

Government of Madras

HOME DEPARTMENT (EDUCATION).

G.O. No. 1209, 19th September 1917

Department of Industries

Recording the administration report of the — for the year 1916-17.

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READ—the following paper :—

Letter—from C. A. INNES, Esq., I.C.S., Special Officer in charge, Department of Industries.

To—the Secretary to Government, Home (Education) Department.

Dated—Madras, the 30th August 1917.

No.—D. Dis. 696.

I have the honour to submit the administration report of the Department of Industries for the year 1916-17. Owing to the scarcity of paper and the need for economy, I propose to make it as brief as possible and to summarise in the report itself the section reports of subordinate officers which are usually printed in full as appendices to the main report.

ADMINISTRATION.

2. *Administration and personnel.*—Mr. Tressler, the Acting Director, remained in charge of the department till the 1st August 1916, when having received a commission in the Indian Army Reserve of Officers he proceeded on military duty. I regret to say that information has recently been received that accidentally he was severely injured while serving with the Sappers and Miners in Mesopotamia. In G.O. No. 403, Educational, dated the 8th April 1916, the deputation of an officer of the Indian Civil Service was sanctioned for a period of six months in order that he might submit proposals for the reorganization of the department and report upon the various experiments carried on by the department. Mr. M. E. Couchman, I.C.S., was selected for the post, and entered on his duties on the 22nd May 1916. On Mr. Tressler's departure, he took over charge of the department as special officer in charge. In October 1916 Mr. Couchman was appointed to act as a Member of the Board of Revenue, and on the 26th idem he was relieved by myself. I remained in charge of the department till the end of the year. Mr. Green continued as Assistant Director throughout the year, his appointment which originally was sanctioned for one year only being extended for another year till the 15th December 1917. The permanent retention of the appointment of Dyeing Expert was sanctioned during the year, and Dr. Marsden was confirmed in the post. Mr. Guthrie, the Leather Expert, was absent on military duty throughout the year, and Mr. K. Raghava Kurup acted for him as Principal of the Leather Trade School. In G.O. No. 1221, dated the 21st November 1916, Mr. W. Fyfe was appointed Inspector of Industrial schools as a temporary measure, without prejudice to his duties as Instructor in Manual Training for European schools. Mr. Dunhill continued to be Superintendent of the Mechanical Engineering section of the Madura Technical Institute.

3. *Director's tours.*—Mr. Tressler spent 30 days on tour visiting Palghat, Cochin, Tanur, Calicut, Coimbatore, Punalur, Madura and Ootacamund. Mr. Couchman visited Ootacamund, Coimbatore, Karur and Bangalore and was 39 days

on tour. I was detained in Madras by the various experiments in progress there, by the necessity of preparing for the visit of the Indian Industrial Commission, and by the reorganization of my office which was one of the first duties that claimed my attention, but I visited Pallavaram, Coimbatore, Madura, Calicut, Cochin, Bezwada, Masulipatam, Ellore and Cocanada and was 34 days on tour.

4. *Removal of the office.*—With the transfer of the Pumping and Boring Branch to the Department of Agriculture, the old office of the Director was made over to the Agricultural Engineer, and new quarters were found further up the Poonamallee High Road, about half a mile beyond the Madras Guards headquarters. The new office serves its purpose very well, but it is much too far from the business quarters of the town.

5. *Reorganization of the office.*—As already noted, the reorganization of the office was one of the first matters which I had to deal with. The "card index" system was supposed to be in force, but none of the clerks understood it, and the records were in confusion. No record was maintained of letters entering or leaving the department; no check over delays was possible; the tracing of previous references was a matter of great difficulty; and files were put up in such a manner that it was impossible to pass satisfactory orders upon them. I have now introduced the disposal number system, and in order that the clerks might fully understand it, I wrote for them a detailed office manual. Government were also good enough to sanction a temporary clerk for three months to sort and list the old records of the department, and the office is now in fair order. I am now engaged in reorganizing on similar lines the Bureau of Industrial Information, and I have to thank the Director-General of Commercial Intelligence for the assistance he has given me by supplying information as to the system followed in indexing and tabulating information in his office. Work of this kind is of course dull, but it is an essential preliminary to the proper organization of the department. Even in the short time that I have been in charge of the department I have been surprised at the variety of subjects that have come up for enquiry and orders, and it is most necessary that the information collected should be recorded and indexed so as to be available in a readily accessible form for future Directors.

GENERAL.

6. *General remarks on the year's work.*—During the year the department had three Directors, and the last of them, myself, was entirely new to the job. Much time therefore had to be spent in making myself acquainted not only with the past history of the department but also with the past history and existing condition of the various experiments I found in progress when I took over charge. Many of the problems moreover which confront the department are very complex and require the most careful study. Cottage industries, the hand-loom weaving industry and industrial education are cases in point. Other difficulties which hampered progress were those incidental to the third year of the greatest war in history. With the export of many articles from home prohibited and tonnage getting scarcer every day, this is a golden opportunity for starting new industries in India. But it is difficult either for the department or private firms to take advantage of the opportunity owing to the impossibility of obtaining either the necessary plant or the necessary experts from home, and moreover the European firms at any rate were chary of launching out in new directions owing to uncertainty as to how many of their already depleted staffs would be left to them after the organization of the Indian Defence Force.

7. *Visit of the Indian Industrial Commission.*—One of the notable events of the year was the visit in January and February of the Indian Industrial Commission. All arrangements for the visit were made by me, except that the list of witnesses was drawn up by the Hon'ble Mr. Couchman. It was originally proposed that besides the Presidency town the Commission should visit Bezwada, Nellikuppam, Ranipet, Madura, Coimbatore and Calicut, but for lack of time this programme was cut down, and Madras, Coimbatore and Calicut were the only places visited. Seventy witnesses were examined orally, while others sent in written evidence, and a number

of industrial institutions were inspected. I prepared for the Commission a long memorandum on the history of the Department of Industries, and was also examined as a witness. Other officers of the department who gave evidence were Dr. Marsden, the Dyeing Expert, M.R.Ry. N. Subrahmanya Ayyar, the Weaving Assistant, and M.R.Ry. C. S. Ramachandra Ayyar, Supervisor in charge of the Pencil factory.

8. *Imperial Silk Specialist.*—Mr. Maxwell Lefroy, the Imperial Silk Specialist, also toured through the Presidency in the month of October, and the services of Mr. Subrahmanya Ayyar, the Weaving Assistant, were placed at his disposal. At the close of his tour, Mr. Lefroy suggested that Mr. Subrahmanya Ayyar, who has studied the silk industry in the Presidency for many years and has published several articles on the subject, should be placed on special duty to complete his enquiries and to work them up into a monograph. But unfortunately a break-down in health compelled Mr. Subrahmanya Ayyar to take long leave before the suggestion could be acted upon.

9. *Transfer of Pumping and Boring.*—Another notable event was the transfer to the Agricultural Department of the Pumping and Boring Branch. In G.O. No. 523, Revenue, dated the 7th March 1916, Government decided to add an Agricultural Engineer to the staff of the Agricultural Department, and as a corollary to the creation of this appointment, they resolved to transfer to that department the pumping and boring operations which until then had been carried on under the control of the Director of Industries. The transfer was effected on 1st August 1916, and at the same time the two motor tractors belonging to the Department of Industries, the departmental workshop and the two sugar-cane experimental stations were handed over to the Agricultural Department. The transfer closed an important chapter in the history of the Department of Industries, and a brief sketch of the development of the pumping and boring operations may be of general interest. In September 1903 the aluminium industry was made over to the Indian Aluminium Company, and as part of his programme of work in connection with the development of Indian industries, Mr. Chatterton proposed that a number of pumping installations should be set up with the object of demonstrating the advantages of modern machinery in agricultural operations. Some work had already been done in this direction, and Mr. Chatterton himself and the Public Works Department had both experimented with pumping by machinery. But these experiments had furnished evidence merely as to the value of lift irrigation on a comparatively large scale, and much scepticism still prevailed as to whether comparatively small areas of land could be profitably irrigated by small engines and pumps. One small installation had already been put up at Melrosapuram in the Chingleput district, and in 1904 permission was obtained to open four other pumping stations where experiments were begun with engines varying in horse-power from $3\frac{1}{2}$ to $6\frac{1}{2}$, and with three and four inch pumps. From the first the progress made was encouraging, and by March 1905 so many applications for assistance had been received that Government agreed to advances being made under the Land Improvement Loans Act for the purchase of oil-engines and pumps and provided Mr. Chatterton with the nucleus of a staff to assist those wishing to put up installations with advice and supervision. A class for training oil-engine drivers was also opened at the School of Arts. It soon became evident, however, that very few of the wells in the Presidency could furnish enough water to make it worth while to put in an engine and pump, and that in order to bring pumping installation into more extended use it would be necessary to deepen existing wells or to sink new ones so as to tap the subterranean reservoirs which were known to exist at no very great depth in certain districts of the Presidency. Accordingly in 1906 the boring branch of the department was inaugurated by the deputation of a special party to the Chingleput district partly to develop well irrigation by the expeditious disposal of applications for loans, and partly to prevent waste of money by preliminary borings before wells were sunk. Later on the operations of the party were extended to the improvement of existing wells, and from this time forward progress was rapid until the outbreak of the war operated as a check. By March 1916 operations were in progress over nearly the whole of the Presidency, and 3,333 borings had been put down. Rather more than half of these borings were made for the purpose of improving existing supplies, the remainder being fresh explorations.

The percentage of success is reported to have exceeded sixty, sub-soil water being met with at depths ranging from 35 to 200 feet. In the same period 818 local investigations were made in connection with projected pumping installations, more than 400 installations were set up, and a sum of Rs 2,99,800 was advanced under the Land Improvement Loans Act to 117 persons for the purchase of oil-engines and pumps. Many other installations were put up independently of the department, the machines being mostly obtained from engineering firms on the hire purchase system, and an admittedly incomplete census taken in 1915 disclosed the existence of nearly 900 installations irrigating an estimated area of nearly 50,000 acres. In addition, a number of oil-engines were installed under the advice and with the aid of the department in rice mills and other industrial concerns. The rapid increase, however, in the popularity of oil-engines and pumps entailed correspondingly heavy work in the department. In the circumstances of South India, it was necessary to provide for the supervision and periodical inspection of the pumps. A system of compounding fees was accordingly instituted, and by 1915, 236 plants were on the inspection list. For inspection and boring purposes the pumping and boring staff was augmented from time to time till in 1915 it consisted of 12 supervisors, 21 mechanics and 38 boring maistries. Much of the Director's time was taken up in the supervision of his supervising staff and in what was practically consulting engineering work. For this reason as well as for the reason that most of the work was work which primarily appertained to the Agricultural Department, it was decided to place the operations under the direct control of the Agricultural Engineer. From past administration reports it appears that the net cost of the pumping and boring branch during the eleven years of existence was approximately Rs. 6,80,000, and in return for this expenditure the Department of Industries may fairly claim to have done much to familiarise the South Indian ryot with the use of modern machinery for agricultural purposes.

MECHANICAL ENGINEERING SECTION.

10. *Mechanical Engineering.*—The engineering branch of the department, after Mr. Tressler's departure, was placed under the direct charge of the Assistant Director who is a mechanical engineer, and I should like here to place on record my opinion that as long as there is a non-technical head to the department he must be provided with an assistant who is a qualified mechanical engineer. Although the whole of the district staff was handed over with the Pumping and Boring Branch to the Agricultural Department, a number of engineering enquiries of an industrial character were received and investigated during the year. The want of a district staff however was severely felt, and the question also arose whether minor industrial installations such as rice mills, cotton gins and so forth in respect of which compounding fees had been paid should be supervised by the Department of Agriculture or the Department of Industries. It may be noted that there were 96 installations of this kind on the inspection list at the time of the transfer of Pumping and Boring to the Agricultural Department. Eventually it was agreed that the supervision of these installations fell within the scope of this department's duties, and since the close of the year I have been provided with the nucleus of a district staff of supervisors and mechanics. They will not only be available for the inspection of minor industrial plants in respect of which fees have been paid but will also conduct any miscellaneous enquiries that may be necessary within the limits of their respective charges and will serve to keep me to some extent in touch with industrial development in the districts. I hope to supplement them however by honorary trade correspondents on the lines of the organization which has been established with satisfactory results in the United Provinces. A beginning has been made in this direction, but it will take time before the system is fully organized.

11. *Proposed demonstration of a gas suction engine.*—Hitherto, as will be seen from paragraph 9 above, the department has devoted much time and trouble to popularising oil-engines in South India. The use of liquid fuel for raising power has obvious advantages in this Presidency where coal is dear and highly-trained mechanics are not plentiful, but in respect of rice mills an obvious disadvantage of the oil-engine is that it renders difficult the problem of the disposal of the paddy

husk. Further the price of liquid fuel increased enormously during the year, and though the increase was mainly due to causes connected with the war, yet the demand for oil for purpose of fuel is increasing so much all the world over that it is doubtful whether the price will ever return to its pre-war level. In the circumstances, it may be expected that the use of suction gas plants burning waste fuel will become more and more popular as small power producers in the Madras Presidency, and one has already been installed and is working satisfactorily in a rice mill in the Kistna district. Sawdust, paddy husks, sugarcane refuse and groundnut shells are among the waste products which contain, it is claimed, the necessary properties for the production of gas in a properly designed producer. The sanction of Government was accordingly obtained for a demonstration of a suction gas plant burning waste fuel. An order was placed with a Bombay firm which promised immediate delivery, and arrangements were made to instal the plant in a new rice mill which was under construction in the Tanjore district. At the last minute, however, the firm wired to say that it was impossible to ship the plant from England, and like many other things, the proposed demonstration was necessarily postponed until after the war.

12. *Proposed survey of the rice mill industry.*—The rice mill industry which is centred chiefly in the delta districts, Godāvāri, Kistna and Tanjore, has made great strides in recent years and is now one of the most important industries in the Presidency. Moreover it is the product of Indian enterprise, and is entirely in Indian hands. The earlier mills did well and attracted many, probably too many, imitators. But in the past year the industry passed through a time of difficulty and anxiety. In February last it was reported that, especially in the Kistna district, the stations were overflowing with rice for which wagons could not be got, and that many of the mills were closing down. I interviewed the General Traffic Manager of the Madras and Southern Mahratta Railway who did what he could in the matter, but owing to the shortage of coasting steamers, all the coal required for the Presidency had to be brought by rail, and the pressure of this coal traffic coupled with the demands of the military for freight left few wagons available for the transport of rice. Subsequently Mr. Campbell, the Collector of Kistna, and myself interviewed the chief mill owners at Bezwada and Masulipatam, and it was suggested to us that some relief would be offered if the canal from Bezwada to Madras were deepened to 4 feet and made available for rice traffic. The suggestion was examined by the Public Works Department and found to be impracticable. Not only would the cost of deepening the canal be very great but also all the locks would require alteration. One result of the shortage of wagons was a revival on a small scale of the ship building industry at Masulipatam where three sailing craft each of about 140 to 150 tons burden were built during the year. The revival would have been more marked had it not been for two reasons, one being the fact that on the east coast after the war sailing craft probably will not long survive the competition of coasting steamers, and the other the fact that Insurance Companies will not ordinarily insure cargoes shipped on sailing craft in Indian waters. Parenthetically, it may be remarked that the former difficulty does not exist to the same degree on the west coast since a flourishing trade between the west coast ports and the Persian Gulf has always been carried on by country craft, and nine wooden ships with an aggregate tonnage of 1,853 tons were constructed at Calicut and Cochin. To revert to the rice mills, it was obvious both from my own observation and from Mr. Green's reports that the industry required careful study. The lay out of the mills is often defective, power is not always obtained in the most suitable manner, and the mechanics are frequently little better than coolies who have picked up a superficial knowledge how to drive an engine, while the boiled rice mills in municipal towns are in difficulties with the municipal councils, because they disseminate from their chimneys particles of charred husk over the towns and because the steeping of the paddy by the processes now in vogue causes offensive odours. Accordingly towards the end of the year I made arrangements for a systematic survey of the industry by Mr. Green with the object of publishing a bulletin on the whole subject.

13. *Survey of a possible cement industry at Bezwada.*—The question of a possible cement industry at Bezwada has been raised on more than one occasion. It was investigated by the Public Works Department in connection with the now defunct

Kistna irrigation project, and some years ago an abortive attempt was made to float a company by a private syndicate. My attention was directed to the subject by the evidence of a witness before the Indian Industrial Commission, and further information was obtained at Bezwada. The whole subject is now being systematically investigated by Mr. Green.

14. *Anderson oil expellers*.—The experiments with these expellers, which were carried on under the direct charge of M.R.Ry. J. Narayanamurthi, Sub-Engineer, were brought to a close during the year, and the results were embodied in two bulletins which are available in my office for perusal by any one interested in the subject. Our conclusions coincide with those of the Industries Department in the United Provinces. The experiments having been concluded, both machines were disposed of during the year.

15. *Hydraulic oil mill*.—This plant was ordered at the beginning of the war not only for the purpose of utilizing the accumulation of groundnuts but also with the object of investigating the possibility of extracting oil on a large scale from the different oil seeds. A few more parts of the machinery were received and erected during the year, but as noted in last year's report, the manufacturing works in England have been taken over by the Ministry of Munitions, and eventually we were advised by the India Office, which made every effort in our behalf, that there was no hope of obtaining the balance of the plant until after the war. A proposal that the Indian Institute of Science at Bangalore should take up the systematic investigation of oil pressing and the connected industries was considered by a small committee consisting of Sir Alfred Bourne, Sir F. A. Nicholson and the Hon'ble Mr. Couchman, and the recommendation was made that the plant should be placed at the disposal of the Institute. But the scheme fell through. At the end of the year a Northern India firm made me an advantageous offer for the machinery as it stood and undertook to take its chance of being able to get the balance of the plant. The machinery was standing idle and was naturally deteriorating, and as I saw no chance of being able to make use of it for some years, I obtained the sanction of Government for the sale of the plant. Reports have appeared in the Press that Messrs. Tata Sons & Co. are contemplating starting a large copra-crushing factory on the West Coast. If so, important developments of the oil pressing and connected industries may be expected, and it is doubtful whether after the war any large scale experiments by the department will be necessary. But there will always be work for an oil chemist in the department, and this question has recently been under the consideration of Government.

INDUSTRIAL EXPERIMENTS.

16. *Glass*.—Quite recently the report of a committee appointed by Government to consider the glass experiments made by the department has been published in the Press, and a short summary of the experiments is all that is required here. Some time prior to 1909, Mr. Scholl, then German Consul in Madras, and Mr. James Short conceived the idea of glass making in Madras, and after some preliminary experiments, they floated in March 1909 the Madras Glass Works Limited. A German expert was engaged as technical adviser, and under his direction the present factory was constructed, and an intermittent gas-fired furnace erected. Four German and Austrian expert blowers were brought out to start work and train labour. The furnace was started up on 3rd January 1910, and by 8th January faultless glass was being made. But the money available had come to an end, and it was already plain to the Directors that a mistake had been made in putting up an intermittent instead of a continuous furnace, and that for the manufacture of bottles mouth blowing was too slow and laborious to be profitable. The quality of the glass made however was so satisfactory that it was decided to go on, and additional capital amounting to Rs. 1,00,000 was raised. This amount enabled the Directors to import compressed air bottle making machinery and an improved annealing lehr as well as to bring out an engineer to set up the plant and an expert bottle maker to instruct workers, but it was not sufficient to meet the cost of a continuous furnace. The new plant was got into working order by June 1911, and by September the output of soda water bottles was nearly treble the maximum output attained by mouth blowing. But funds were again exhausted.

Government were appealed to to take over the factory, build a continuous furnace and continue the work in order that it might definitely be decided whether the manufacture of soda water bottles and other glassware could successfully be carried on in Madras, but unfortunately Lord Morley's orders of 1910 left Government no option but to decline the request, and the Company went into liquidation. In September 1914, however, in the altered circumstances caused by the outbreak of war, Mr. Tressler decided to make an effort to resuscitate the industry, and the glass works were placed at his disposal for the purpose. He decided that one main cause of failure of the former Company was the furnace, and he set himself to devise a continuous oil tank furnace. More than eighteen months were spent in experimenting with mixtures and furnaces, and finally in May 1916 a temperature of 1400° F. was attained, and the furnace kept going for three days and nights during which period several gross of soda water bottles were made. The result of these experiments was considered sufficiently encouraging to justify further expenditure. The glass works were acquired, and by the middle of October one big and one small continuous tank furnace had been constructed. Work with the smaller furnace had been in progress about a fortnight when I took over charge of the department, and the plan of operations was that the next three months should be spent in training labour and experimenting with mixtures in order that work on commercial lines should begin in February. From the first however the proposition seemed to me a doubtful one. In the first place the consumption of oil, which in the meantime had increased enormously in price, was much greater than had been anticipated, secondly a number of practical difficulties in the way of making good glass immediately made themselves apparent, and to put it bluntly the department was in the false position of endeavouring to master extremely technical process by purely amateur and very expensive experiments. This was not altogether the department's fault. Mr. Tressler had made several fruitless attempts to obtain a glass expert, and when the continuance of the experiments was sanctioned, there was a good prospect of obtaining the services of a man who had spent several years in glass works in France. By the time however when sanction was obtained for his employment, he was no longer available. As the readiest way of remedying partially the situation, M.R.Ry. J. Narayanamurthi, the Sub-Engineer in charge of the factory, was sent on a short tour to the glass factories in Central and Northern India, and in the meantime the training of blowers was continued. By the middle of January however I decided that it was time to stop the experiments. Mr. J. Narayanamurthi's report, our own experience and the examination I had made of the prospects of a successful soda water bottle industry in Madras all pointed to the same conclusion. We had arrived at a point beyond which we could not hope to advance without expert guidance. The Hon'ble Mr. Silver, Director of Industries in the United Provinces, kindly offered to lend me the services of Mr. Elland, the glass expert of the United Provinces, and Mr. Elland would have given us useful advice in the matter of glass mixtures and methods of testing them. But he did not profess to be an expert blower nor to be a specialist in glass furnaces. The furnace however was the crucial point. The furnace designed by Mr. Tressler was probably too small for a continuous tank furnace, and further there seemed reason to believe that it had been wrongly designed. We got too fierce a heat at the working end and not enough heat at the mixture end. What we really wanted was a glass engineer, an engineer that is with some knowledge of glass-making, and expert glass blowers. In ordinary times such men could easily have been obtained, but at the beginning of 1917 it seemed hopeless even to enquire for them. Further on a general survey of the situation, there seemed no prospect of establishing successfully a permanent soda water bottle industry in Madras, though during the war such an industry would be most profitable. Accordingly at the end of January last I closed down, and reported my action for approval. Government then appointed a committee consisting of Mr. W. A. Beardsell (of Messrs. W. A. Beardsell & Co., Managing Agents of the late Madras glass works, Ltd.), Sir F. A. Nicholson, K.C.I.E., Sir C. B. Simpson, the Hon'ble Sir Francis Spring, the Hon'ble Mr. M. E. Couchman, the Hon'ble Rao Bahadur K. Suryanarayanamurthi Nayudu, Dr. J. L. Simonsen and myself to advise whether the experiments in the manufacture of soda water bottles should be continued, and if not, whether experiments should be made with other forms of glassware. The committee considered that the experiments had been

rightly discontinued, and after a survey of the position from the point of view of (1) fuel, (2) materials, (3) labour, (4) market and (5) general considerations, were not in favour of their being begun again. They considered however that a survey of the bangle industry in the Presidency should be undertaken in order that it might be determined whether the department could do anything to help it, and that the alkaline earths of the Presidency should also be systematically examined. Both surveys are now in progress. It is also worth mentioning that an Indian who has studied glass-working in Japan hopes to start the working of lamp ware, etc., in Madras. A syndicate of private gentlemen has agreed to finance preliminary experiments, and I have promised to allow the experiments to be made at the glass works and to assist with moulds, chemicals and so on.

The cost of the experiments was as follows:—

	Receipts.	Expenditure.
	RS.	RS.
1915-16	5	6,172
1916-17	640	18,734

17. *Lime sand bricks.*—Another experiment which must be written down as a failure is that of lime sand bricks. Proposals for the inception of these experiments were submitted in May 1914. At that time the Chetput brickfields were approaching exhaustion, and it had been decided to open a new brickfield further afield. Mr. Tressler suggested that before Government committed themselves to the expenditure involved in this scheme, the question of making lime sand bricks should be considered. The materials, lime and sand, were available in large quantities in Madras; if properly made, these bricks had a crushing strength of between 200 to 300 tons to the square foot; and Mr. Tressler anticipated that they could be made at about the same cost as the clay brick. The experiments were accordingly sanctioned in G.O. No. 1473 Educational, dated 23rd June 1914, and an indent for machinery sufficient for an output of 8,000 bricks a day was sent home to an English firm. Part of the machinery delivered in June 1915 was set up in accommodation kindly provided by the South Indian Industrials, but owing to the war and the fact that one consignment was sunk by a submarine, the delivery was not completed till September 1916. Unfortunately provision had not been made for an adequate power plant. An engine of an antiquated type was lent by a local firm, and two worn out boilers were borrowed from Government House, but with this plant it was not possible to work the grinding mill and press simultaneously. Accordingly Mr. Couchman submitted in September last an estimate for working the plant in 1917-18 with a 50 B.H.P. electric motor. In the meantime after all efforts to procure an engine of the horse-power required had failed, a supplementary steam engine was obtained from the glass factory, and work was begun towards the end of October. A number of bricks were made. They were massive, firm and clean in shape, and to all outward appearances were excellent bricks, but possibly owing to the fact that sufficient pressure could not be maintained in the hardening chamber they were not satisfactory in point of crushing strength. Not only did they vary excessively from brick to brick, but on the average they were inferior in crushing strength to the best quality Madras stock bricks. Further, though owing to the fact that two engines and two boilers were employed for purposes of power accurate figures of the cost of production had not been obtained, sufficient information had been gathered to make it practically certain that the bricks could not be made in Madras for the price of the best clay bricks, viz., Rs. 16—18 per 1,000. Mr. Green was then deputed to Colombo to study the conditions in which the manufacture of lime sand bricks was successfully carried on in Ceylon and the processes of manufacture, and his enquiries showed that given a satisfactory power plant and provided that our processes were somewhat elaborated, we could possibly turn out a really high class brick at a price which at a minimum in his opinion would not be less than Rs. 21 per 1,000. Enquiries were therefore made of the Port Trust, the Madras and Southern Mahratta Railway, the South Indian Railway and the Madras Corporation as to whether there was likely to be any demand in Madras for a superior but more expensive brick than the best quality Madras clay brick. The answers were all in the negative. All Superintending Engineers in the Presidency were also consulted whether owing to the absence of clay and building stone the conditions were favourable for lime sand bricks in any

part of the Presidency, but here again answers were unfavourable. Accordingly I was unable to recommend that the experiments which had been temporarily closed down in December last should be continued. My final report which was submitted to Government after the close of year will probably be published in due course.

18. *Pencils.*—Experiments in pencil making were continued throughout the year, and in the latter half of the year production was attempted on a commercial scale. The lead making was improved, and the pencil leads are now fairly satisfactory. Graphite ore obtained from an abandoned mine in the Gōdāvari district was chiefly used during the year, and the process of refinement described in last year's report, though somewhat tedious, gave satisfactory results. Analysis showed that the ore after disintegration contained 39 per cent of sand, and that the refining process reduced the percentage to 7. If however we get further supplies of ore from the Gōdāvari mine, it will mean reopening and working the mine. Accordingly the experiment was tried of purchasing graphite with a guaranteed carbon content from Ceylon. The graphite proved quite satisfactory. It is rather expensive however, and a further objection to it is that it is the flaky rather than the amorphous variety. Hence it requires prolonged grinding to prevent the pencil lead from being gritty, and this grinding adds to the expense. Numerous samples of graphite from the Northern Circars were tried and reported on, and some of them were found quite suitable for pencil leads. But none of the deposits are regularly worked, and the past history of the search for graphite in the Presidency makes it doubtful whether they are worth working on a commercial scale. In the circumstances Ceylon must probably be looked upon as our regular source of supply.

19. The question of a suitable wood for pencils gave far greater trouble. Cedar wood from British East Africa (*Juniperus procera*) proved very satisfactory and I have been able to sell pencils made from this wood at a good profit. But we have so far failed to find a really satisfactory Indian wood. The failure was not due to any lack of effort or inquiry. As a matter of fact I have experimental pencils made from more than sixty different kinds of Indian wood, but none of them are really satisfactory. Some of them would do admirably if the wood were not too hard; others would suit equally well were the wood not white. (White pencils do not look well and are difficult to sell.) I have been told by a gentleman back from Japan that processes exist by which hard woods can be softened and white woods stained. If so, the solution of our difficulties probably lies in these directions. In the meantime, in default of better woods and in order to keep the machinery in full work, I have been compelled to make pencils from two Indian woods, but I cannot say that either is really satisfactory or that pencils made from them can be sold at a profit. As at present advised therefore I should recommend any firm that took up pencil making to concentrate on East African cedar, but I am still continuing the search for suitable Indian woods, and with the help of Mr. A. W. Lushington, C.I.E., temporary Assistant to the Commissioner of Forests, I have now got on to the track of some much more promising woods. Various junipers, one of them known as the Himalayan pencil cedar, grow in Baluchistan, but the difficulties of extraction are enormous.

20. By the end of the year we had arrived at the stage of being able to make plain serviceable pencils. But the pencils were lacking in finish, and apparently what the wholesale dealers want is not so much a pencil that writes well as a pencil that looks nice. We are now working hard therefore at colour lacquers. The scarcity of aniline dyes is a difficulty, but as far as they have gone, the experiments are promising, and I hope soon to be in a position to sell nothing but well-finished pencils suitably lacquered. Various other experiments are in progress. Copying lead pencils have been made, but here again we are hampered by the difficulty of obtaining methyl-violet of the right quality. Blue and red chalk pencils are being tried, though fancy prices have to be paid for the colouring agents. An inquiry was received for carpenters' pencils, and the samples sent were favourably reported on, and I hope soon to produce specimens of diary pencils.

21. In the matter of sales, an attempt was first made to sell all our pencils through an Indian firm, but it was not successful, and at the end of the year I had to take over the sales arrangements myself with the result that—thanks mainly to

large orders from the Superintendent of Stationery, Madras, and the Controller of Printing and Stationery in Calcutta—I sold nearly 40,000 dozen pencils in three months.

22. Government experimental factories are frequently criticized on the ground that proper commercial accounts are not kept. In order to meet this objection, I obtained the sanction of Government to employ Messrs. Fraser & Ross, Chartered Accountants, to devise forms of accounts for the factory. The firm took a great deal of trouble over the matter, and I am now able to work out accurately the manufacturing cost of each kind of pencil made.

23. The accounts of the pencil factory for the year are roughly summarized in the following statement:—

Expenditure.				Receipts.			
	RS.	A.	P.		RS.	A.	P.
Establishment—				Sale-proceeds	5,224	4	3
Supervision and staff	1,761	3	3	Miscellaneous receipts (Re-			
Labour at factory	2,577	9	10	funds)	488	1	2
Stock of raw materials on 17th				Stock of manufactured goods			
June 1916	1,695	0	0	on 31st March 1917	6,408	5	2
Stores—				Stock of raw materials on			
Wood	6,493	10	7	31st March 1917	4,568	14	4
Raw materials	2,989	12	8	Half-finished goods on 31st			
				March 1917	1,148	11	0
Contingencies				Outstandings	215	10	0
Liabilities—							
Staff	365	6	5				
Labour	261	7	0				
Stores	231	13	3				
Rent	166	10	8				
Depreciation on building							
and plant							
Total	17,905	5	0				
Profit							
	148	8	11				
Grand total	18,053	13	11	Total	18,053	13	11

Regular manufacture was started on the 17th June 1916 and the above figures cover the period 17th June 1916 to 31st March 1917. It will be seen that the experiment resulted in a small profit of Rs. 148-8-11.

It should be remembered however that the factory has even yet hardly passed out of the experimental stage and that no attempt has yet been made to run it at its full capacity. The outturn could be doubled without much difficulty except that of getting cutters and the costs of production greatly reduced, but until a decision has been come to on the question of woods it is obviously inadvisable to aim at a maximum possible outturn.

24. *Punalur paper mill.*—The Punalur paper mill may conveniently be referred to at this stage, though, strictly speaking, the mill is not an industrial experiment conducted by the department. There appears to be a good deal of confusion on this point, and quite recently I noticed an article in the Press in which the statement was made that the Department of Industries was responsible for the failure of the Punalur paper mill. This statement betrays a misconception of the nature of the department's connection with the mill. The facts are as follows: The Punalur Paper Mills Company was first organized as far back as 1887. The Travancore Government assisted the company not only by taking shares but also by guaranteeing interest on the capital, but after losing steadily year after year the company went into liquidation. The Travancore Government brought the property at the court auction in 1895 and sold it at a very low price to a Cochin firm. The Travancore Government lost over

Rs. 5 lakhs over the concern. In 1908 the property passed into the hands of the Luxmi Paper Mills Company, but again the mill worked at a loss, and the present proprietor took it over. In 1914 he applied to the department for assistance in resuscitating the concern, and on Mr. Tressler's recommendation Government agreed to render some help. It was expressly stated in the agreement that Government would undertake no responsibility for the management of the mill, but they agreed to pay the salaries for one year of an engineer and a pulp-maker and also to allow Dr. Marsden, who had some previous experience of paper-making, to visit the mill from time to time for purposes of supervision and advice. On his part the proprietor agreed to keep such accounts as the department might prescribe, and Mr. Tressler hoped to obtain from these accounts useful data in regard to the possibility of starting a bamboo pulp factory in the Presidency. These orders were passed by Government in December 1915, and on February 21, 1916 the engineer and pulp-maker were appointed. In the meantime the proprietor had made some pulp, but the price obtained for it was low that it was evident that pulp could not be made except at a loss, and it was decided to manufacture brown paper. The plant, however, was old, and owing to a series of breakdowns, work was much delayed. Eventually, however, the machinery was got into some sort of order, and the mill was worked more or less continuously from the 5th June till the 22nd July 1916. The boilers then began to work so badly that Mr. Dunhill was summoned from Madura to examine them. He pronounced them to be so badly corroded as to be positively dangerous, and the proprietor was advised that work could not be resumed until new boilers had been installed. Some difficulty was experienced in obtaining them, but by the end of the year they had been installed. The question whether Government assistance should be continued then came up for decision. At that time an experienced paper-maker happened to be available in Madras, and he was engaged, on my advice, by the proprietor. And Government, also on my advice, have agreed to subsidize the mill for a further period of one year to the extent of Rs. 150 a month on condition that certain data are furnished by the proprietor. But the department has nothing to do with the management of the mill, and in my report on the subject to Government I made it quite clear that the main reason why I recommended assistance to the mill was that, in view of the general scarcity of paper in India, it was worth our while to encourage the manufacture of paper at Punalur.

DYEING SECTION.

25. *Dyeing Expert.*—As the question of dyes is a technical one, I give Dr. Marsden's report in his own words:—

"Complaints regarding the scarcity of dyes consequent upon the continuance of the war have been pronounced throughout the year, and the dyeing trade has suffered severely. It is not that no dyes whatever were available or that imports had ceased. Stocks were held by many dealers but naturally dealers were keen to obtain the highest prices possible, and the prices demanded were beyond those which the necessitous dyer in a small way of business could afford to pay. Imports have naturally been much restricted, for although dye-making firms in England and America have increased their output considerably, the quantities which they have been able to produce are hardly likely to be comparable with those produced in Germany before the war. We know for certain that in the first instance the energies of the English firms were devoted largely to the production of dyes required for cloth for the fighting forces and only later were the requirements of the general dyeing trade considered. The latest news shows that great strides have been made in this direction, but, in the main, production has been for the Home trade, and the demands made upon the industries of the country for war purposes have made it impossible for the dye-makers to meet the requirements of a special trade like the Indian one. The bulk of the European trade may be taken as dealing in dyes in bulk, put up in casks and kegs, with a small proportion in tins of 5 and 10 lbs. In India, with the exception of alizarin and dyes on mill account, the trade is mainly a "tin" one and almost entirely one of dyes in 1 lb. packages. The attention of makers in England was drawn to this point, but they regretted that they found it impossible to supply in anything but bulk owing to the difficulty in obtaining a supply of suitable tins. One

firm did ship a consignment of dyes in tins, but the shape and style of these bore no resemblance to those which had been in vogue here, and this fact alone was sufficient to condemn the contents in the eyes of small users.

"The prices of dyes both here and in England have been abnormally high, and as the price of cotton has been much above the average, cloths could not be produced at anything approaching normal rates, and whereas the demand has generally been for full-dyed cloths, dyeing has recently been more and more restricted to yarns for coloured headings and borders.

"There has been no material improvement in the position with regard to the indigenous dyes. Supplies of chey and other red-dyeing roots appear to have increased a little and are being used, but the quantity still bears no relationship to that which would be required were the dyers throughout the country to take to them. Their use appears to be restricted to the smaller dyers, and large dye-houses accustomed to the use of imported alizarin find the indigenous material unremunerative and are not prepared to revert to it owing to the comparative poorness of the shade obtained and the cost and trouble of dyeing. Many use alizarin still, even at the enormously high price at which it is selling, but this dye will now be difficult to obtain owing to the damage caused to the only alizarin works in England by an explosion.

"Outside these roots and indigo the other indigenous dyes do not meet the requirements for cotton-dyeing, which is the chief demand in Madras, and find no application except munjeet and kadukkai flowers (pista) and such other specialities for printing, for which they have always been employed.

"During the early part of the year replies continued to be received to the circular requesting information upon the question of supplies of the different materials which could be obtained. From these replies it was very evident that, apart from the tanning materials generally classed as dyes, the quantities available were very small, and in all cases the cost of collection and delivery was high. Even had the materials been available in quantity, they would not have found any application in Madras unless there had been a radical change in the taste of the people as regards colour and fastness; for in the majority of cases (chey root, nuna, suroolpattai, munjeet, red sanders wood, cutch, divi divi, etc.) the shades given are too dull to admit of their competing with more suitable synthetic dyes, and where shades of sufficient brightness are possible (turmeric, annatto, sappan wood) the fastness properties in all cases are so poor as to limit their scope of application materially.

"Much has been made of the difference of opinion regarding the usefulness of natural dyes which appears to exist between the Director of Industries, Cawnpore, and the Dyeing Expert, Madras, and the latter has been severely criticised for what has been taken to be the biased opinion which he has maintained. Even the Industrial Commissioners seemed to have held this view and thought that more should have been done to resuscitate the old time products. Samples of the shades obtainable and said to be finding a ready market in the United Provinces were forwarded to Madras as an example of what might be done. The Dyeing Expert classed them as unsaleable here. Samples were forwarded to representative people with knowledge of the requirements in Madras, and they one and all confirmed his statement, so the only explanation of the difference of opinion must lie in the difference in the demands made by the people in the two provinces as regards dyed materials.

"Many people have taken up the cry that research would improve our knowledge of these materials and make it possible for them to be altered to meet the requirements. As a matter of fact a great deal of research upon the natural dye-stuffs has been carried out, and much has been written about the dyeing principles they contain. In the majority of cases they have been isolated in a state of purity and thoroughly examined, and many have been synthetically prepared. The result has been that where a natural dye-stuff has been found to possess outstanding valuable characteristics the investigation has stimulated research with the idea of synthetic manufacture, and alizarin and indigo are typical examples of the effect of improved knowledge. The alizarin-producing plants have gone out of cultivation, and while the production of synthetic indigo was growing by leaps and bounds, the export of natural indigo was steadily diminishing.

"Plants in general produce dye-stuffs but in small quantity and in admixture with non-dyeing matters, which may or may not affect the shade but certainly do not improve it, and dyeings made with crude plant products cannot compare in brilliance with those produced by the aid of pure colouring principle prepared synthetically.

"It is not even the case that research would increase our knowledge to any material extent of the methods of application, for the best methods for all the possibly useful natural dye-stuffs have been studied, and the conditions for obtaining the best results with the dye contained have been fixed. One great trouble with the natural dyes is that when any shade is to be produced which necessitates an admixture of dyes, separate dyeing process have to be carried through for each individual, and the result is an expenditure in the matter of time, labour and material which is out of all comparison with that required for an admixture of synthetic dyes which may be selected to dye together on one operation and of a quality to meet all demands that can be made upon the dyeing.

"The Madras Press drew attention in the reports upon the Indian Science Congress Meeting at Bangalore to the splendid results obtained at the Institute there with the natural dyes and gave quite a wrong impression of the position. The materials therein referred to were those which had been dyed and reported upon by the Dyeing Expert in December 1915, and the question to which the Professor of Applied Chemistry at Bangalore was devoting himself was the production of a dye in powder from sappan wood. In this he has been successful and the material is finding application. An extract from the report by the Dyeing Expert upon this dye-stuff may be of interest. He wrote 'the dye contained is very easily extracted with water and no further treatment is required than the rasping of the wood to give a suitable dyeing material'. Dyed upon an alum mordant it gives a bright bluish crimson shade, but unfortunately this is of very little or no value at all, as exposure to the sun for less than 12 hours caused the shade to lose some 50 per cent in depth and therefore, however much it might be employed upon silk where the demands are not so severe, it can never hope to find applications here upon cotton.'

"No recent report upon the results obtained with the natural dyes available in the United Provinces has been received, but the attitude of dyers in Madras to the materials found in this Presidency shows that those actually engaged in the trade endorse the Dyeing Expert's view that these materials will not meet the general market demands. Many dyers have tried them but have found it impossible to maintain with their aid a trade which has been built up by the use of the imported synthetic dyes. A great deal of interest has been taken in the question of dyes and dye substitutes and the Dyeing Expert has had enquiries from all parts of India as to the value of materials submitted. In the majority of cases these were coloured products of natural origin of no dyeing value whatever (being of the nature of pigments and inapplicable to textile materials), but in some instances the products were manufactured ones and seemed designed to catch the ignorant and unwary; for to apply them to dyeing purposes would have necessitated the employment of methods which no textile material would stand.

"It had been proposed that Government should acquire the dye cargo of the S.S. 'Barenfels' for distribution among dyers in the Presidency, but it was found impossible to arrange satisfactory conditions and the cargo was sold by auction in July. The cargo having been destined for Madras it was possible to arrange with the Agents of the Prize Court for the restriction of bidding to dyers in the Madras Presidency. The fact that the dyes to be auctioned were in makers' original packages and that the brands and tickets were well known here created a keen competition, and dyers all over the Presidency were present. The prices realised averaged a little over 15 times those holding previous to the war, and the result seemed to act as an incentive to holders of dyes (?) to have auctions on their own account. In Madura one merchant announced an auction of alizarin and aniline dyes, but purchasers of alizarin (?) upon opening their casks found the contents agreed in no way with the alizarin they had been in the habit of purchasing, and the resulting actions are still pending in the courts at Madura.

"At a more recent auction in Madras the bidding was not at all keen, and the results demonstrated that purchasers have now become shy of touching dyes the

origin and history of which are unknown, for tampering with packages and adulteration of the contents have been widespread, and whereas, in the past, a label and ticket were well known and served as a guarantee of the quality of the material which carried them, cases have been so numerous in which it was evident that the contents of the package had been adulterated (or even substituted by something quite different) that dyers are now very chary of purchasing without trial and even genuine, unadulterated imported dye is not being readily taken up.

"Such a condition of things makes it difficult to decide how the question of dye-supplies might best be dealt with, but attempts have not ceased to get dyes to the dyers at prices which would permit of their free use and thus assist the general textile trade of the Presidency."

26. Dr. Marsden spent most of his time during the year in charge of the pencil experiments. It was an obvious waste of power so to use a man with his special knowledge. Accordingly towards the end of the year it was arranged with the sanction of Government and in consultation with Mr. McKenna, the Agricultural Adviser to the Government of India, and Mr. Stuart, the Director of Agriculture, that he should undertake the investigation of the methods of manufacturing indigo in vogue among the ryots of the Madras Presidency, and that he should also enquire into the processes of adulteration in use. The object of the investigation is to see if Dr. Marsden can suggest improvements in the methods of manufacture and marketing. Concurrently with Dr. Marsden's enquiries the Agricultural Department will investigate the possibility of replacing the *Java* by the *Sumatran* plant.

WEAVING SECTION.

27. Two peripatetic weaving parties each under the charge of a Superintendent continued to work throughout the year, but their efforts to introduce improved appliances were rather hampered by the general depression of the hand-loom weaving industry caused by the war. The difficulty of obtaining dye-stuffs reduced the number of looms employed in making women's cloths, and many looms usually employed in weaving grey goods were idle owing to an abnormal rise in the price of yarn. From April 1916 to January 1917 No. I Party under the superintendence of M.R.Ry. N. Subrahmanya Ayyar, the Weaving Assistant, worked in the Tanjore district, a district which is distinguished not only by the number of handlooms at work but also by the quality of the fabrics woven. A census disclosed that there were more than 19,000 looms in the district, and a further feature of interest is the particular care devoted in some parts of the district to the preparatory processes. Sizing is a specialized industry in the district, and the warps of 60s and higher counts made at Kumbakonam are perhaps the best in the Presidency. Generally speaking, the warps made in the Tanjore district are longer than those made elsewhere, and in most places they are made on what may be called warping mills. The party toured systematically through all the weaving centres of the district, and demonstrations of the fly shuttle slay were made in all places where the Weaving Assistant was satisfied that the introduction of the fly shuttle would be advantageous. The method of demonstration was always the same. The fly shuttle slay was fitted to an ordinary loom in the weavers' quarters, and the weavers were given ocular demonstration that the class of cloth they were ordinarily engaged in weaving could be woven just as well as and far more rapidly than on an ordinary loom. In some places, the results were disappointing, but fly shuttle slays were introduced into all taluks of the district except Mayavaram, and experience elsewhere shows that once the fly shuttle slay has been fairly introduced, the use of it will spread automatically among the weavers. For instance, at Peddapur in the Gōdāvari district I found a number of looms fitted with fly shuttle slay, and on enquiry I found that one or two had been introduced by Mr. Sundaram a few months before, and that many other weavers had since adopted the improvement. In all 70 fly shuttle slays were introduced, but though demonstrations of the jacquard machine were given at Tanjore, not much success was achieved in the introduction of jacquards, dobbies and other similar improved appliances. As in previous years, the demand was very great for looms and loom accessories from districts, the Coimbatore district especially, visited in previous years, but many of these orders had to be held back for want of

stocks in Bombay. In January the Weaving Assistant made a preliminary tour through the South Arcot district with the object of seeing what work there was for the party in that district and of deciding what centres could usefully be visited. In March the party moved on to this district. The second party, under the charge of M.R.Ry. N. M. Sundaram, worked during the year in the Gōdāvari and Vizagapatam districts. The greater part of the year was spent in the former district, and demonstrations of fly shuttle slays, dobbies, jacquards and warping mills were given in the Amalapuram, Rajahmundry, Pithapuram and Peddapuram taluks. Eighty dobbies of various kinds, two jacquards, three frame looms, thirty fly shuttle slays, three solid border slays and a large number of minor accessories were introduced in the district. The use of the fly shuttle slay has been steadily spreading in the district since it was first introduced some years ago, and an actual census taken showed that nearly 60 per cent of the looms in the district are now fitted with the fly shuttle. At the request of the Inspector-General of Prisons, the Superintendent spent some time in improving the methods of weaving followed in the Rajahmundry jail, and he also devoted a good deal of attention to the Rajahmundry silk weaving industry. There are a number of small hand loom factories engaged in weaving silk cloths in the town, but the organization of labour in these factories apparently leaves much to be desired. The difficulty with small hand-loom factories always has lain in the restlessness of the weavers and in their dislike of the discipline and regular hours inseparable from factory life. The manufacturers have attempted to get over this difficulty by binding the weavers down by contracts to work for small wages. The weavers become discontented and behave badly in order that they may be dismissed. When they are dismissed, they are at once employed by a neighbouring factory, and so the process goes on. Mr. Sundaram endeavoured to form a manufacturers' association in order to prevent the factories from cutting one another's throats, but after a few meetings the association dissolved. In January last the party moved on to the Vizagapatam district, and until the close of the year it was engaged in working in the Vizagapatam and Chipurupalli taluks. The weavers in the Vizagapatam district are less progressive than in Gōdāvari. Many of the looms were idle owing to the high price of yarn and the scarcity of dyes, and it was reported that many of the weavers were deserting their hereditary occupation and migrating to Burma. They were not enthusiastic about improved appliances, but about a dozen fly shuttle slays and a few dobbies were introduced.

28. I think that these peripatetic weaving parties are doing useful work. From my point of view, the objection to them is that they are difficult to control, and their success or non-success necessarily depends mainly on the conscientiousness and enthusiasm of the Superintendents—not that I have anything to complain of in either Superintendent on this score. A further objection is that if, as is commonly reported, the weavers are entirely in the hands of the cloth merchants and sowcars, the introduction of the fly shuttle slay and other improved appliances is not by itself of much use, for the increased profits resulting from the use of these appliances go into the pockets not of the weavers themselves but of those who finance them. Some form of co-operative organization is probably the ideal to aim at, but there are obvious difficulties in the path, and so far co-operation has not made much headway among the weavers. It is obvious however that in dealing with the problem my department and that of the Registrar of Co-operative Societies should work together, and I have been concerting measures to this end with Diwan Bahadur Swamikannu Pillai and Mr. Hemingway.

BUREAU.

29. One of the important branches of the office is the Bureau of Industrial Information, and as usual a large number of enquiries covering a very wide range were received during the year. In respect of enquiries relating to mechanical engineering, the tanning and finishing of leather, handloom weaving and dyeing, there are officers in the department who are in a position to give useful advice, but as regards other enquiries, having no expert knowledge at my command, all I can do is to refer the enquirer to the literature on the subject. This particular difficulty obviously will never be wholly overcome, but provided that it is properly organized,

the Bureau ought in time to be able to fulfil a useful function particularly in supplying information regarding the various industries and the resources mineral and otherwise of the Presidency. A beginning was made in this direction. A *handbook of commercial information*, based largely on information contained in *The book of Madras exhibition*, was prepared and published by the Hon'ble Mr. Couchman, and was favourably received by commercial bodies and the press. The incipient surveys of the rice mill and bangle industries have already been referred to. A study in which Mr. A. Y. G. Campbell, C.I.E., I.C.S., Collector of Kistna, gave valuable assistance, was made of the economic conditions of the Ellore Carpet Industry, and the information obtained was forwarded to the Registrar of Co-operative Credit Societies in order that he might consider whether anything in the way of co-operative organization could be devised for the improvement of the industry. Parenthetically it may be remarked that a scheme for the support of the industry during the war was worked out by Mr. Tressler in collaboration with a Madras firm, but eventually it was negatived by the Government of India. The lace exhibition organized by the Victoria Technical Institute was followed up by an enquiry into the lace-making industry of the Presidency. Much information has been collected, but I have not yet had time to write it up. Information is gradually being accumulated about the various cottage industries of the Presidency. Enquiries were set on foot, under the orders of Government, as to how far the resources of the Presidency could be developed for the supply of necessities to the troops in India and samples of pipe tobacco, cigarettes and rum were sent to the Quarter Master General. The East India Distilleries Company as the result of these enquiries is now supplying golden syrup to the army, and is considering the question of experimenting with jams. Shortage of tins and tin-plate is however a difficulty in the way of such industries. Specimens of minerals were received from various persons and were sent to the Geological Survey Department for analysis. One of these specimens led to a special visit by an officer of the department to the Presidency. A good deal of work was done for Mr. A. W. Lushington, C.I.E., temporary assistant to the Commissioner of Forests, in his efforts to find a use for the lesser known woods of the Presidency and an effort was made to induce a private firm to take up the manufacture of bobbins. The firm made some jute bobbins which were favourably reported on by one of the biggest jute mills in Calcutta, but unfortunately it was so busy with supply of cordite boxes that it was unable to take up the business in earnest. A very large number of applications for priority were also received from Government for report.

INDUSTRIAL EDUCATION.

30. *The Madura Technical Institute.*—The work of the Mechanical Engineering Section of the Institute continued to be carried on under difficulties in temporary sheds while the new buildings for the Institute were under construction in the same compound. Mr. Dunhill was in charge of the section throughout the year. There were 56 students on the rolls on the 1st April 1916, 49 students were admitted and 24 left during the year, the number on the rolls on the 31st March 1917 being 81. Eleven students appeared for the Government Technical Examinations and 8 passed. The total expenditure was Rs. 27,995-15-6 and the receipts Rs. 7,459-15-10. The average net cost per student was Rs. 253-6-6 against Rs. 301-1-0 in the previous year. Most of the work done by the students was wood work for the new buildings. Munitions work, viz., base plates for shells, was suspended in September 1916.

31. The mechanical workshop buildings are now approaching completion, though some extension of the original design will probably be necessary, and the other two blocks of the Institute are under construction. The hostel had not been begun by the end of the year, and sites have only just been selected for the officers' quarters. The Institute when completed will be a very fine building, and a short description of it may be of interest. The Institute proper will comprise three blocks. One block will contain the mechanical workshop buildings including a machine shop, fitters' shop, engine room, boiler house, carpentry shop, wood working machine shop, industrial machine shop, blacksmiths' shop, and foundry in addition to a store-room and offices. A schedule of the machinery required for the equipment of

the different sections has been prepared, but it will be impossible to obtain delivery until the war is over. In the engine shop will eventually be installed the latest type of steam engine and suction gas plant, electric generator and storage batteries and accumulators. The electric generator will charge the storage batteries from which current will be supplied to the various electric motors and also for the lights and fans. The machine shop will contain a variety of machine tools including in addition to a number of lathes, planing, slotting, shaping, milling, gear cutting and drilling machines, these machine tools will be driven by a separate electric motor. The industrial machine bay will contain rice shelling, hulling and polishing machinery, cotton gins, oil and flour mills, and will be driven by a liquid fuel burning oil engine. The wood working bay will be driven by a separate electric motor and will comprise wood working lathes, Band saw and Universal Wood Worker. The blacksmiths' shop and foundry will also be well equipped. The centre block will comprise a large show-room, a hall for mechanical drawing, a laboratory for the dyeing section as well as lecture halls and class rooms. The third block is intended for the Weaving department. The present intention is that Dr. Marsden should be Principal of the Institute as well as Superintendent of the Dyeing Section, and that Mr. Dunhill should remain in charge of the Mechanical Engineering Section. Mr. Chatterton's views regarding the scope and objects of the institute have been generally approved by Government, but these proposals were submitted some years ago. Circumstances have changed considerably since then, and the whole question of the courses of instruction to be given at the institute is now being reconsidered.

32. *The Leather Trade School.*—Mr. Kurup, the Assistant Leather Expert, remained in charge of the Leather Trade School which entered on the second year of its existence. Two more students joined, bringing the total number up to 5, and the cost of the school was as much as Rs. 11,631-1-3 against Rs. 11,469-11-9 in the previous year. The net cost per student was thus Rs. 193-13-7 per mensem, and as run it was obviously a very expensive institution, especially as most of the five students came from Northern India. Accordingly after watching the working of the school for some months, I formulated certain proposals for the reorganization of the school. These proposals were circulated for criticism among various gentlemen interested in the tanning and leather industry of the Presidency, and the school is now being worked on a different basis. The number of lectures has been cut down, and the school is now being run as a small model tannery and leather finishing school. The existence of the school was also widely advertized and the number of students has now risen to 12.

33. *Government Trades School.*—My final report on the working of this school has only recently been published, and it is unnecessary to refer to the school more than very briefly here. The opening of a Trade School in a rented building in Georgetown was sanctioned in G.O. No. 1092, dated 17th October 1916, and the sessions began in December 1916. The school was purely an experiment, and it was decided to begin with classes in mechanical engineering and plumbing. Mr. W. H. Lockley of the Beehive Foundry and Mr. Hillier, the European plumber of Oakes & Co., Limited, were engaged as lecturers, and only workmen or apprentices actually engaged in the engineering workshops or in the plumbing trade were admitted to the classes which were limited each to 20 students. The course which consisted of 40 lectures was brought to a close in April 1917 when examinations were held by Mr. Coats, the Corporation Engineer, in Mechanical Engineering, and by Mr. Madeley, the Special Drainage and Water Works Engineer, in Plumbing. The result of the examinations was very fair, a particularly satisfactory feature being that all the students in the plumbing examination passed the practical part of the examination, some of them being pronounced quite expert in all the branches of the work in which they were examined. The results of the first year's work justify persevering with the experiment, and I have proposed that besides continuing the classes in plumbing and mechanical engineering, a number of new classes should be added, including classes in electric wiring and mechanical drawing and a Perambur apprentice class.

34. *Industrial Schools.*—Apart from the three Government institutions mentioned above there were 36 industrial schools controlled by the department at the beginning

of the year and two more were recognized during the year. These 38 schools may be roughly classified as below :—

Carpentry schools where carpentry is the principal subject taught	17
Lace schools where needle craft is the principal subject taught	15
Printing schools where printing, book-binding, etc., are the principal subjects taught	2
Agricultural school	1
Blind boys' school for weaving	1
Weaving schools	2
Total	38

In nine of the above mentioned 17 carpentry schools mechanical engineering is also taught as a subsidiary subject. Statistical information regarding the schools is given in Tables II and III of the Appendix. It will be seen that there were 1,970 pupils under instruction on 31st March 1917 against 1,916 on the corresponding date in the previous year. The usual scholarship and teaching grants were given and the variations in the expenditure under these heads are so small as to require no remark. But owing to financial stringency the building and furniture grants were cut down to a minimum. The future of these industrial schools has frequently been debated, but no solution has yet been arrived at. Mr. Tressler devoted much time to drafting a Code of Industrial Education, but his final proposals were not accepted by Government. I have now been ordered to submit fresh proposals but it has been decided that, before any proposals are submitted, all the schools should first systematically be inspected by Mr. Fyfe. This inspection is now in progress.

35. *Cost of the department.*—The receipts and expenditure of the various branches of the department are given in the appended Table No. I. The total expenditure amounted to Rs. 2,32,307 and the receipts Rs. 19,245, while the corresponding figures for last year were Rs. 2,19,941 and Rs. 13,698, respectively. The slight increase in expenditure is mainly due to the increased salary and allowances of the officer on special duty. The increase during the year of over Rs. 5,000 in receipts is accounted for by the sale-proceeds of pencils manufactured by the department. The net cost of the department was Rs. 2.13 lakhs as against Rs. 2.06 in the previous year.

36. All the officers of the department worked well.

APPENDIX.

Table I.—Financial statement for 1916-17 (Comparative statement for 1915-16 and 1916-17).

Number.	Detailed head.	1915-16.		1916-17.	
		Receipts.	Expenditure.	Receipts.	Expenditure.
		RS.	RS.	RS.	RS.
1	Director of Industries	..	37,256	400	50,193
2	Madura Technical Institute	..	27,013	7,460	27,995
3	Dyeing Expert	..	13,496	..	11,734
4	Leather Trade School	..	11,525	1,773	13,404
5	Peripatetic Weaving Party No. I	..	876	674	5,742
6	Do. No. II	..	541	1,536	3,981
7	Madras Trade School	..	..	120	8,090
8	Grants-in-aid and scholarships	..	48,840	..	47,615
9	Bureau of Industrial information	..	11,874	..	540
10	Industrial (war) exports—				
	(a) Pencil	118	10,630	5,773	16,955
	(b) Glass	5	6,172	640	18,734
	(c) Paper	..	..	..	942
	(d) Miscellaneous items	..	8,016	63	3,270
11	Lime brick experiments	743	22,358	428	17,206
12	Oil expeller demonstration	1,548	2,962	378	990
13	Construction of oil mill	..	10,298	..	4,915
	Total	13,698	2,19,941	19,245	2,32,307

As the pumping and boring branch, sugarcane, motor tractor and the Gunjana pumping experiments have been transferred to the Agricultural Department, these items have been eliminated from the statement.

Table II.—Statistics relating to industrial schools for 1916-17.

[illegible][illegible]

Table III.—Statistics relating to industrial schools for 1916-17.

District.	Name of institution.	Number on rolls on the 31st March 1917.							Receipts.					Public funds.	Manager's contribution.	Total receipt (equal expenditure).	
		Boys' or Girls'.							Miscellaneous receipts including sale proceeds of manufactured articles.	Fees.	Grants—Provincial funds.						
		Advanced.	Intermediate.	Standard D.	Standard C.	Standard B.	Standard A.	Total.			Teaching.	Furniture and special.	Total.				
RECOGNISED SCHOOLS.																	
Government.																	
Madras	Leather Trades school, Madras	Boys.	..	..	..	..	..	..	6	1,472 11 0	300 0	..	..	11,022 8 6	..	12,796 3 6	
	Trades school, Madras	Do.	..	..	..	..	..	..	+36	..	120 0	..	..	7,969 15 11	..	8,089 15 11	
	Government Technical school, Madras	Do.	..	..	3	4	18	42	81	6,002 6 1	..	..	..	21,993 9 5	..	27,995 15 6	
	Total	..	..	5	3	4	18	42	122	7,475 1 1	420 0	..	..	40,986 1 10	..	48,881 2 11	
AIDED SCHOOLS.																	
First and Second class.																	
Coimbatore	Coimbatore St. Joseph's Industrial school	Boys.	8	6	1	5	6	13	22	37,366 7 5	..	1,750	128 4	1,878 4	845 10 5	40,090 5 10	
Trichinopoly	Kannur Wesleyan Mission Industrial school	Do.	14	20	9	15	8	1	72	14,398 6 6	357 0	2,800	600 0	3,400 0	1,930 12 11	20,095 3 5	
	Madras Chengalvura Nalokar's Technical Institute	Do.	29	42	85	16	22	71	205	7,708 12 0	4,710 14	5,000	2,752 0	8,752 0	17,312 3 1	38,483 13 1	
North Arcot	Katpadi-Aroor American Mission Industrial school.	Do.	6	11	4	4	6	5	42	7,980 11 4	..	1,820	185 0	2,005 0	4,420 4 5	14,405 15 9	
	Tindivanam St. Joseph's Orphan Industrial school.	Do.	7	6	9	6	7	5	40	7,976 8 0	..	1,500	..	1,500 0	287 3 0	9,189 5 0	
Madras	Madras Anjuman-i-Nafai-i-Islam	Do.	..	23	20	18	30	39	130	12,378 6 0	..	5,000	..	5,000 0	-2,777 9 0	14,600 13 0	
Tinnevely	Nazareth Art Industrial school for boys	Do.	14	7	2	12	4	18	57	5,081 12 4	..	1,950	225 0	2,175 0	932 14 6	8,209 10 10	
Tanjore	Nazareth St. Francis Xavier's Industrial school	Do.	5	6	6	6	22	18	63	5,352 4 0	..	1,250	175 0	1,425 0	2,000 2 3	9,357 6 3	
Trichinopoly	Puttur All Saints' Boys' Industrial school.	Do.	8	6	6	7	1	3	44	3,561 4 7	..	700	..	700 0	1,947 9 9	5,208 14 4	
Vellore	Vellore Anjuman-i-Islam-Athul-Hasanath	Do.	..	6	3	5	2	4	32	12,799 13 4	..	350	..	350 0	3,298 2 3	17,447 15 7	
Nellore	Nayadupet O.E.L.M. Industrial school	Do.	..	..	4	2	1	5	12	2,237 6 10	..	708	71 6	779 0	16 0 0	3,032 6 10	
Kistna	Manlipatam Andra Jatheeya Kalasala	Do.	..	..	4	9	13	22	48	11,938 3 7	15 8	400	225 0	3,500 0	4,017 5 11	16,596 1 6	
Vizagapatam	St. Aloysius' Industrial school, Vizagapatam	Do.	..	..	..	..	..	..	18	48,641 13 5	..	3,500	..	3,500 0	-1,700 0 0	50,341 13 5	
	Total	34	96	127	162	104	140	195	889	1,78,331 13 4	5,093 6	27,728	4,351 4	32,089 4	32,576 5 6	2,48,090 12 10	
Third class.																	
Chingleput	Melrosapuram United Free Church Mission Agricultural school	Boys.	..	1	..	2	..	6	9	888 13 8	27 8	160	175 0	335 0	61 12 2	1,313 1 10	
Madras	Madras Government Press Technical school	Do.	..	47	126	..	..	..	172	..	..	400	..	400 0	-45 9 0	354 7 0	
The Nilgiris	Ootacamund Government Press Technical school	Do.	..	2	17	..	..	..	219	..	..	350	..	350 0	233 2 2	5,538 1 9	
South Arcot	Keelur Danish Mission Girls' Industrial school	Girls	..	..	..	8	5	14	35	6,054 15 7	..	..	..	..	1,315 11 8	3,844 9 10	
Madras	Kilpauk Church of Scotland Mission Industrial school.	Do.	..	1	2	7	11	23	35	1,778 14 2	..	500	250 0	750 0	..	..	

Chingleput	Chingleput United Free Church Mission Lace school.	Do.	3	4	11	8	5	8	13	2	1,980 15 10	..	250	..	250 0	..	..	-779 13 5	1,451 2
North Arcot	Banipet Aroor-American Mission Women's Industrial Home.	Do.	..	..	8	5	3	5	24	45	607 0 5	..	200	..	200 0	..	..	1,824 8 11	2,631 9 4
Trichinopoly	Kempotown Church of Sweden Mission Girls' Industrial school.	Do.	..	..	..	..	3	3	1	3	10	..	225	37 8	262 8	..	..	396 14 6	659 5 6
Madras	Madras St. Joseph's Convent Girls' Industrial school.	Do.	..	..	..	8	20	14	10	52	1,014 15 0	..	450	..	450 0	..	..	1,315 13 0	2,780 12 0
Tinnevely	Idayagudi S.P.G. Lace school	Do.	..	..	8	1	10	4	10	33	1,026 10 0	..	300	..	300 0	..	..	283 6 0	1,043 4 0
Cuddapah	Kudagulam S.P.G. Lace school	Do.	..	..	2	4	3	8	7	24	613 5 0	..	280	..	280 0	..	..	169 0 9	624 4 3
Trichinopoly	O.E.L.M. Lace-making class, Kodur	Do.	..	..	3	11	13	12	40	..	264 0 0	..	300	..	300 0	..	..	6 6 5	367 9 7
Coimbatore	Kann Wesleyan Mission Girls' Industrial school	Do.	..	..	1	1	3	1	4	15	282 6 5	..	150	95 0	245 0	..	..	43 9 11	571 0 4
Bellary	Erode London Mission Girls' Industrial school	Do.	..	..	6	15	17	17	6	78	65 0 0	..	100	..	100 0	..	..	101 0 0	201 0 0
Tinnevely	Bellary St. Joseph's Girls' Industrial school	Do.	..	..	7	2	1	1	1	13	283 9 0	..	450	..	450 0	..	..	1,674 0 0	2,189 0 0
Malabar	Nazareth St. John's Art Industrial school for Girls.	Do.	..	..	7	2	1	1	1	13	283 9 0	..	100	..	100 0	..	..	51 11 9	435 4 9
Tinnevely	Chombala Basal Mission Girls' Industrial school.	Do.	17	6	2	1	1	6	33	..	552 1 0	..	150	..	150 0	..	..	444 1 3	1,146 2 3
	Palamcottah Church Mission Society Blind Boys' Industrial school.	Boys.	..	..	4	2	2	3	7	23	2,290 0 0	..	300	128 0	428 0	..	..	928 0 0	3,646 0 0
	Total	27	82	205	68	101	106	174	763	27 8	4,655	685 8	5,350 8	7,106 1 9	29,086 11 10	..	..	..	..
Fourth class.																			
Salem	Weaving classes of Government Girls' school, Tiruchengode.	Girls	..	..	..	6	14	15	12	47	80 5 3	..	..	292 10 9	..	..	..	373 0 0	..
Ganjam	Berhampur Baptist Mission Industrial school	Boys.	4	..	2	..	4	1	..	11	2,444 12 3	..	650	..	650 0	..	..	711 10 0	3,806 6 3
Chingleput	Vellore American Advent Mission Industrial school.	Do.	..	..	..	3	5	21	17	46	2,161 3 6	..	350	..	350 0	..	..	3,090 5 5	5,591 8 11
Kurnool	Nandyal S.P.G. Weaving school	Do.	..	..	..	..	..	..	..	4	3,365 9 0	..	84	140 11	224 11	..	..	371 5 0	496 0 0
Madras	School of Dress-making, New Town, Madras	Girls.	..	..	25	..	..	..	..	25	..	..	500	..	500 0	..	..	555 7 2	4,465 8 2
	Total	4	..	27	9	23	37	38	133	..	8,041 14 0	..	1,684	140 11	1,724 11	292 10 9	4,638 11 7	14,732 7 4	..
UNUSED SCHOOLS.																			
Trichinopoly	Trichinopoly St. Joseph's Industrial school	Boys.	..	..	3	12	15	..	13	43	19,974 8 5	..	..	..	..	..	..	358 13 11	20,328 6 4
Tanjore	Kumbakonam St. Mary's Industrial school	Do.	..	..	1	3	7	..	5	4	9,428 14 0	..	..	..	..	..	..	934 14 4	10,363 12 4
	Total	1	6	7	12	15	5	17	63	..	29,403 6 5	..	..	..	..	..	..	1,288 12 3	30,692 2 8
	Grand total	71	188	371	254	247	306	461	1,070	239,854 12 11	5,575 6	33,977	5,187 7	39,164 7	41,278 12 7	45,609 15 1	3,71,483 5 7	..	..

* First year course 2, second year course 3.

† Plumbing 19, Mechanical engineering 17.

‡ In October 16 the last working day.

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No. 1209, HOME (EDUCATION), 19TH SEPTEMBER 1917

Order—No. 1209, Home (Education), dated 19th September 1917.

Recorded.

(True extract)

R. RAMACHANDRA RAO,
Secretary to Government.

To the Officer in charge of the Department of Industries.

" Honorary Director of Fisheries.

" Revenue Department.

" Home (Miscellaneous) Department (for Presidency Administration Report).