Deccan Agricultural Association, Poona, an Agricultural Magazine in Marathi has been

started since June. It is ably conducted, well illustrated and ought to be welcomed by farmers and others interested in the progress of Agriculture.

In July last, the opening ceremony of the Vishnu Mill at Sholapur was performed by His Excellency the Governor of Bombay, who made a very important speech on the occasion dealing with the various problems connected with the cotton mill industry. The Vishnu mill, as it now stands, has 32,460 ring spindles and 770 looms manufactured by Messrs. Platt Brothers & Co. The plan of the building will admit of further extensions being made without inconvenience.

Mr. K. S. Sanghani, a Bombay Engineer has addressed a letter to the local Municipal Corporation stating that he has devised a kind of machine which can generate power by burning stable litter and refuse including straw and all such inflammable material at the rate of not less than 80,000 foot grounds per each pound of litter, etc., consumed.

The following are the classified results of City and Guilds of London Institute Examinations held in the Victoria Jubilee T. Institute, Bombay, which have recently been announced.

SUBJECT.	Total No. entered.	Total No. of Passes.	Ordinary grade 1st year.	Ordinary grade 2nd year.	Honor's grade.
Cotton Spinning ...	34	92	17	12	3
Cotton Weaving ...	24	18	13	4	1
Cotton Dyeing ...	3	2	2	...	...
Cotton and Linen bleaching ...	3	2	2	...	...
Mechanical Engineering ...	14	9	8 Elementary Grade	6 Continuous Current.	...
Electrical " "	28	15	11	3	...
Motor " "	6	3	3	...	...

The Ambajee Taranga Light Railway Company, Ltd. is the title of a new venture which is being started with the sanction of Government. His Highness the Maharaja of Gaikwad has subscribed shares to the value of one lakh. The authorised capital of the company is 16 lakhs in shares of Rs. 100 each. Sir Bhalchandra Krishna, Kt., Sir Jamsetjee Jejeebhoy, Bart. being among the promoters.

Another Light Railway is being projected from Talegaon to Mancher. The price of a share is Rs. 100 each. A dividend of 5 per cent. is guaranteed by the Company.

Reference has been made in our last report to the Tata Iron and Steel Works Co., Ltd. Those interested in the progress of this important concern will be glad to learn that a town intended for 20,000 European and Indian inhabitants is being constructed and about 100 bungalows are now stated to be under roof or above ground. There are two blast furnaces 19 ft. in diameter by 77 ft. high each equipped with the latest arrangements. Orders have been placed with various firms in Calcutta, London, Pittsburg, Brussels, Germany and other places for the necessary plants. A branch Railway from Kalimati station of the B. N. Ry. to the works is being pushed through, the foundation of the blast furnaces, steel mill and the principal buildings as well as mill buildings are now under construction. With an abundant supply of raw materials, and an expanding market for their production, the success of the Company appears to be assured.

MADRAS

Through the philanthropic exertions of Mr. Rungiah Gounden of the Nilgherry Brewery Co., and a few other leading gentlemen, a trades school has been started at Madras, where the children of the employees in various firms, will be taught free of charge some technical work in addition to ordinary education. Madras Trades Association and a few gentlemen have promised pecuniary aid to this institution.

The Pushpagiri Weaving Factory lately converted into Sitaram Weaving and Spinning Mills, Ltd., Trichur, starts business, with 50 hand looms and 75 power looms.

The annual meeting of the Tellicherry Agricultural

Association was held when a variety of agricultural subjects were discussed and views on the processes of sugar-cane cultivation, sugar making and other matters were freely exchanged.

An educational exhibition was arranged in October last at Tanjore. There was a large gathering of School Masters, pupils of the town and the outside places in the district. The exhibition was a grand sight containing articles of industrial and commercial value and artistic tastes, all being the work of the School Masters and their pupils.

A resolution was passed in February last at a meeting of the Madras Glass Work, Ltd., authorising the increase of the Company's capital from two to 4 lakhs of Rupees. The glass as at present turned out is considered better than glass of the same class imported from foreign countries. The company proposes to bring from Europe a full time manager for the Factory and two skilled workmen, as foreman instructors and overseers as soon as the capital is raised.

To solve the problem of finding out a long stapled cotton which may be universally grown in place of inferior varieties which are now raised all over the country and to help the weaving industry of India, an experimental cotton farm has been started by the Zamindar of Munagala in Krishna District, where about eleven varieties of cotton have been tried, six of them being amongst the most important cottons known to commerce. Out of the several varieties tried on the estate, the Cambodian cotton has proved a great success and has been very favourably reported on by experts in the line like the Bombay Chamber of Commerce. The excellent results of the cultivation of this cotton, will probably revolutionise the cotton cultivation problem in India. Further particulars on this subject can be supplied by Mr. P. Venkatyya, Superintendent of Farms, Munagala Estate, Jalarpet.

A cattle show was held at Tirupur under the auspices of the local Agricultural Association, at which Mr. G. N. Dewal explained in detail the advantages of the fly-shuttle loom and pointed out the necessity of adding an industrial section to the annual cattleshow and exhorted the wealthy people of the place to give a helping hand to the weaving community.

Agricultural and industrial Exhibitions or shows were held at the following places in the Presidency :—

Ganjam-Ellore, Pittapur, Madras (fine arts Exhibition), Kumbakonam, Salem.

From the latest report of the Bassel Mission it appears that various additions have recently been made to the industries which are being carried on so profitably under its auspices. Iron safes valued at Rs. 10,000 were manufactured and sold by the mission last year including Rs. 3,000 for erecting a strong room. Steam power has been introduced into the weaving establishment at Mangalore, and Cannanore cotton fabrics won a gold medal at the Lahore Exhibition. The output of tiles at Calicut which is only one of several factories amounted to nearly 2 lakhs of pieces. Nearly 8,700 in the total number of employees working in the industrial works of the mission.

At the Fourth Provincial Industrial Conference held at Karnool, an important speech was made by the late Mr. Perrazu Pantulu of Cocanada, in the course of which he emphasised the importance of organising the weavers on modern lines, by inducing them to adopt modern methods and appliances in weaving. They are working now as disorganised units in the absence of any agency which will teach them the importance of "Combination" in the interest of their own trade and to free them from the clutches of the sowcar or the middleman.

Mr. K. T. B. Tressler, Director of Industries, in the course of his speech, observed that although a few factories may be in existence for many years, in India, what is called the industrial movement is of recent growth and must therefore pass through all the trials incident to a state of adolescence before it can reach full development, based on experience. He also deprecates the tendency to be satisfied with partial results and employing indifferently trained men,—features of the movement which cannot but react most unfavorably. Papers were read by Mr. Parthasarathi Aiyengar on "arrowroot," and Mr. Rajaram Naidu of Hyderabad on "Hyderabad industries."

A "thief catching steel safe" is the latest novelty in safe-

making introduced by the proprietor of the self-guarding safe-Factory of 44, Broadway, Madras, who has been exhibiting a special form of burglar proof safe. It is represented to be a pure Indian invention of Khan Bahadur Waljee Laljee. The safe contains a handle in one of its recesses which when turned by any unauthorized person, at once releases a handcuff which closes on the wrist of a person that attempts to open it by stealth.

The agents of the automatic Knitting Machine Co. of London, organised a demonstration of Machine Knitting in Madras. Mrs. Audinarayan and several other ladies took a prominent part in the demonstration and explained to the ladies assembled the advantages of introducing knitting and other cottage industry in their household. The second anniversary of Singh's Institute of Commerce was celebrated with great *eclat* in September last when Mr. C. Gopal Menon delivered a very able address on "commerce as a vocation for young men" to emphasise the necessity of commercial education among the Youths of India.

Under the auspices of Messrs. Shaw Wallace & Co., Bezwada Portland Cement Co., Ltd., is proposed to be started with a capital of 4 lakhs of rupees divided into shares of Rs. 100 each.

The Government of Madras have approved certain proposals of the Director of Industries to extend the Chengalvaroya Naicker's Technical Institute, that it may be utilized for the training of Mechanical Foremen, Fitters, &c. The proposals are :—

(1) The Institute should be equipped with additional machinery and tools at a cost of Rs. 9,000 of which Government should contribute two-thirds.

(2) The Trustees of the School should construct a second workshop at a cost not exceeding Rs. 4,000.

(3) A qualified European Superintendent be appointed on Rs. 400 per month.

A new candle Factory has been established in Madras with the aid of Mr. H. Ananta Subramania Iyer, an expert who had his training in Japan after a course of study in Madras Engineering College. Japanese machinery has been imported.

At the second Nellore District Conference which was held in October, important speeches were made advocating the necessity of industrial development and spread of technical education.

BENGAL

A Bengalee student has been sent to England to qualify as a Chartered Accountant. Considering the rapidity with which limited liability companies have sprung into existence of late in India, and the necessity of having at hand the services of competent accountants as auditors, there appears to be ample scope for young men in this line. Bombay justly claims the credit of having the first chartered accountant and Bengal appears to be determined to follow in the footsteps of Bombay in this matter.

Bankura Agricultural and Industrial Exhibition was held in February last and was opened by the Hon'ble Mr. Justice Digambar Chatterjee. The exhibits in the agricultural section were larger than in previous years.

The Ganesh Cloth Mills Co., of Calcutta, has been started with a capital of five lakhs divided into 5,000 shares.

The Bengal Chamber of commerce has recommended to the Local Government that Scholarships for 1910 be awarded for the study of coal-mining which offers very lucrative openings to trained men in Bengal.

Under the superintendence of Mr. M. N. Ghose, M. C. E. (Japan), the Jessore Comb, Button, and Mat Mfg. Co., Ltd., is making good progress. The initial experiments of the company having proved highly successful, the promoters have been encouraged to erect a big commodious shed for the Workshop and have ordered 12 sets of comb-making machines and an Engine to start work on a large scale. The combs and mats turned out by the Company are highly appreciated by the public. A Mica Factory has been established near Calcutta, where mica is ground into fine dust and is used in the preparation of a paste for boiler and other covering. The annual export of mica to Europe and America based on the average of the last three years' figures, has exceeded the sum of 80 lakhs at Rs. 75 per cent.

The Committee of the Association for the advance of Scientific and Industrial education of Indians, Calcutta, has resolved to form an Association of all the manufacturers of Bengal for the following purposes :—

- (1) To secure co-operation among the various factories.
- (2) To push forward the sale of the products of those factories.
- (3) To secure mutual help.
- (4) To avoid the closing of concerns which have met with failures in the beginning.
- (5) To secure proper financing of *bona fide* manufacturing companies.
- (6) To prevent the starting of bogus companies.
- (7) To see that factories and other concerns are started on proper business lines.

The manufacture of steel trunks and boxes is coming into vogue and a series of agricultural and industrial exhibitions have been held in various centres in the Province during the year.

An association of manufacturers has been formed at Calcutta for promoting mutual help and co-operation among the manufacturers of Bengal. The Government of Bengal are said to have promised to pay to the association Rs. 5,000 annually.

Addition of 400 looms has been made to the Ganges Jute Manufacturing Co. of Calcutta at a cost about Rs. 9,000 per loom. Corresponding extension had to be made to the buildings, machinery, &c.

From the Report of the seventh annual meeting of the association for the advancement of Scientific and Technical education, it appears that the financial position of the association is secure and has been considerably strengthened by annual grant of Rs. 5,000 by the Government of Bengal. Twenty-two students returned from foreign countries last year after completing their courses. Within six years this institution sent more than 200 students to foreign countries for study, a fact which speaks volumes in favor of the munificence and public spirit of some of the Bengal

leaders ; at this meeting the following important resolutions were passed:

(1) That the Government should respectfully be asked to fulfil its promise to start graduate classes in Mechanical, Electrical Engineering, Mining and Industrial Chemistry in connection with the Sibpore Engineering College.

(2) That this council appeals to Indian capitalists to employ Indian in preference to foreign experts to start new industries.

(8) That the council urges upon the Government and universities to provide for the study of German, French and Japanese and for the manual training of youths.

(4) In the opinion of the council of this association, Indian capitalists may start with every prospect of success, the following industries with the help of students who have returned after duly completing their courses in foreign countries :—

Matches, pencils, porcelain, enamel, tobacco, sugar, hosiery, soap, perfumery, paper, glass, umbrella, biscuit, leather and printing ink industries.

(5) That a syndicate be formed to raise 25 lakhs of rupees from the people of Bengal for giving employment to these students by starting any of the above industries.

Sixty students were sent by the association this year. Of this number 26 are going to America, 24 to England, 5 to Japan, 3 to Germany and 2 to France. Five of these students will get a scholarship of Rs. 75 per month, eight of Rs. 50 and four of Rs. 25 a month. The remaining 43 have been granted passage only. Among the students there are three Mahomedans, 1 Assamese, 1 Behari, 1 Utkaliya, 1 Indian Christian, and the rest Bengali Hindus.

Seven students have been awarded scholarships by the National Council of Education, Calcutta, and left in August last for America for technical education. Of these 4 belong to Dacca; one to Faridpur, and one to Calcutta.

In March last, at a well attended meeting of Swadeshi dealers, manufacturers, and bankers, a Swadeshi Chamber of Commerce was established. Requisite funds were eagerly subscribed and a sum of money needed for current expenses

was paid on the spot. It aims to be an all comprehensive organisation to embrace the entire industrial activities of the swadeshi movement.

The art and agricultural exhibitions were held at Serampore and Hoogley under very encouraging auspices.

The Maharaja Kumar Shashikanta of Mymensingh has made a further donation of Rs. 25,000 for a chemical laboratory for the Anandmohun College in addition to his former donation of Rs. 20,000 for the College building.

The record of the progress of mining instruction in Bengal in the Colliery District contains an appreciative remark regarding the accuracy and practical knowledge displayed by Indian candidates in answering their examination questions, as compared with the answers of European candidates.

Mr. A Brown, Mining Engineer has announced through the medium of the "commerce" of Calcutta, that he has discovered the largest deposit in India of galena (sulphide of lead) and is desirous of forming a syndicate to work the property.

Out of the youngmen sent abroad by the association for the advancement of Scientific and Industrial Education, the latest arrival is Dr. W. C. Chowdry, who proceeded to Germany about four years ago. This young man who had a brilliant college career in India has passed his Examination as Doctor of Philosophy and has made a thorough study of Ceramics both practical and theoretical.

BEHAR

The third Behar Industrial Conference met at Muzaffarpur in April last under the Presidentship of Mr. Syed Hasan Imam. Mr. Hasan Imam pointed out that although economics was related to politics, economical questions were capable of treatment without being dragged into the controversial ethics that regulated the contest of political parties. Individual efficiency being the keynote to national success, he strongly advocated free and compulsory education as well as technical and commercial training.

The sixth Behar Agricultural and Industrial Exhibition

was held at Bankipur in February last and the opening ceremony was performed by Mr. Maude, the Commissioner of the Patna Division. Babu Purnendra Narayan Sinha Senior Govt. Pleader and Honorary Secretary of the Exhibition, read a very interesting report describing the industrial activities of the Province. The Hon'ble Mr. Mazharul Huq has started a limited company at Dinapore with a capital of Rs. 50,000 for tanning leather, curing skins, and manufacturing leather goods. Babu Basanti Charan Singh of Muzaffarpur has started fruit canning industry. The button factory of Mehshi has made much progress during the last year. Bell-metal and German silver industries have been introduced in Patna City where articles of these metals are being made for the first time. Hurricane lanterns after the Dietz pattern, sola hats and tin stills are also made in some places. Experiments are under trial to rear endi silk worms. A water lifting machine has been devised by Sayad Yusaf Imam and manufactured at the iron factory of Mr. Hasan Imam. There appears to be much industrial awakening on the whole in Behar.

Much credit is due to Mr. Basanti Charan Sinha, M.A., High Court Vakil of Muzafferpore for the success that he has achieved in his experiments in Fruit preserving industry.

An Agricultural and Industrial show was held at Bihta (Patna District) in March last on the occasion of Shivratri Mela held there. The exhibition consisted of agricultural and industrial courts and prizes were awarded to successful exhibitors.

An Industrial and Agricultural Exhibition was held at Noakhali in March last. The elite of the town, officials, non-officials and gentlemen from the mofussil were present at the opening ceremony which was performed by the Commissioner, Mr. J. N. Gupta: the President explained the object of the Exhibition and advocated the necessity of holding a Divisional Exhibition every year in each District by turn, towards which Government should largely contribute. Dairy farming, poultry rearing and cocoanut industry being the principal industries are in need of encouragement.

PUNJAB

Mr. Ram Ratan, District Surveyor, P. W. Department has obtained a patent for an automatic collision preventor, which is an ingenious contrivance to prevent Railway collision between any two adjacent Railway stations.

Mr. Shiv Narain, B.A. has completed his course of Textile Engineering at the Municipal School of Technology, Manchester, and has obtained much practical experience from the mills of England.

The Indian Tobacco Manufacturing Co. has been established at Lahore with a capital of one and a half lakhs of Rupees of 25 each share. The company proposes to manufacture, cigarettes, cheroots and snuff.

Mr. A. Roller of Berlin proposes to start a match factory in the Punjab that could turn out 700 gross of filled boxes per day with a capital of one lakh and seventy thousand.

It is announced that about 7,000 maunds of American cotton were produced in the Punjab last year.

An association has been formed at Lahore for promoting scientific and industrial education, Mr. Dhuni Chand, Bar-at-Law being its Honorary Secretary. The object of the association is to send out qualified Hindu students of the Punjab and N. W. F. Provinces to foreign countries for acquiring technical education. The students will be paid a monthly scholarship of Rs. 120 in America or Europe and Rs. 60 in Japan, in addition to Railway fare and passage money.

An Indian Chamber of Commerce has been formed at Lahore with the object of promoting and protecting trade, commerce and manufactures in the Punjab, to arbitrate in the settlement of disputes in commercial matters.

The Lahore Municipality has allotted a sum of Rs. 2,400 for the encouragement of Indian art products and a sub-committee has been appointed to arrange the holding of a monthly fair for the purpose in the local Municipal Gardens.

The opening ceremony of the Mahomedan Technical

Night School at Lahore, started under the auspices of the Anjuman Hamic Hunar Mandan was performed in June last. It is contemplated to convert this into a Day School if the well to do Mahomedans, would come forward and give it the needed pecuniary help. The school as at present conducted is established principally to suit the requirements of persons, who are engaged during the day and are desirous of gaining technical knowledge.

Colonel Rennick a well known planter of the Kulu Valley has recently developed a new industry in the hills beyond Simla. In the centre of a tract of extensive potato cultivation Colonel Rennick has started a factory for making potato meal, large quantities of which are being purchased by the Indian army as emergency ration. The process may be briefly described thus :—

The potatoes after being boiled and peeled by hand labour are then crushed by a machine driven by an Engine, preserved by a patent process and packed in hermetically sealed tins of a pound each. It is understood that the pound tin of potato meal can be obtained for about 8 or 9 annas. Two ounces suffice for one person for a day's use.

UNITED PROVINCES

In connection with the Mugh Mela an Allahabad District Industrial and Agricultural Exhibition was opened on 10th January and continued up to the 15th February last. Articles produced in the District were only accepted, arrangements being made to add a lady's and children's department thereto. The exhibition proved a source of great interest and enjoyment to many thousands of people who came to bathe in the Ganges during the month.

A large number of exhibits has been sent by the Hewett Weaving School of Bara Banki to the U. P. Exhibition which is now being held at Allahabad including Hosiery, lace work and embroidery. This school was formally opened by Sir John Hewett, the popular Lt.-Governor of U. P. in February last. A weaving competition is to be held from 9th to 11th January 1911 in connection with U. P. Exhibition, Allahabad; and with the object of

encouraging the weavers of the Province, a special set of prizes will be reserved for them. In addition to this, prizes in money and medals will be awarded to successful competitors and it is also hoped that the competition will attract makers of new types of inexpensive handlooms and induce them to exhibit their looms.

The Fourth U. P. Industrial Conference was held in March last at Benares under the presidentship of Khan Bahadur S. M. Hadi, at which papers on various important subjects were read and many topics of interest in connection with industrial matters were discussed.

A Sugar Factory was started at Pillibhit by Rai Sahidri Sahu Lalla Prasad and his brother Har Prasad. At the opening ceremony of the factory, Mr. Tweedy, the Commissioner presided.

The Hon'ble Mr. Sanders, the Commissioner laid the foundation stone in March last of the Ganga Glass Works, Ltd., at Hardoi.

A demonstration was given at the recent Shia conference convened at Lucknow of the new development in Mr. Hadi's process of sugar manufacture. This process will enable anyone to set up a small sugar concern with a capital of about Rs. 600 to start the business, and the output is about three maunds of sugar from one mechanic working for ten hours a day.

The opening ceremony of the Hewett Weaving School at Bara Banki was performed in February last by His Honor Sir John Hewett, the Lieut-Governor of the U. P. His Honor pointed out in the course of his reply to the address presented to him on the occasion, the need of raising the standard of elementary education among the weavers and to teach them the use of improved handlooms. As a result of the deliberations at the Industrial Conference of Naini Tal in 1907, it was announced by His Honor, that an experimental weaving station was to be established at Benares and several demonstration schools at suitable localities in the Province.

Dr. Coomaraswamy has offered a prize of Rs. 250 for the best essay upon "Trade Guilds (shreni) in India," on the following conditions :—

(1) The principal factor in determining the award will be the amount of exact and detailed information.

(2) The competitors are advised to select any guild or guilds in a manufacturing town; for instance the silk weavers' guild in Benares or one of weavers' or metal workers' guilds of Ahmedabad or Gujerat and make a detailed study of the same. The essay should contain, history of the guild, duties of members and officers, the object, the mode of work and settlement of differences of opinion, &c.

The Cawnpore Sugar Works, Ltd., one of the largest producers of sugar in India, have taken the initiative in moving towards the establishment of an Indian Sugar League, the object of which will be to enrol all the sugar producers in India for the introduction of reforms in the methods of cultivation and manufacture.

The District Industrial and Agricultural Exhibition was held at Debipatan, Gonda with the annual horse fair, in April last under the patronage of the Maharaja of Balrampur.

C. P. AND BERAR

The Bank of Berar, Ltd., is the name of a bank newly started at Amraoti, to meet the commercial needs of the Province of Berar. It is proposed to open branches of this concern at the principal towns in Berar under the superintendence of experienced Bankers, and also at Bombay. The total number of shares of this Bank is 10,000 of Rs. 100 each, to be paid by easy instalments. The Board of Directors is composed of some of the leading pleaders of Amraoti, including Messrs. Pandurang Govind, J. K. Asnare and others and a few bankers of Thugaon in the Amraoti District; Messrs. N. M. Bedarkar and S. B. Tambe, High Court Pleaders are its legal advisers.

The ceremony of opening the Berhampur Tapti Mills, Ltd., was performed in January last by the Deputy Commissioner of Khandwa, in the presence of a very large and representative gathering composed of the prominent members of all the communities of that place. The mill owes its origin to the efforts of the late Rao Bahadur Balwant Rao Govind Rao Bhuskute, who had laid its foundation stone.

The Netra Manganese Company, Ltd., is the little of a new venture started at Chindwara by Rai Saheb Mathura Prasad, Motilal and Co., who have obtained after considerable labour and perseverance the prospecting licenses and mining leases from the Government.

The Central Provinces Railway Company has been formed with the object of constructing feeder lines from Murtizapur to Elichpur and from Murtizapur to Yeotmal, to be worked by the G. I. P. Railway Company.

BURMA

The Rangoon Oil Company's capital has been increased from ten to thirty lakhs of Rupees and a bonus of 25 per cent. declared.

The Annual Art Handicrafts Exhibition was held at Rangoon in February last and is reported to have been a great success.

The South Indian Industrial Association of Rangoon has sent Mr. D. Sadashivan, late Professor of Science, Pittapur College, Cocanada to Manchester to study textile industry (dyeing, calico printing, &c.)

MYSORE

The Tata Silk Farm at Bangalore has been taken over by the Salvation Army in India.

Dr. Coleman the Mycologist and Entomologist gave a demonstration on the subject of sugar making at the Government Agricultural Farm at Hebbal near Bangalore, to a large gathering of farmers and others interested in development of sugar industry in February last.

The foundation stone of the Vakkaligara Sangha, Bangalore, was laid by the Yuvaraj of Mysore. The object of the Sangha is to diffuse education among the agricultural population, and to induce them to adopt improved methods of Agriculture and new machinery and appliances.

TRAVANCORE

A Swadeshi Rubber Company has been formed by some leading enterprising men of Travancore for the purpose of

Rubber Plantation. The company is floated with a capital of 4½ lakhs of Rupees, divided into 15,000 shares of Rs. 30 each. It is likely that the shares of the Company will be purchased quickly.

Mr. C. W. Schornburg, the representative of the London Cosmopolitan Mining Company has secured valuable concessions from the Travancore Darbar to collect monozife sand from the whole sea coast of South Travancore for 17 miles north of Quilon. A factory for treating the sand is shortly to be erected.

Kerala Rubber & Produce Co., Ltd., is the title of a new Rubber Company registered at Kottayam. Mr. P. John of Messrs. S. John & Sons of Alleppey is the managing Director.

ICHAL KURANJI

The opening ceremony of the first Ginning Factory in the State was performed by the Chief of the State who highly appreciated the enterprise of the local traders.

NIZAM STATE

Cotton cultivation is making rapid progress in the Nizams' dominions above 2 million acres of land are already under cotton crop, the outturn for the current year has been estimated at 380,000 bales.

APPENDIX A

Industrial Survey Questions and Answers.

Amraoli, August 1910.

DEAR SIR,

I beg to forward herewith a set of questions framed for the purpose of collecting the information, in connection with agriculture, education, and general industrial activity in your State. I trust that you will be so good as to give early attention to this matter, and send your reply at as early a date as possible, so that the information so collected might be classified and compiled before the beginning of October next. If the information sought for is received within the period mentioned, it is proposed to incorporate the same in the Report of the ensuing Industrial Conference to be held at Allhabad in December next.

If it is not possible to answer all the queries, an attempt should be made to answer only those about which information is available, other portions being left blank.

Yours faithfully,

(Sd). R. N. MUDHOLKAR,

General Secretary.

QUESTIONS TO BE ANSWERED.

A.—Agriculture.

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

privileged tenants, and to what extent by mere tenants at will?

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

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

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

B.—Manufacturing Industries.

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

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

9. What is their present condition ?

10. What was their condition in the *past* ?

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

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

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

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

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

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

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

17. What industries existed in your district formerly but have since decayed ?

18. What are the causes of their decay ?

19. Is it practicable to revive any of them profitably ?

20. If so, suggest measures to bring about their revival.

C.—Minerals and other Natural Products.

21. Name the mineral and other natural products of your district which are or can be manufactured into finished articles of consumption and use.

22. Which of these are manufactured in your district ?

23. Which, if any, of these are sent to other parts of the country for manufacture ?

24. Which of them are exported to foreign countries in their raw state, and re-imported as finished articles ?

D.—Capital.

25. What banking facilities are there for the support of the industries in your district ?

26. Have any urban industrial banks been started in any town of your district under the provisions of the Co-operative Credit Societies Act ?

27. If so, give particulars in regard to their organization, the capital employed, the conditions of lending and borrowing, etc.

E.—Technical Education.

28. What facilities are there for training young men in the various industries that exist in your district ?

29. If there are any special schools for the purpose, give particulars in regard to their curricula.

30. Is instruction given both in the practice of and the principles which underlie an industry, or, is it theoretical merely or merely empirical ?

31. What success has attended these schools?
32. Are industrial and commercial classes attached to any of the schools in your district?
33. If so, give full particulars in regard to them.
34. Have any students been sent abroad from your district to acquire technical, industrial or commercial education?
35. What are their qualifications and were they tested?
36. Who, or what agency, has sent them, and under what conditions, if any?
37. In what countries are they being trained?
38. What arrangements are made to utilise their special technical knowledge by the supply of capital or otherwise, to start or develop the industries in which they receive special training?
39. Are there at present in your district any persons who have received special training in any industry? If so, what are the industries in which they have been trained?
40. How are they employed at present?
41. If their knowledge is not being utilised, what steps can be, or are proposed to be taken, to utilize it?

F.—Industrial Associations.

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

1.—NIZAM STATE.

ANSWERS

A.—Agriculture.

1. The Agricultural Industry is carried on according to the old Native fashion. No modern improvements have been introduced.
2. His Highness' Dominions are divided into two great divisions,—the Mahratwara or dry country, and the Telingana in the Eastern part of the Dominions where there is a large extent of cultivation under rain-fed tanks. The soil in this latter part is mostly of a sandy nature and there are large tracts of country in which dry cultivation is not

possible. In the Mahratwara country it may generally be said that every available acre of culturable land is taken up for cultivation. It is quite the exception to find any fields unoccupied, although the ryots themselves periodically allow their fields to lie fallow for the sake either of grazing or giving the land a rest.

3. In the Mahratwara country, the soil in a large part is *regar* or black cotton soil; in other places it is brown loam. In the Telingana, in some parts there is *regar* soil not much valued by the people, and in other parts brown Mahasab soil mixed with sand and which is well suited for irrigation crops. This class of soil is also largely occupied by castor seed cultivation, which, in parts of the Telingana country, has been as valuable to the ryots as cotton crops in the Mahratwara districts.

4. The Land Settlement of His Highness' Dominions is on the ryotwari system. The ryots hold the proprietary and hereditary right of occupation subject to the punctual payment of the Government demand; and fields in this way descend from father to son without the interference of Government beyond the recognition of the heir. Government does not recognise any privileged tenants, if by 'privileged' is meant holding on exceptionally favourable terms. In cases of disputes, the tenant or Shikmidar who is holding the land for a period exceeding 12 years is generally recognised as a tenant. The extent to which land is held by privileged tenants, which would here mean by Shikmidar or sharers of the registered holder, and by mere tenants-at-will, cannot be given.

6. (a) No measures have been adopted for supplying cheap capital.
- (b) An Agricultural School has been started at Aurangabad, but it is still in its infancy.
- (c) Very little has been done under this head. In the case of sugar cane mills, the ryots themselves have imported mills of improved type and the old Native *Ghana* is now out of use in parts where sugar cane is cultivated to any extent. Beyond this no special measures have been adopted.

- (d) The ryots themselves thoroughly understand the use of manure and they place a great value upon it and use it as far as they possibly can. No special measures under this head have been introduced by Government.

B.—Manufacturing Industries.

8. (1) To give complete information under this head will require a reference to the districts, and it might take several months to obtain the information. It is perhaps sufficient to say that several towns, such as Aurangabad, Pattan, Nanded, Narayanpet, Warangal and other places are noted for their handloom industries in the manufacture of Art Textile Fabrics. Under the other heads, there is nothing very special to mention. None of the articles referred to are exported in a great extent, nor is there anything of special value manufactured under these heads.
9. Local industries, specially in Fine Art class, are languishing. Aurangabad, Pattan and such like places, which used largely to supply the wealthy classes in Hyderabad with their clothing, are now feeling competition with Benares and other places for a similar style of clothing, and the large trade which they used to carry on is now a thing of the past. Several weavers, have imported improved hand-looms; but these people do not attempt to make fine cloths for which Aurangabad and other places were famous in olden days.
10. In former days these industries were carried to a much larger extent than now.
11. Without reference to districts, which would take time, it is impossible to give the approximate number of people employed in these industries; to obtain returns, it will take time.
12. The approximate value of handloom weaving cannot be given. There are three mills established in the Dominions—Hyderabad, Aurangabad and Gulbargah—whose aggregate capital is Rs. 32,00,000.

13. Outside competition has greatly affected the handloom weavers; to give figures under this head is not possible.
14. The products of these industries are, mostly disposed of locally and exports are trifling.
15. If an increased demand arose, there would be no difficulty in increasing supply.
16. (a) The system of giving advances has been tried at Nanded, but it has had no beneficial result and the weavers there are as poor as they were before.
- (b) No doubt improved appliances which are being gradually introduced by local men with a little capital will help the weavers; but the appliances must be moderate in price.
- (c) Special instructions are being given in the Industrial School at Aurangabad and in time the good effects of this will be more apparent than they are now.
- (d) There is room in this country for the expansion of weaving by power machinery.
17. The only industry I know of which previously existed to a considerable extent and is now obsolete, is the manufacture of steel blades which used to be carried on at Elgandal. It is said that the finest blades were exported in the olden days to Damascus. I do not know of other industries which have died out, but a good many have decayed such as the manufacture of fine cloths at Aurangabad and other places, and carpets of Warangal, and a good many have decayed or are in a languishing state.
18. It is difficult in a short answer to give all the causes of decay. They may be attributed to apathy and want of enterprise of persons carrying on these trades, to persons taking to agriculture rather than to their own trade, to the importation of power-made goods, either imported from Europe or from Mills in Bombay and elsewhere, to the habit of the younger generations of Indians to wear English clothes and clothes made of English fashion rather than their own national style of dress.
19. Yes, no doubt, it is so in some cases.

20. The Weaving industry might certainly be revived to some extent if small capitalists would take an interest in it.

D.—Capital.

25. The banking facilities in this country, except in Hyderabad itself, consist of the Marwaris of Central India, or the Komties, whose native place is either here or in the Madras districts.

26. No.

27. No.

In the above replies I have strictly limited myself to the questions put by the Indian Industrial Conference. I have referred to agricultural, manufacturing industries &c. The word 'manufacturing' seems to exclude other industries, such as ginning of cotton, pressing of cotton, cleaning of rice and such like. These latter industries are of much importance in this country. In recent years many factories have been erected, and there are at the present moment the following factories established and worked during the cotton season.

Ginning	...	...	81
Pressing	...	...	34
Rice Mills	...	...	13
Flour Mills	...	...	5
Oil Mills	...	...	10
Silk weaving Mills	...	...	2

These factories employ a large number of people and in the cotton districts, where previously after the harvest people were thrown out of employment and sometimes found it difficult to get sufficient to eat for themselves and their families, they are now earning large wages, and are very much better off than in previous years. It is not an unusual thing in the cotton districts to have to pay a cooly, who formerly was satisfied with 1 annas a day, a sum of 8 annas; and the hire of carts which formerly was from 12 annas to Re. 1 is now from Rs. 2 to Rs. 3 a day in those parts. In previous years, the ryots when they had good season used to invest their savings in silver ornaments, now they scarcely look at silver and it has been a noticeable feature of the past year when the ryots made a large profit

on their cotton crops that they invested largely in gold, and much of this gold was bought by them in the form of British Sovereigns. The local industries of the country are undoubtedly languishing but the prosperity of the ryots generally has materially increased. The standard of living is higher than it used to be, and although the price of the necessary commodities of life has greatly increased, at the same time there has been an increase in the wages of labour, and the people who really are suffering are those on fixed salaries who are not able to earn an income which labourers earn and whose salaries have not increased in proportion to the rise in the price of articles for consumption.

2.—BHOPAL STATE.

ANSWERS.

A.—Agriculture.

1 & 2. Improving.

About 54 % of the culturable area has been already brought under cultivation and more is very shortly expected.

3. Moran, Kabar and Siyar of which Moran (a rich soil) is greater.

4. Generally good.

5. There is no land owner holding proprietary rights in this State. The Moafidars, however, can be classed as such, and the area in their possession amounts to 14,221 Bhopal Bighas. There are two other classes of tenants *viz.* *Mauroosi* (occupancy) and *Mamuli* (ordinary) and the total area held by them measures 18,88,403 Bhopal Bighas. The privileged tenants possess 2,01,200 Bhopal Bighas, mere tenants-at-will do not exist in this State.

6. (a) No arrangement has yet been made. It has however been arranged that Takavi (cash and seed loan) without interest might be advanced to the tenants.

(b) Three villages have been set apart for an Agricultural Farm which has not as yet been opened.

(c) Deep-well lift and improved water pumps or improved charas have been introduced;

- (d) Resort to recuperative processes not being found necessary, as the people arrange for it themselves.

7. No public co-operation society has been established. The agriculturists having now been given due powers and privileges at the last settlement it is hoped that the system will soon be utilised to by those wanting it.

B.—Manufacturing Industries.

8. Except opium and Ginning and Pressing industries the State has no industries of any importance.

- (1) The usual coarse cloth is made in all villages. Also fine cloth and Muslin is made.

- (7) Good Daris and blankets are made by Jail industries.

11. In Ginning and Pressing Factory the average number of persons employed daily is above 60.

12. The above factory works on Contract.

14. The above industries supply for the most part the local demand.

C.—Minerals and other Natural Products.

21. The chief mineral products of the State are the magnificent sandstones met with in many places and which have been extensively used since the days of the Sanchi *Tope* (250 B. C.) up to the present time in the construction of buildings. Lime being obtained from *Lanker* is worked by the State P. W. D. Iron ore is also found in some parts and the metal smelted.

23. None.

24. None.

E.—Technical Education.

28. Industrial schools are being maintained for training young boys and girls in various industries, and every encouragement is given for the purpose by the State.

29. There are two special schools for the purpose. One the "Widows" Industrial School and the other the Bhopal Industrial Institute. They impart instruction in knitting, sewing, tailoring and also shoe-making.

30. The instruction is merely empirical.

31. Through the instruction given in the above schools, several of the widows who could not earn themselves and lived upon other's resources are now able to earn an independent living.

32. An industrial class is attached to the Bhopal Sulemani Anglo Vernacular School.

33. The above class gives instruction in knitting, sewing and shoe-making.

34. A few students have been sent abroad for this education.

35. Some of them are Matriculated in English and some possess a practical knowledge in English and Vernacular; they were tested here and by the Allahabad University.

36. No Agency, but the Bhopal State has sent them.

37. Cawnpore, Lahore, Bombay.

38. They will be employed in the State and their knowledge will be utilised by the State as may be necessary.

39. Yes. Agriculture and Arts.

40. They are serving the State.

41. Knowledge is being utilised.

3.—GONDAL STATE.

ANSWERS.

A.—Agriculture.

1. Fairly good.

2. Greater portion has been brought under cultivation; nearly 1/40th remains uncultivated.

3. Greater part of the soil is rich black, a small portion being mixed with sand.

4. Fairly good.

5. The general condition of the land owning classes is fair, and that of cultivating classes fairly good. Nearly three-fourths of the cultivators hold land under a proprietary tenure and the rest are tenants-at-will.

6. (a) Capital is generally employed by village Shahookars at the rate of interest ranging from 12 to 18 per cent. per annum.

- (b) Recently a specialist is employed for imparting these instructions.
- (c) None, except sugar-cane presses manufactured in Northern India.
- (d) Ordinary farm manure, and bones manure are used, the people being too poor to pay for dearer manures.

7. The village co-operative credit system is not being taken advantage of by the cultivators in this State.

B.—Manufacturing Industries.

- 8. (1) There are hand-loom for cotton, wool and silk fabrics.
- (2) to (4) None.
- (5) There is an iron foundry at Gondal.
- (6) None.
- (7) Ornamental articles on the lathe and toys.
- (8) Limestone and harder black-stone.

11. About three thousand people.

14. The products are not even sufficient for local demand.

16. (a) to (d) If improvement is made in hand-loom for weaving, and properly introduced, the industry is capable of expansion under these heads.

17. The gold thread hand-loom industry was in existence formerly, but has since decayed.

18. Importation of cheap stuff.

19. No, on account of the variation in the tastes of the people.

C.—Minerals and other Natural Products.

21. Stone generally used for building purposes.

22. A hard stone found near Mojera is locally manufactured into mill-stones for grinding and into mortars for pounding.

D.—Capital.

25. No other banking facilities than these afforded by Shahookars.

26. No.

E.—Technical Education.

28. There was a workshop previously established at Gondal, but it failed for want of any support from people. 29 and 30. No.

F.—Industrial Associations.

42. There is an agricultural association in the chief town, which helps people by holding fairs and exhibitions and discussing agricultural topics.

APPENDIX B

INDIAN PATENTS.*

APPLICATIONS FILED

1. Jhammanlal and Bedram of Aligarh, for improvements in padlocks and the like.
2. Chandra Mohan Roy of Lucknow, for improved beater bars for disintegrators.
3. Hukam Chand of Bakhlaur, for a bullock engine.
4. M. S. Somasundara Mudaliar of Streeperambudur, and M. S. Shunmuga Mudaliar of Madura, for an improved gravity water lift.
5. Sham Sunder Lal and Radha Raman Lal of Allahabad, for a dentifrice.
6. Ramuath Mundal of Calcutta, for improved harmonium reeds and improved hand and portable harmoniums.
7. Maunga Ba Pe of Mandalay, for the new patent sandal.
8. Ram Ratan of Muzaffarnagar, U. P. for Dewans' automatic collisions preventer, viz., a contrivance to prevent railway collisions automatically between any two adjacent railway stations.
9. Lala Kanhialal Nandkishore of Bombay, for improvements in locks and padlocks.
10. Charu Chandra Ghosh of Pusa, for an improved type of the hand spinning machine called the Pusa continuous spinning machine.
11. Tehentan Bamanshaw of Bombay, for an improved key for regulating sluices, hydrants and stopcocks affixed to water pipes.
12. Ramchandra Moreshwar Jog of Poona, for improvements in casks and barrels.
13. Jahar Lal Dhar, Pandit Gungadutt Misser and Rameshwar Singh, all of Calcutta, L.H. Row of London, for

improvements in and relating to the treatment of ramie, China grass and other fibrous substances.

14. Makhan Lal Dey of Howrah, for a combined die and tap for the manufacture of sheet steel or sheet iron pans by screw or hydraulic pressing.
15. Harchand Mancharam & Sons of Bombay, for improvements in fire and thief proof safes.
16. Vishnu K. Paranjape of Lonauli, G.I.P.R. for dust proof stoppers for glass bottles.
17. J. C. Dallas Engineers of Barrackpore, for improvements in automatic flushing apparatus for latrines.
18. Abdulla Sharafdin of Bombay, for an automatically working hot air motor fan.
19. Kanhaya Lal of Sitapur, (Oudh), for hand power grinding machine.
20. Khan Sahib Mohboobalum of Jallundhur, for improvements in water lifts.
21. Mohkam Singh & Sons of Gujranwala, for camp harmonium.
22. Anant S. Desai of Bombay, for improvements in wire drawing.
23. M. R. Rangachari of Karnool, Madras, for "nava supari" or the new substitute for arecanut.
24. T. V. Sundaram Aiyar of Madras, for a key board for typing tamil language.
25. Munshi Hoosain Buksh of Meerut, for a double acting hand power water lift.
26. Pirojshaw B. Godrej of Bombay, for improvements in safes, and in non-conductors of heat applicable to fire proof safes.
27. Syamala of Madura, for a water lift.
28. Rao Bahadur C. Nagojee Rau of Coimbatore, for a harmonium with twenty-two notes in each octave.
29. O. S. Surgia of Bombay, for improvements in gin rollers.
30. Rasik Chandra Mandal and Ram Chandra Nandi of Howrah, for handis or cooking utensils to be made of cast iron of different shapes and sizes.

* Compiled from Lists published in the Indian Textile Journal from November 1909 to October 1910.

31. Dr. Indoo Madhub Mallick of Calcutta, for improvement in receptacles whether portable or stationary in which food or the like may be cooked or kept warm, or cold.
32. Ishwar Das of Aligarh, for an improved padlock.
33. Abdul Rahim of Amroha, India, for an improved street watering cart with an automatic and adjustable spray distributor.
34. Kharak Singh of Lyallpur, Panjab, for lifting water from wells, etc.
35. Ambadas V. Haldipur of Bombay, for the simplex cradle.
36. Theettalam Vellaiyachariar Pachaiyappachariar of Madras, for goldsmith bar shaper.
37. Bawa Narain Singh of Raigarh, for improvements in rail joints.
38. Sundar Ahmad of Lahore, for a plough.
39. Hafeez Abdur Razak of Cawnpore, for double puttee or tabular lagging.
40. Peare Lal Mistre of Muttra, for a lock.
41. Fateh Mohamed Deura & Co., of Sialkote, Punjab, for champion polo stick.
42. Thakorlal Nathalal Yajnik of Baroda, for formation of the characters of the different languages by the combination of the several parts of the holy Vedic syllable "Pranava".
43. Gulbux Khan Lalbaz Khan of Hyderabad, Sind, for disposal of nightsoil and rubbish called the "Gulbas Latrine Incinerator."
44. Mohendra Pratap of Muttra, for a new pattern of a fire place.
45. M. Yusuf of Naini Tal, for a punkha pulling machine.
46. A. Sharafdin of Bombay, for an automatically working hot air motor fan.
47. V. S. Gnanaprakasam of Vepery, Madras, for combined rain water trap and gully with air tight frame and cover.
48. M. Shurfuddin Ahmed of Selang, Assam, for automatic fan.

49. V. Krishnamachari of Madras, for typewriting, in Devanagari (which covers Sanskrit, Marathi, and Hindi) Gujarathi, Tamil, Telugu, Kanarese and Malayalam characters.
50. Rahimtoola Ismail of Bombay, for improvements on lever locks.
51. Mistri Kuber Moti of Ahmedabad, for a new design of loom fork.
52. Manuck Lal, of Bikaner, for A. K. carpet.
53. Kavasjee Karshedjee Bhappu of Karachi, for an improved oil mill.
54. N. D. Hari Ram and brother of Rawal Pindi, for the simplex patent latrine seat.
55. Lala Kanhialal Nandkishore of Bombay, for improvements in locks and padlocks.

SPECIFICATIONS FILED.

1. Karim Ilahi and Nabi Baksh of Aligarh, for a new or improved double bolt lock.
2. Mirza Aslam Beg of Lahore, for water lifting machine called Butler Charsa-lifter.
3. E.R. Subroyar of Mysore, a door and window catch.
4. Ramji Das & Co., of Sialkot, for a racket.
6. Gangadhar L. Karvan of Indore, for a slide rule.
7. V. Muhamed Ganni Ravuttar and V. Mahamed Sally Ravuttar, both of Tinnevely, Madras, for a reed grass-matting loom for weaving mats from reeds.
8. Tarak Nath Mukerjee of Belghoria, 24 Purgunnahs, for an improved gate for the manufacture of cooking pans.
9. Hara Dhan Mandal of Howrah, for pulley power jute press regulated by means of connecting rods linked to the crank shaped ends of its arms.
10. Chandra Mohan Roy of Lucknow, for improved beater bars for disintegrators.
11. Ramachandra Moreswar Jog of Poona, for improvements in casks and barrels.
12. Bhola Nath Shantra of Howrah, for the pressing of jute.
13. Haradhan Mondal of Howrah, for pulley power jute press (regulated by sectional pinions).

14. Sorabji M. Rutnagar and Dossabhoy M. Wadia both of Bombay, for improvements in or relating to carding engines.
15. K. Tholasi Doss of Madras, for the Tholasi Doss water lift.
16. Lala Kamhlal Nan/dki-hore of Bombay, for improvements in locks.
17. Harichand Mancharam & Sons of Bombay, for improvements in fire and thief proof safes.
18. Pirojshaw Godrej of Bombay, for improvements in the insulating materials of safe and in locks.
19. J. C. Dallas Engineers of Barrackpore, Bengal, for improved method of and apparatus for sterilizing the effluent of latrines, septic tanks and the like.
20. Hukam Chand of Bakhaur, Punjab, for a bullock engine.
21. Jhammulal and Bedram of Aligarah for improvements in padlocks and the like.
22. Krishnrao S. Pimperker of Coimbatore, for an improved automatic loom to be worked by pedal motion.
23. Ram Ratan of Muzaffernagar U. P. for Dewans automatic collisions preventer.
24. Khan Sahib Mahboobulam of Jullundhur, for improvement in water lift.
25. T. V. Sundaram Aiyar of Madras, for a key board for typing in Tamil language.
26. Wazir Khan Mistry of Jubbulpur, for a threshing machine to be called the Wazir Threshing Machine.
27. T. Rangaswami Aiyangar of Tanjore, Madras, for a water lift.
28. Charu Chandra Ghose of Pusa, for an improved type of hand spinning machine called the Pusa continuous spinning machine.
29. J. C. Dallas of Barrackpore, Bengal, for improvements in automatic flushing apparatus for latrines.
30. Dr. Indoo Madhub Mallick of Calcutta, for improvements in receptacles whether portable or stationary in which food or the like may be cooked or kept warm.
31. M. S. Somasundara Mudaliar of Chingleput, and

- M. S. Shunmuga Mudaliar of Madras, for an improved gravity water lift.
32. Vishnu Kashinath Paranjape of Lonawli, for dust proof stop for glass bottles.
33. Nehal Chand Detaram Adwani of Hyderabad, Sind, for a safety train conductor.
34. Sayyad Munwar Khan of Delhi, for a plough.
35. Durga Dass Gupta of Calcutta, for a comb with two sets of teeth with sprinklers for sprinkling oil in using the comb.
36. Dinshah Pestauji Framji Ghadiali of Surat, for the utilization of the high tension electric spark of permanent and indelible writing without ink.

DESIGNS FILED.

1. Framjee Cowasjee of Bombay, for revolving advertisement.
2. Sumer Chand, Sham Lal Sadh of Farrukhabad, for jungle scenery, printed on cotton, wool or silk.
3. Sree Benoybhusan Raha Dass, of Calcutta, for a vehicle for running on water.
4. Hira Lal Mundal of Khooroot, India, for a cooking pan.
5. Sree Benoy Bhasan Rahu Dass of Calcutta, for an aeroplane

APPENDIX C

JOINT STOCK COMPANIES

Number and particulars of Joint Stock Companies registered in each Province in British India in twelve months with October 1910.

No.	Class and Name	Situation of Registered office	Object	Nominal Capital
I. BANKING, LOAN AND INSURANCE				
<i>(a) BANKING AND LOAN</i>				
1	United Provinces Co-operative Bank	Allahabad, U. P.	Banking business	8,00,000
2	Credit Bank of India, Ltd.	Bombay	Banking business	1,00,00,000
3	Jalpaiguri Lakshmi Loan office	Jalpaiguri, E. B. & A.	Money lending	50,000
4	Navalpattu Deshabhimani Bank	Triplicane, Madras	Banking	10,000
5	Satyamangalam Karpaka Nidhi	Coimbatore, Madras	Money lending	1,00,000
6	Idegurai Majira Govinda Naickenpalavam Sri Kodandarama Kripa Vilasa Nidhi	Do.	Do.	1,00,000
7	N. G. C. I. & Co.	Tanjore, Madras	Do.	1,75,000
8	Karen Co-operative Agricultural Bank	Rangoon, Burma	Banking and Insurance	20,00,000
9	Sri Kunjibhatpa Government Security Permanent Chittu Company	Tanjore, Madras	Banking	75,000
10	Oriental Trading Bank	Vizianagaram, Madras	Banking and Trading	2,00,000
11	Bank of Asia	Rangoon, Burma	Banking	30,00,000
12	Serajanji Loan office Company	Serajanji, E. B. & A.	Do.	50,000
13	People Banking Association	Jubbulpore, C. P. & Berar	Do.	1,00,000
14	Bombay Mortgage and Investment Co.	Bombay	Money lending	50,00,000
15	Pappanaickanpalayampudur Sri Venkatesa Vilasa Nidhi	Coimbatore, Madras	Do.	1,00,000
16	Kuthambakam Sri Kaliyugaraya Perumal Jana Sahaya Dhana Sekara Sasvatha Nidhi	Chingleput	Do.	84,000
17	Eastern Banking Corporation	Calcutta, Bengal	Banking and Loan, etc.	5,00,000
18	Provincial Bank of India	Meerut, U. P.	Do.	2,00,000
19	Popular Bank	Rawal Pindi, Punjab	Banking and Trade, etc.	2,00,000
20	Govindanaickanpalayam Tirumala Paripalana Nidhi	Coimbatore, Madras	Money lending (mutual)	1,00,000
21	Itail Loan office	Mymensingh, E. B. & A.	Banking	20,000
22	Indian Co-operative Bank	Cawnpore, U. P.	Banking	2,50,000
23	Chennai Sri Andal Dhana Sekara Nidhi	Madras	Money lending (mutual)	76,875
24	Dharma Samavaya	Calcutta, Bengal	Banking and Loan business	30,00,000
25	Kayastha Public Beneficial Bank	Meerut, U. P.	Do.	20,000
26	Kathiawad and Ahmedabad Banking Co-operation	Ahmedabad, Bombay	Do.	1,00,00,000
27	Kattalum Rudresswara Swami Kattalar Company	Virdupatti, Madras	Money lending (mutual)	90,000
28	Commercial Association	Walaabad, Madras	Do do.	39,800
29	Baluchistan Banking & Commercial Association	Quetta, Baluchistan	Banking, Trading and Commission Agents, etc.	5,00,000
30	Rangpur Bank	Rangpur, E. B. & A.	Banking	2,50,000
31	Muffasil Bank	Gorakhpur City, U. P.	Do.	20,000
32	Triplicane Hindu Permanent Fund	Triplicane, Madras	Money lending (mutual)	19,980
<i>(b) INSURANCE</i>				
33	People's Marriage Fund	Peshwar, N. W. F. P.	Collecting subscriptions and distributing them at Marriage.	1,00,000
34	New Bombay Presidency Assurance Society	Bombay	Life Insurance	10,00,000

No.	Class and Name	Situation of Registered office	Object	Nominal Capital
35	Bharat Luxmi Provident	Calcutta, Bengal	Life Insurance.	20,000
36	South Indian Marine Insurance Company	Cochin, Madras	Marine Insurance.	2,00,000
37	Arya Insurance Company	Sikhar, E. B. & A.	Insurance, Banking, etc.	20,000
38	Bengal Provident Company	Bangal	Do do.	10,000
39	Asiatic Insurance Company	Ahmedabad, Bombay	Life Assurance, etc.	20,000
40	Chandrasekhar Benefit Society	Chittagong, E. B. & A.	Life and Marriage Insurance	10,000
41	Prabandhu Life Assurance and Marriage Provision Company	Russikonda, Ganjam, Madras	Life Assurance and Marriage Endowment	20,000
42	South Indian Life Investment Company	Madras	Life Assurance	2,50,000
43	Indian Mutual Benefit Fund	Chittagong, E. B. & A.	Life Assurance and Marriage Endowment	20,000
44	All-India Provident Corporation	Calcutta, Bengal	Life and other Insurance	20,000

H. TRADING.

100 Co-OPERATIVE ASSOCIATIONS.

45	Akola Co-operative Pioneers Company	Akola, C. P. and Berar	General Traders & Contractors, etc.	50,000
46	Deccan Co-operative Porcelain Works	Dharwar, Bombay	Manufacturers of Porcelain Works, etc.	20,000
47	Sun Drug Company	Rangoon, Burma	Manufacturing chemicals, drugs and Medicines, etc.	1,50,000
48	Kaliganj Byabasaya Sanftad	Sylhet, E. B. & A.	Trading, etc.	20,000
49	Delepara Tea Company	Jalpaiguri, E. B. & A.	Carrying on the business of Tea and Coffee	1,50,000
50	Purulia Swadeshi Bhandar	Bengal	General Merchants of Indian Arts.	50,000
51	Vaishya Glass Works Company	Ferozabad, V. P.	Manufacturing Glass & Glassware	20,000
52	K. R. Friend and Company	Bahia, V. P.	General Traders	20,000

53	Alexander and Company	Lafore, Punjab	Bankers and Manufacturers of cigars and cigarettes	2,50,000
54	Wiechers Kaiser and Levy	Karachi, Bombay	Merchants and Commission Agents.	30,000
55	Gajanan Industrial and Trading Company.	Satara, Bombay	Manufacturing Safety Matches	40,000
56	Sri Chakras Industries	Tanjore, Madras	Weaving and Trading in cloths	20,000
57	Swadeshi Stores Company	South Malabar, Madras	Trading in Indian Manufactures and Industries	20,000
58	Indian Motor Traction Company	Bengal	Importers and dealers in appliances for Motorcars, etc.	10,000
59	Calcutta Motor Company	Bengal	Engineers & Dealers in Motor-cars	1,00,000
60	Belgaon Weaving and Dyeing Company	Belgaon, Bombay	Weaving and Dyeing, etc.	1,00,000
61	Gujarat Vermicelle Company	Bombay	Confectioners	25,000
62	Nizam Betel Leaves Company	Nellore, Madras	Dealing in Betel Leaves	20,000
63	Milligam and Company	Tuticorin, Madras	Trading in Cotton	1,00,000
64	South Indian Brick and Tile Works	Madras	Manufacturing Bricks & Tiles, etc.	3,00,000
65	Bapatia Co-operative Association	Guntur, Madras	Co-operative Stores	50,000
66	Jorhat Islamia Trading Company	Jorhat, E. B. & A.	General Merchants	20,000
67	Anandpur Timber and Trading Company.	Calcutta, Bengal	Merchants & Dealers in Timber, Grass, etc.	1,50,000
68	Islamia Shawl Trading Company	Amritsar, Punjab	Manufacturing & dealing in Shawls, etc.	50,000
69	William Drug Company	Bombay	Dealers in Drugs	1,50,000
70	Circars Commission Agency Company	Rajahmundry, Madras	Merchants & Agents	1,800
71	South Indian Steam Launch and Motor-car Company	Negapatam, Madras	Carriers by Land and River	20,000
72	Indian Co-operative Stores Co.	Bombay	General Merchants	10,000
73	Nahura Boat Company	Negapatam, Madras	Shipping & Landing	60,600
74	NAVIGATION Bombay and Africa Steam Navigation Co.	Bombay	Ship Owners and Hires of Ships...	2,40,000
75	Indian & Peninsular Steam Navigation Co.	Bombay	Ship Owners, Charterers of ships, etc.	50,00,000

No.	Class and Name	Situation of Registered office	Object	Nominal Capital
(b) PRINTING, PUBLISHING & STATIONERY.				
76	Fraser Printing and Publishing Company. Bengal	...	Printers Publishers & Book-binders, etc.	20,000
77	Bangalore Daily Post.	...	Do.	50,000
78	Bartabaha.	...	Printing & Publishing Newspapers, etc.	20,000
79	Min Wha Pao Press Co.	...	Printers, Publishers & Dealers in Printing Machines, etc.	20,000
80	University Printing & Publishing Company	...	Printing, Publishing & Stationery	1,00,000
81	Calcutta Advertising	...	Printing & Publishing Newspaper and Stationery	30,000
82	Decca Hrishikesh Company	...	Printing and Publishing Newspapers, etc.	10,000
(c) OTHERS.				
83	Oriental Bioscope Company	...	Carrying on business of Bioscope Exhibitors, etc.	20,000
84	Deccan Cutlery & Metal Works Company.	...	Founders and Dealers in Cutlery.	10,000
85	Krishna Company	...	Commission Agents	2,50,000
86	Shri Sidheshwar Mandli	...	General Merchants	5,000
87	Cotton Trading Company of India	...	Dealers in Cotton	1,01,000
88	Kirala Weaving Company	...	Trading in Cotton and other goods	50,000
89	Kirala Swadeshi Store and Loan Co.	...	Trade in Indigenous goods	20,000
90	Noakhali Swadeshi Store and Loan Co.	...	Dealers in Musical Instruments	2,25,000
91	Misquith	...	Pianofortes, etc.	1,00,000
	Agricultural Developments	...	To acquire the patents rights of "Butler's chara's lifter."	1,00,000

92	Soap and Candle Manufacturing Company	Karhad, Bombay	Manufacture of Soap, candle, etc.	5,000
93	Chokshi Pearl Trading Co.	...	Dealers in Pearls, etc.	25,00,000
94	Fisheries	...	Dealers in Fish and Fish Oils	20,000
95	Tothill Sharp and Co.	...	General Merchants	2,25,000
96	Optical Society	...	Manufacturing eye Glasses and Spectacles	1,00,000
97	Stork and Company	...	General Merchants, Mill Owners and Agents, etc.	11,00,000
98	McLaren and Company	...	Wine and Spirit Merchants	1,00,000
99	Calcutta Clothing Company	...	Dealers in Country made cloths	20,000
100	Ross and Beb	...	Manufacturers and Dealers in Spectacles, etc.	20,000
101	Dykes and Company	...	Manufacturers and Repairers of and Dealers in Carriages, etc.	4,60,000
102	Darjeeling Timber Trading Company	...	Timber Merchants and Owners of Saw Mills	20,000
103	Doaba Leather Works Company	...	Dealers in and Manufacturers of Leather	15,000
104	Gujarat Automobile Transport Company	...	Carrying on business of Traction Engines Proprietors, etc.	2,50,000
105	De Laitte Lighting Company	...	Electrical Engineers and General Merchants, etc.	10,00,000
106	Kendell & Co.	...	Manufacturers of Boilers, Varnishes, Compositions, etc.	50,000
107	Hyderabad Trading and Manufacturing Company	...	General Merchants	50,000
108	Cuddalore Lakshmi & Co.	...	General Trade	20,000
109	Pollachi Konganadu Industrial Company	...	Weaving Cloth and Trading in Timber, etc.	50,000
110	Kin-toscope Exhibition Company	...	Purchasing Kinetoscope, etc., and performing public exhibitions	35,000
111	Misra and Company	...	Dealing in Furniture, etc.	1,00,000

No.	Class and Name	Situation of Registered office	Object	Nominal Capital
112	Union Trading Company	...	Engineers and Contractors	1,00,000
113	Indian Commission Agency	Lahore, Punjab	Merchants and Agents	2,00,000
114	Charles Brown and Company	Multan City, Punjab	...	...
115	Rajam and Company	Bombay	Engineers and Iron and Brass Founders.	6,50,000
116	B. Andrianopolo	Kumbakonam, Madras	Manufacturing Soap, etc.	20,000
117	Bengal Miscellany	Calcutta, Bengal	Manufacturing and Dealing in Cigars, Cigarettes, etc.	1,00,000
118	Indian Alkolooidal Company	Do.	Manufacturing and Dealing in Chemicals and Essential goods, etc.	1,50,000
119	Bharata Bhandur	Bombay	Helping Medical Men	1,20,000
120	T. Stanes and Company	Madras	Selling Indian Goods	20,000
121	Lakshmi Vilasa Trading Company	Coimbatore, Madras	General Merchants and Agents	4,50,000
122	Rangpur Manufacturing Company	Civil and Military Station of Bangalore, Mysore	Trading	20,000
123	International Commercial Agency	Rangpur, E. B. & A.	Manufacturing and Trading in Indigenous goods	20,000
124	Match and Pencil Works	Bombay	Brokers, Commission, Agents, etc.	5,00,000
125	Jaganmitra Association	Dharwar, Bombay	Manufacturing Matches and Pencils, etc.	20,000
126	Bombay Electric Supply and Tramways Company	Vizagapatam, Madras	Merchants and Traders	20,000
127	National Khondul Brother Company	Bombay	Constructing and working a Tramway by Electricity	1,20,00,000
128	Imperial Tobacco Company of India	Feni, E. B. & Assam	Trading in Miscellaneous goods...	20,000
129	Calcutta Dairy Farm	Calcutta, Bengal	Cultivators, Manufacturers of, and Dealers in Tobacco, etc.	1,000
130	United India Trading Company	Do.	Carrying on business of Dairy Farm	50,000
130	United India Trading Company	Ahmedabad, Bombay	Merchants and Commission Agents.	40,000

131	Allahabad Ice Association	... Allahabad, U. P.	...	Manufacturing, Importing and Dealing in goods of all descrip- tion.	1,00,000
III. MILLS AND PRESSES.					
(a) COTTON MILLS.					
132	Coromandel Cotton Spinning and Weav- ing Mills Company	Kistna, Madras	...	Spinning, Weaving and Dyeing Cotton, etc.	4,50,000
133	Trinnevelly Weaving Factory	Tinnevelly, Madras	...	Manufacturing and Selling Cotton goods	20,000
134	Hindustan Cotton Mills	Bengal	...	Spinning, Weaving and Dyeing Cotton, etc.	3,00,000
135	Edward Sassoon Mills	Bombay	...	Spinning, Weaving, Manufacturing, Bleaching Cotton, Wools, etc.	17,00,000
136	Lakshmi Mills Company	Coimbatore, Madras	...	Spinning and Weaving Cotton, etc.	1,00,000
137	Swan Mills Company	Madras	...	Spinning and Weaving Cotton, etc.	15,00,000
138	Crown Mills	Culcutta, Bengal	...	Spinning, Weaving and Pressing Cotton and Manufacturing Oil	1,00,000
139	Bhiwani Cotton Spinning and Weaving Mills Company	Bombay	...	Spinning, Ginning, Pressing, Blea- ching and Dyeing Cotton, etc.	7,00,000
(b) COTTON AND JUTE SCREWS AND PRESSES					
140	Best's Pressing and Ginning Factory	Madras	...	Ginning and Pressing Cotton	1,20,000
141	Albion Jute Mills Company	Calcutta, Bengal	...	Spinning, Weaving, etc. of Jute, Hemp, etc.	15,00,000
142	Sri Karthikeya Ginning Factory	Coimbatore, Madras	...	Ginning Cotton, etc.	...
143	Kadi Ginning Pressing and Oil Mill Company	Bombay	...	Cleaning, Ginning, Pressing and Packing Cotton etc.	1,50,000
144	Central Hydraulic Press Company	Culcutta, Bengal	...	Balers and Pressers of Jute, etc.	2,50,000

No.	Class and Name	Situation of Registered office	Object	Nominal Capital
145	Western cotton company	...	... Ginning Cotton	50,000
146	Sind Ginning and Oil Manufacturing Company	Madras	...	...
147	Karculi Ginning and Press Company	Karachi, Bombay	... Manufacturing Vegetable Oils	3,00,000
148	Nagar Ginning and Trading Company	Bombay	... Ginning, Cleaning and Pressing Cotton Jute, etc.	3,00,000
		Ahmednagar, Bombay	... Ginning and Pressing Cotton, etc.	1,00,000
	(c) MILLS FOR WOOL, SILK ETC.			
149	Ramdas Mills	...	...	...
150	Surat Silks and General Manufacturing Company	Bombay	... Manufacture of Wool, Silk, etc.	12,00,000
		Do.	... Spinning, Weaving, Dyeing, Bleaching Yarn of Silk-Cotton, Hemp etc.	50,000
	IV (a) TEA & OTHER PLANTING COMPANIES.			
151	Bengal Agricultural Company	...	...	...
152	National Tea Company	Bengal	... Carrying on Agricultural Scientifically, etc.	75,000
153	Emerald Valley Estate Company	Calcutta, Bengal	... Cultivators and Manufacturers of Tea	60,000
154	Kuluri Tea Company	Ootacamund, Madras	... Cultivation of Tea, etc	30,000
155	Lohagar Company	Calcutta, Bengal	... Cultivation and Manufacture of Tea	1,00,000
156	Dilaram Tea Company	Do. do.	... Cultivation and Manufacture of Tea	50,000
157	Nuxal Bari Tea Company	Do. do.	... Cultivation and Manufacture of Tea	2,00,000
		Jaipalguri, E. B. & A	... Planting and Manufacturing Tea...	51,200

158	Rajabhat Tea Company	...	...	3,00,000
159	Moulmein Rubber Plantations	Calcutta, Bengal	... Planting Rubber in the Amherst District	5,00,000
160	Rahimia Lands and Tea Company	Moulmein, Burma	... Cultivation of Tea, Coffee, Paddy, etc.	1,92,000
161	Kambay Pura Rubber Estates	Jaipalguri, E. B. & A	... Planting, Manufacturing and Trading in Rubber	2,00,000
162	Chincoorie Tea Company	Rangoon, Burma	... Cultivation and Manufacture of Tea, etc.	80,000
	MINING AND QUARRYING			
	(a) COAL.			
163	Northern India Coal Company	Calcutta, Bengal	...	...
164	Kadanoor Ruby Mining Company	Amritsar, Punjab	... Coal Miners and Workers, etc.	10,00,000
165	Netra Manganesse Company	Bombay	... Extracting Rubies from Mines	5,00,000
166	Maibar Stone and Lime Company	Chindwara, C. P. & Berar.	... Prospecting and Mining, etc., Manganesse and other Minerals...	1,00,000
167	Sutall Manganesse Company	Calcutta, Bengal	... Mining and Quarrying Stone, Lime, etc.	80,000
168	Burma Consolidated Mines	Bombay	... Mining Manganesse Oders	...
169	Sankara Mining Syndicate	Rangoon, Burma	... Prospecting and exploring Mines for Mineral oils or precious stones	5,00,000
170	Yaung Calauing Copper Mine	Madras	... Mining Gold	2,00,000
		Mandalay, Burma	... Working and prospecting per Copper Oars and other minerals in Myit Kyina	2,00,000

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