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Recent Trends in the Distribution of the Cotton Mill Industry in India

BY

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IMPORTANCE OF THE STUDY

There is special appropriateness in my addressing the Geographical Association on a subject of this kind dealing with the localisation and distribution of a particular industry, for it is one of those subjects in which there is urgent need for fruitful collaboration between the Economist and the Economic Geographer. The migration of population from one region to another under the stimulus of changing geographical and economic conditions and the shift of industry from one locality to another, resulting in poverty and suffering in the depleted areas invest the problem of industrial location with great interest. The rise and development of the cotton industry in India and Japan has created problems not alone in those countries but even more so in Lancashire where those dependent on the cotton industry have been thrown out of work. New methods of production or new sources of power or new inventions completely alter the importance of old locations of industry which has to move out to other regions more suited to the changed conditions. The utilization of new forms of power such as hydro-electric energy and the new possibilities of electric transmission in India offer scope for the use of machinery in localities not supplied with coal.

CONCENTRATION OF INDUSTRY IN INDIA

Modern industry in India is concentrated in a small number of towns and in a few geographical regions. More than half the factory workers of the country are employed in two cities and their neighbourhood, Calcutta and Bombay ; and a small number of other

centres like Ahmedabad, Cawnpore, Jamshedpur, Madras and Rangoon account for nearly all the rest. In Delhi, Lahore, Lucknow and Nagpur the factory population is only a small part of the total population, but there is some concentration of factories in those capital towns.

FACTORIES OF LOCATION

Why is industrial life so much concentrated in these cities? If purely natural factors were decisive, we should expect economic activity to be widely dispersed in accordance with the distribution of natural resources and raw materials. It is true that in agriculture and mining the principle still holds good. The extraction of metals and minerals, the raising of various kinds of agricultural produce, the development of plantation industries like tea, coffee and rubber and generally speaking the production of what may be called the first order of goods are all conditioned by natural factors. Thus the raising of cotton and jute and of the various food crops like wheat and rice, the extraction of coal or of gold and silver and the opening up of oil fields are all carried on in regions where natural conditions are suitable for the purpose. But as soon as we reach the second order of production, new factors begin to operate. While wheat must be raised from the wheat lands, wheat flour may be produced almost anywhere if certain conditions are satisfied. The spinning of cotton yarn requires, it is true, a fairly moist climate; but artificial humidity can be secured at a cost and if there are compensating advantages, the cotton spinning industry may be located in regions not only far away from the raw material but even in places having but little moisture. At the same time natural factors always remain in the picture and are ready to make themselves felt if conditions of production in an industry begin to change.

I propose in this paper to do two things. I shall in the first place deal with those causes which had brought about the high concentration of the cotton mill industry of India in the nineteenth century, in the light of the general theory of industrial location. Secondly, I shall note the changes that have taken place in the distribution of the industry in recent years and examine the causes of such changes and estimate their effects.

BOMBAY'S PRE-EMINENCE IN THE 19TH CENTURY

The cotton mill industry of India had from its origin been loca[ted] in the Bombay Presidency and more especially in the two cities of Bombay and Ahmedabad. In 1894-95 out of 144 mills in

India 100 were in the Bombay Presidency, of which 67 were in Bombay city. Towards the close of the last century, out of 167 mills of all kinds, i.e., including purely spinning and purely weaving mills, there were in Bombay city alone 74 mills or 44·3% of the total. The extent to which Bombay Presidency was responsible for the development of the Indian cotton industry could be understood from the fact that in the period of 1901-04 nearly three-quarters of the yarn and over 82% of the woven goods made in the country were supplied by that province. Bombay city's share was 57% of the total yarn and 54% of the woven goods produced in the country and Ahmedabad was a poor second with a share of 8% of yarn and 19% of woven goods. The position was more or less the same right up to 1920-22, the Bombay Presidency maintaining the same percentage share in the total production in yarn and cloth, although within the province itself Bombay city was losing ground steadily to Ahmedabad. Thus in the period 1919-22 Bombay Presidency spun 70% of the yarn and wove 83% of the cloth in India, Bombay city's share being 50% in yarn and 53% in woven goods. To get some idea of the concentration of the industry in these two cities, the following figures will be instructive. In 1919-20 out of a total of 235 mills in British India, Bombay had 83 mills and Ahmedabad 66 and these were responsible for 63% of the number of mills in India, 62% of the yarn and 76% of the woven goods produced. While 63% of the mills were located in those two centres, the other mills were widely scattered all over India, although in Sholapur, Nagpur, Madras and Cawnpore there was some degree of concentration. But the scattered factories turned out only about 24% of the cloth and 38% of yarn made in the country. Contrast this with the position of Bombay which turned out 50% of the yarn and 53% of the cloth and you have some idea of its absolute predominance.

CAUSES THEREFOR

How is it that Bombay had ever been the most dominating textile centre of the country right up to quite recent times? The main raw material of the industry is raw cotton and this is evenly distributed in the productive areas of the country. A glance at the cotton map of India will show that with the exception of Bengal, Bihar and Orissa, parts of the United Provinces and coast districts of Bombay including the regions near the city and island, cotton is available in varying quantities. The *Oomras* of Central India, Khandesh, C. P. & Berar, the *Dholleras* of Kathiawar and Ahmedabad, the *Bengal-Sind* of U.P. and Rajputana, the *Broach* of Bombay

Presidency, the *Westerns and Northerns* of the Circars, the *Salem, Cambodias* and *Tinnevellis* of the southern parts of the Madras Presidency and the *Punjab-American* of the Punjab are some of the trade names given to the varieties grown in the several tracts of the country. The distribution of cotton mills was not in accord with the distribution of the raw material of the industry. There are still vast cotton-growing tracts like the Punjab in the north and Circars in the south, with practically no cotton spinning and weaving factories; and this lack of correlation between the sources of the main raw material and places of manufacture requires some explanation, especially when it is borne in mind that the cost of the primary raw material, *i.e.,* cotton accounts for about one-half of the total cost. It may, however, be recalled that neither Lancashire, nor Japan, the two great world suppliers of cotton goods, grows any cotton. In the U.S.A. while the Southern States grow cotton, the manufacturing was carried on till recently almost entirely in the Northern States. So far as cotton industry is concerned, it would seem therefore that nearness to raw material does not constitute a necessary condition of the location of the manufacturing industry.

THEORY OF INDUSTRIAL LOCATION

The reason for this phenomenon may be explained by the general theory of industrial location. Every industry requires various kinds of raw materials including coal, if steam power is to be used or oil, if oil engines are used. In addition to the question of raw material and power, the problem of transporting the finished product to the region of consumption remains. The relative distance of a producing centre from the region of the raw material (including therein coal) and from the market combined with the weight of the raw materials to be moved to the producing region and of the finished product to the market will determine whether an industry should be located near the source of the material, or near the source of power or near the market. In general, it may be said, that if a raw material is more difficult to transport than the product made from it, production tends to be placed near the former. But not all raw materials exert the same kind of locating force. For this purpose the raw materials may be distinguished into "pure" and "weight-losing" materials on the one hand, and "localised" materials and "ubiquities" on the other. Pure materials are those that enter without any loss of weight into the product and therefore by themselves cannot bind production to their deposit, for whether they are converted into finished product in the region of their deposit or are carried over to the place of consumption and there converted into finished product makes no difference so far as actual transport is concerned. On the other hand, the presence of raw material of which a large proportion is waste, *i.e.,* a weight-losing material will attract manufacture to it because a saving in freight can be effected. Examples of this kind are the saw mill industry, the woodpulp industry, the cocoanut oil industry and these find their location near the place of material. "Raw materials, therefore, tend to attach industries to their place of production in inverse proportion to the amount of the raw material that enters into the finished product." Raw cotton after it is ginned becomes a "pure" material and enters fully into the weight of the product. There is therefore no compelling reason binding the textile industry to the region of the sources of raw cotton.

But the case is different when it comes to the use of large quantities of coal. Coal is a weight-losing material and an industry like the textile industry having to use considerable quantities of coal for power is drawn to the regions of coal and before coal-mining industry was developed to the regions of water-power which too could not be transported. Thus when an industry has to use materials of various kinds some of which are weight-losing, the latter will exert a great influence as a locating factor.

There are some materials which are localised in certain regions and others are to be found almost everywhere. The latter, termed ubiquities, have no locating force at all. They will be available wherever production is carried on and there is no need to transport them. But their influence is felt in an indirect manner. Their weight being included in the final product, the question as to whether an industry should be located near the regions of the localised material or the finished product, results ultimately in a comparison between the weight of the localised material and the weight of the final product in which ubiquities have been absorbed. It is true that in course of time there is a tendency for the ubiquities by being used up to become "localised" and this together with the fact that the increasing control of nature tends to increase the weight losses in production strengthens the locating force of the material component in contrast with that of the finished product.

It will now be clear that the relative pulls of the weight of the material and of the weight of the product will determine in each case as to whether the location should be near the raw material or near the market. The distance to be covered in each case and the

relative costs of transportation of the materials and of the product are the other factors determining location. The distance is more than mere geographical distance and the systems of transportation, whether they are by land or by water and the freight rates by land and by water determine ultimately the location. Until a few years ago most of the Punjab wheat was sent to Bengal, there to be converted into flour and sent back to the Punjab; but now on account of the changes in freight rates, the wheat is milled into flour locally. In all this the relative freights on raw material and finished product come into play. If the rate on raw material is low, the remoter area will be favoured ; if it is high, manufacture will take place near the source of the material.

TRANSPORTATION COST—THE DOMINANT FACTOR OF LOCATION

Fundamentally therefore it is transportation costs and the transport relations which a region enjoys in respect of the material and of the market that determine industrial location. One region may have good transport relations in respect of materials and another in respect of the market but the industry would be located in a centre where the combined transport costs of materials and product are at a minimum. The movement of the iron industry from Eastern to Western Pennsylvania since 1890 is to be explained by the fact that the latter has better transport relations to the market. Again the steel industry in the Chicago District is an example of localisation in a place which has the advantage of the lowest transportation costs, taking both the material and the product into account. Other places have better access to coal and ore, but Chicago gets the advantage of close proximity to a large consuming market.

The consuming market is itself governed by the distribution of productive factors, *i.e.*, labour and capital. Where large numbers of people work and live, consumption also increases and the market for various kinds of goods becomes extensive. The conditions for many kinds of industrial activities exist there better than elsewhere and many industries are thus drawn to such consuming markets. They thus affect and are affected by the localisation of industry. We may sum up the whole matter by saying that localisation of industry depends upon the transport relations of each place and product with regard to natural resources and consumers' markets and upon the transportability of the various goods required.

THE CASE OF THE COTTON INDUSTRY

We are now in a position to see why in the first place the cotton industry of the nineteenth century was located in India and in other countries far from the regions of the main raw material and far also from the place of consumption. Raw cotton as already pointed out is a pure material and enters fully into the finished product but the other important material, namely, coal (for power) was "weight-losing" and being more difficult of transport drew industry to it. Water power could not be had away from the regions of water-fall and hence the textile industry was drawn to the sources of its power and located near the region of coal or of water-power. It was possible to locate the industry far also from the consumers' markets because of the system of transport. Ocean transport is always cheaper than land transport, and the cost of transporting both cotton and cotton goods by water is so small that it causes very little addition to the total costs. It costs no more to take cotton from Galveston to Lancashire than to take it to the chief manufacturing areas of the U.S.A. Japan is able to take cotton from India at nearly the same cost as the Bombay mills because of the exceptionally low ocean freights. The cost of transporting cotton from Bombay, Madras or Tuticorin to Japan was only 4·56 yen per bale (400 lbs.) of which 1·40 yen was returned by the shipping company as rebate. (1 yen = 2s.). Again as the Tariff Board pointed out in 1927 the one-way railway freight on piece-goods from Bombay to Sholapur, a distance of 283 miles, was exactly the same as the combined freights on raw cotton from Bombay to Japan and of piece-goods from Japan to Bombay. The advantage of a highly trained labour force in Lancashire and of the extremely low labour costs in Japan, combined with their transport advantages, contributed to the location of the cotton industry in those countries.

BOMBAY'S TRANSPORT RELATIONS

For similar reasons, Bombay was found to be the only suitable location for the rising Indian mill industry. It was favoured by the cheap sea transport and could import raw material, machinery stores and other accessories more cheaply than any inland centre. Until the Indian coal industry had been developed, coal had to be imported in any case and Bombay could import foreign coal. Although its raw material had to be drawn from the interior, other centres nearer the raw material had other serious handicaps and Bombay had the advantage of being a good assembling and collecting centre of raw cotton. The advantages of relia-

bility of supply, of wide choice of selection and of mixing various cottons are often so great that a factory will prosper better in a raw material assembling centre than in the region of production of any one variety of cotton.

The Indian cotton industry was for a long time a spinning industry and most of the yarn was exported to foreign markets and Bombay had therefore excellent transport relations, being an important port town. Like Calcutta, it is a place where two transport systems meet—the ship and the railway and the converging points of transportation offer relatively favourable transport relations to manufacturing industries for two reasons: (1) The existence of a net-work of transport lines and (2) a reduction in the number of times goods have to be reloaded. Thus to manufacture imported raw materials saves the expense of loading them on railways, which must be done if industry is located close to a railway station at some distance from the port. For these reasons, whenever there is a break in the transportation systems, the tendency has always been to evade the costs of it by locating production there. Examples of break localisation are numerous. The Scandinavian Pulp industry, the Chicago steel industry are instances in point. Calcutta might have developed a cotton industry of its own and indeed one of the early cotton mills was actually located there. It was however more distant from the raw material than Bombay and although nearer to coal, the coal mining industry had not then been developed. When however the mining industry had actually been established, Calcutta interested itself only in the jute industry and the enormous profits made therein led to a total neglect of the cotton textile industry.

ITS PRODUCTIVE EQUIPMENT

Another important reason why the cotton mill industry was concentrated first in Bombay and later in Ahmedabad was that it was only in those places that productive equipment as represented by labour, capital and organization was available in sufficient quantity and quality. All capital that was available for industrial development was to be found only in those centres and for a long time industrial capital was unavailable in any smaller centres. The managing agency firms who were mostly financial entrepreneurs established themselves in Bombay and Ahmedabad and all industrial development was due to their enterprise and management. Until recently Bombay like other port towns enjoyed also the advantage of cheap rail transport because the railway rates to and from the ports were cheaper than for inland towns.

AGGLOMERATING FORCES

To summarise the position then, the concentration of the cotton industry in Bombay may be explained by the superior transport relations which it enjoyed in regard to all the materials required for the industry and to the market and by the presence of its enterprising managing agents who had sufficient capital and industrial ability. Climate also undoubtedly added to its advantage. The humidity required for the purpose of spinning yarn was present in its climate although efficient humidifying plants are nowadays installed everywhere for the spinning of finer counts. These natural advantages were increased by certain "agglomerating" factors which usually accompany large-scale production and concentration. An agglomerating factor is any advantage or cheapening of production or of marketing which results from the fact that production is carried on to some considerable extent at one place. Thus the economies of concentration of industry in general such as the development of a trained labour supply, the saving in marketing costs and overheads are agglomerating forces which draw industry more and more to the place. Bombay had the full benefit of these agglomerating forces for quite a long time.

BREAK-UP OF THE COTTON INDUSTRY

Recent Tendencies. I now pass on to the second part of my paper and shall consider the changes in the distribution of the cottage industry in recent years and more particularly during the last 15 years. The most striking change is in the relative position of Bombay. From the year when the first cotton mill was started in India in 1851 to the year 1930, Bombay was singly the largest textile centre, judged by every conceivable standard; whether the test was the number of mills, spindles or looms or the quantity of yarn spun or cloth turned out. In 1931 both Bombay and Ahmedabad had an equal number of cotton factories at work but in 1932 Bombay had to give away the pride of place to Ahmedabad, while in 1933 each centre had 73 mills at work, in 1935, Bombay had only 66, while Ahmedabad had 79. But although Ahmedabad has now become the largest textile centre judged by the number of mills, Bombay still has larger spindle and loom equipment and produces even to-day the largest quantity of yarn and largest quantity of cloth. This of course is due to the fact that the average spinning and weaving mill in Bombay is much larger than that in Ahmedabad. While the modal class mills in Bombay have an equipment of 30 to 45,000 spindles, the modal class mills in Ahmedabad have only 15 to 30,000 spindles. Similarly the modal class in Bombay were

mills having 800 to 1,000 looms while in Ahmedabad the modal class were those having 400 to 600 looms. Thus despite a greater number of mills in Ahmedabad, its share in the total Indian production of yarn and cloth was only 18 per cent. and 25 per cent. respectively as against Bombay's share of 26 per cent in yarn and 30 per cent. in cloth. However, the trend is clear. Bombay is steadily, and after 1920 somewhat rapidly, losing ground and it is likely that its pre-eminence will soon disappear. In 1901, it had 42.6 per cent. of the mills in India in 1935 its share was under 20 per cent.

It is necessary to find out first of all which centres have gained the ground lost by Bombay and, secondly, to enquire as to whether the resulting change has only meant a concentration of industry in other centres. At first sight it might appear that what Bombay lost, Ahmedabad gained and, therefore, the concentration of the textile industry in one or two centres has not been broken up. It is true that Ahmedabad has more than gained the ground lost by Bombay. While in 1913-14, it had only 60 mills, in 1935, it had 79 and the rest of the Bombay Presidency did not also show any expansion. But a study of the distribution of the industry in recent years shows that the breaking-up of the excessive concentration of the industry is now in process and that the cotton industry is getting more widely scattered all over the country. The Indian States of the Bombay Presidency and Central India, Mysore and Hyderabad, Bengal and particularly Madras are witnessing a very important development of the textile industry and the share of these centres in the number of mills and in the quantity of production is steadily increasing. I give below the distribution of the 333 mills (excluding 3 at Pondicherry) at work in India and the share of each centre in the production of yarn and cloth.

PRESENT DISTRIBUTION OF THE INDUSTRY

	No. of mills.	Percentage share in production of Yarn.	Cloth.
Ahmedabad	79	16	27
Bombay	66	28	34·5
Madras	34	11	2
Indian States in Bombay Presidency	31	15*	15*
Rest of Bombay	27	7	6
United Provinces	21	10	6
Bengal	19	4	4
Central Indian States	15	—	—
Central Provinces and Berar	11	4	2
Mysore	6	—	—
Hyderabad	6	—	—
Delhi	6	2·5	2
Rajaputana	5	—	—
Punjab	4	·6	·5
Cochin	1	—	—
Travancore	1	—	—
Burma	1	—	—
	333		

Although Bombay's share in the production of yarn and cloth is still considerable, it had fallen from 50 per cent. in 1920 to 28 per cent. in 1935 in respect of yarn and from 54 per cent. to 35 per cent. in cloth during the same period.

CAUSES FOR THE MIGRATION OF THE INDUSTRY FROM BOMBAY

The causes for the migration of the cotton industry from Bombay are to be found in a number of factors. In the first place, Bombay is losing its advantage in respect of transport relations owing to the change in the character of its production. As long as the market was in other countries, Bombay had undoubtedly a superior advantage over inlaid centres which were nearer the source of the material. But since the loss of its export trade in yarn, it is engaged

* Includes other States also.

more and more in the production of cloth for home consumption and supplies an internal market where its transport relations are certainly inferior to regions nearer the market centres of the country. Secondly, it is now faced with certain deglomerating tendencies which have the effect of breaking down excessive concentration. The very agglomerating forces which formerly helped local concentration have by raising the prices of natural resources, cost of land, internal costs of transport and of labour brought about counteracting influences tending to destroy concentration. The high rents of land, high local taxation, high local rates for water and other municipal services are making it difficult to hold its ground against new rivals. Thirdly, high labour costs combined with labour unrest and strikes have rendered its position somewhat shaky compared to its rivals.

Compared to Bombay, Ahmedabad is in many ways in a more favourable position. Its nearness to raw material and to north Indian markets, its contented labour force and lower labour costs and its relatively low rates of local taxation have contributed to the rapid growth of the cotton industry. Further in the management of the industry, Ahmedabad has a decided advantage over Bombay. There is much closer attention given to the details of management in Ahmedabad, where each industrial unit is managed by a separate managing agency firm. However, there are reasons to think that Ahmedabad too is reaching saturation point. It has, judging from certain tendencies, reached the stage which Bombay had reached about 20 or 30 years ago. Further Ahmedabad, no more than Bombay, can resist the force of certain factors now at work to bring about a much greater dispersion of the cotton textile industry, the beginnings of which we are now witnessing to-day.

Reasons for the growing dispersion of the industry. There are several reasons why it is likely that the Indian cotton industry would be more widely distributed in the country in the future than it had been in the past. The distance to the consumer is an important factor in India with its vast size and scattered population. If a factory or a group of factories in one centre is to supply a vast area, the average distance to the consumer will be much larger than if factories are evenly distributed over that area. Again the greater the cost of transport, the more evenly each industry will have to be spread over the area and the smaller the area which can be served by any factory or group of factories. Both these considerations are very relevant to the question on hand. As railway rates are more and more adjusted in proportion to the cost of service rendered and as

exceptional and unduly favourable rates charged to port to port traffic are replaced by more equitable rates, transportation costs tend to confer advantages on a large number of centres near the region of consumption. Actually this process is going on in India. Thanks to the work of the Railway Rates Advisory Committee, rates are adjusted according to costs of service based on distance and have the effect of bringing about a rapid decentralization of industry. There is a large local demand for different varieties of cloth which is governed by local tastes of consumption and which can only be met by a number of small factories in the neighbourhood of cotton ginning areas. Above all the most dominant factor tending towards decentralization of the industry is the supply of electric power. The development of hydro-electric power in South India is already revolutionising the location of the cotton industry. This factor combined with the attracting force of lower rents and cheaper labour in the smaller towns would further decentralize the cotton mill industry in India. Similar influences have been felt in other countries too. Thus the cotton industry in U.S.A. has been moving south in recent years, the stimulus being cheaper labour and rent as well as cheaper transportation.

PROSPECTS OF MADRAS

Of all the centres which are likely to reap the full benefit of decentralization, our Presidency stands foremost. The development of the Pykara electric scheme has already contributed to the establishment of a large number of new textile mills in Coimbatore, which to-day has as many as 32 mills all of which are using electric power. Salem, Erode, Trichinopoly and North Arcot are erecting new mills under the motive of cheap electric power. The price charged comes to about 6½ to 7 pies per unit and compares most favourably with the cost of power generated by steam or oil, which cannot be had for anything under 9 pies even for a well-managed plant. But the great advantage of electric power apart from its reduced power cost is that the factory can save on capital investment. Not being compelled to have its own power plant, it can either start with a modest capital or use the capital thus saved for installing more spindles or looms. There is also considerable saving in operation cost. Breakdowns are avoided and reliability of supply is guaranteed by the public utility company which in this case is the hydro-electric department of the Government of Madras. These are no small advantages for small factories which cannot afford to raise large capital or employ expert engineers to look after their steam or oil engines. As long as steam was the main motive power large

units and location in large cities were required ; but development of electricity has the contrary effect and will bring about a more even distribution of industry. Coimbatore and other neighbouring regions also get the full benefit of cheaper labour and cheaper rents. A further cause of decentralization is the use of motor transport. There is now no longer any compelling reason why the cotton industry should be located at a railway town. Motor transport has now rendered the superiority as to transport relations of factories in the neighbourhood of railways largely a thing of the past in some western countries. If the goods must be transported from the railway station by motor trucks in any case, location near the railway is of little importance.

Of the 34 mills working in Madras in 1935, 19 were purely spinning mills and all of the 12 mills which were in course of erection in 1935 and the newly-registered ones are also spinning mills. Except in Madras and the United Provinces the number of spinning mills is generally falling off. But in these two provinces the existence of a considerable volume of handloom weaving keeps the spinning industry going. The limit of expansion is nearly reached in Coimbatore and its neighbourhood as most of the raw cotton available in the area would be just enough for the existing mills and the mills in the course of erection. Unless, therefore, the mills draw cotton from other areas or take to weaving, their demand for power will not increase rapidly in the future. But if it does, there will be sufficient supply available from the Mettur electric scheme.

Of the 5 million bales of cotton produced in India, Madras contributes nearly 1 million bales. The *Cambodias* are fully utilized by the mills of Coimbatore and Madura. Already Madura and Tinnevelly have important textile mills and the development of the Papanasam electric scheme is likely to cause a further expansion of the industry in the southernmost districts. It is in the Ceded Districts where the *Northerns* and *Westerns* are available and in Kistna and Guntur which grow *Uppam* bearing the trade name of *Cocanadas* that practically no mills exist. They must await the development of hydro-electric power. The Vizagapatam power scheme is not likely to benefit these regions, and it is only when the Bellary scheme is developed that some mills are likely to be established.

Of the other centres in India having large potentialities, Bengal and some of the Indian States are the most important. Between 1931 and 1935 the number of mills there increased from 13 to 19, while the number of mills in course of erection was as many as 21—a very rapid rise. Apart from the proximity of raw cotton,

cheap labour, cheap rents, etc., the States enjoy a competitive advantage over British India on account of absence of labour legislation in some States and of laxer administration in all. Apart from Bengal's easier access to coal, the superiority of Bengal lies in her large consuming markets. The jute industry having reached the saturation point long ago, the capital and enterprise of her managing agents are now directed towards the expansion of the cotton industry. Bengal is also favourably situated for the import of machinery, stores and cotton for spinning and weaving superior varieties.

The Punjab is another province where the growth of an important cotton textile industry is only a matter of the next few years. The Punjab grows the largest quantity of cotton in India amounting in the year 1934-35 to 946,000 bales or 25 per cent. of the total Indian production. Yet there are only four textile mills in that province. Here again as soon as the projected hydro-electric schemes are completed, the expansion of the cotton industry might be looked for.

LOCALISATION IN QUALITY GOODS

Although in the next two or three decades the cotton industry in India would be more evenly distributed, there is bound to be still a considerable degree of localisation for special kinds of yarn and cloth. Bombay and Ahmedabad have definitely switched off to the production of finer counts. Bombay's advantage in fine yarn will remain for a long time. The raw material required for yarn of 40 counts and over is not available in India and has to be imported. India is of course the largest exporting country in the world of short staple cotton. Her long staple cotton of about ⅞ inch to 1 inch is suitable for the spinning of 24—40's and is available to the extent of about 700,000 —750,000 bales. But there do not seem to be any near prospects of her growing long staple cotton in sufficient quantity and quality to enable her to produce the 20 per cent. of the total consumption of cloth or about 1,000 million yards represented by finer types of goods. The Indian Central Cotton Committee is of the view that high quality cotton having a staple of 1⅛ to 1¼ inch and capable of spinning up to 60's, could be grown in certain areas in Sind as a result of the Sukkur Barrage scheme. In the meantime Indian spinners have to draw much of their supplies from other countries, chiefly East Africa, Egypt, Sudan and U.S.A. Out of 44 million lbs. of yarn over 40's produced in India in 1935, Bombay produced nearly 14 million lbs and Ahmedabad 16 millions. The extent to which Ahmedabad and Bombay are specialising in the

production of yarn may also be noted from the fact that while 22.34 per cent of the yarn produced by Ahmedabad mills and 13.2 per cent. of the yarn produced by Bombay mills are over 30's, in the rest of India less than 6 per cent. of the total yarn was 30's and over. Bombay is concentrating more and more on dhoties. While its share in dhoties was only 26 per cent in 1926-27 as against 41 per cent of Ahmedabad's, its share increased to 33 per cent in 1935 as against a fall to 26 per cent. of Ahmedabad's. Indian States are specialising in long cloth and shirting and are responsible for 21 per cent. of the total production in that line. Bombay's greatest handicap is in coloured goods where on account of the insufficiency of fresh water and high water charges, it has been unable to march with Ahmedabad or other centres. In 1926-27 Bombay's share in coloured goods was 61 per cent. while that of Ahmedabad was only 19. In less than a decade Bombay's share fell to 30 per cent. (a fall of 50 per cent.) while that of Ahmedabad rose to 38 per cent. showing a rise of 100 per cent.

THE FUTURE OF BOMBAY AND AHMEDABAD

The future position of Bombay and Ahmedabad depends upon the extent to which they concentrate in certain special lines of production where their superior advantages will more than offset the disadvantages of distance to the markets. For it is a well-known law that the greater the economies of specialization and large-scale production, the more negligible will be the proportion of transport costs to the total costs of the product. In any case it is very unlikely that small and scattered factories in India would be able to satisfy more than local needs and varieties. There is still room for some degree of specialization and concentration and while natural advantages will continue to play an important part in the trade relations between various centres, the distribution of productive power and organisation and capital will exercise no less decisive influence. There are again incalculable forces which may completely alter localisation. To take only one instance, the demand for artificial silk and silk goods which compete so effectively with cotton goods may not merely bring about new centres of the silk industry but cause extensive changes in the distribution of the cotton industry. But the problems raised by such factors cannot be dealt with within the limits of this paper which, I am afraid, has already become too long.

A Geographical Study of the Vellar Basin

By

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The Vellar Basin lies roughly between 11° and 12° N. Lat. and 78° and 80° E. Long., and has an area of about 4,000 sq. miles. It is bounded by the Bay of Bengal on the East, the Shevaroys and Kollimalais on the west and the low-lying ridges separating it from the Coleroon on the south and the Pennar and the Gadilam on the north. It comprises roughly the Attur Taluk of the Salem District, the Perambaloor and Udayarpalayam Taluks of the Trichinopoly District and the Kallakurichi, Vriddhachalam and Chidambaram Taluks of the South Arcot District. It occupies an important position between the Pennar and Cauvery basins. It has ever been a land of plenty and has not suffered so severely during the many famines that have ravaged the surrounding areas. It has a well distributed system of irrigation and cultivation of crops of all types. It is only in this basin that we meet with excellent artesian wells in the whole of South India, or, even in India. The region has a unity about it, in its arts and crafts and the daily life of its inhabitants. The newly-introduced railway lines that traverse it from east to west and north to south have opened it to the surrounding regions.

Physically, this region can be divided into 3 great divisions :—

I. *The Hilly Regions* lying to the west.

II. *The Undulating Region* from the foot of the hills up to the low deltaic area.

III. *The Low Deltaic Area* supplied with plenty of water from the Vellar and Coleroon Anicuts. This is more the work of man than of nature.

I. THE CHIEF HILLY REGIONS

(1) The Shevaroyan Malai lying north of Salem.

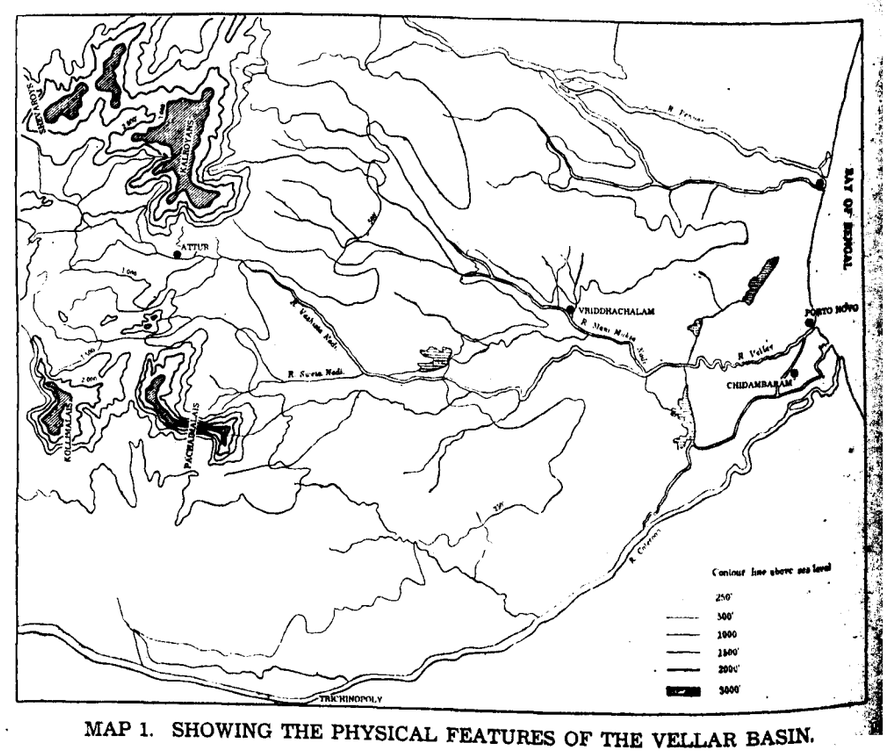
(2) Tennande Malai which falls into three sub-divisions.

(*a*) The Tirtha Malais of Uttankarai.

(*b*) The Chitteri Plateau, a tangled mass of highland and ravine.

(c) The Aranattu Malai in Salem Taluk immediately east of the Manjavadi Pass. The Vasishtanadi takes rise in this last hill.

(3) The Kalroyans.—It is about 25 miles in length and presents to Vellar a continuous front of 23 miles from east to west. They are only of moderate height. The general level is being 2,000′ to 3,000′. But they rise abruptly from the surrounding country and from a distance they have the appearance of a great wall shutting off the country from the west. At either end are passes, the Attur Pass in the south and the Chengam Pass in the north leading from South Arcot to Salem District. These passes have been of great importance in ancient and modern days. They were the easiest



MAP 1. SHOWING THE PHYSICAL FEATURES OF THE VELLAR BASIN.

routes for Haider's troops; and their existence can be easily felt during the South-West monsoon when a strong cool breeze blows through them (vide S. W. Monsoon Rainfall Map).

To the south of the Vellar lie chiefly (4) the Pachaimalais and (5) the Kollimalais, and a few other scattered hills.

II. THE LOW COUNTRY

It occupies a region of large area. Though much less diversified in surface than the hilly country, it yet shows considerable variety of aspect, coinciding in great measure with the changes in geological structure. A great part of the low country is occupied by rocks of sedimentary origin resting on metamorphic rocks of which the entire mountain country is formed.

On the northern side close under the Kalroyans the level is 500′ to 700′ above the sea and it falls to 153′ at Memattur Anicut; but after that it slopes away gently to the sea. It is a great plain, almost everywhere covered by jungle. With the exception of 3 or 4 isolated hills lying close to the foot of the mountains, it is broken only by a few very low rocky hills.

In the southern portion of this region, the land is more undulating being cut into numerous ridges and furrows by the valleys of the Manimuthar and the other tributaries of the Vellar rising in the Kalroyans.

The country south of the Vellar, sloping from the Pachaimalais eastward, is very similar to the above in appearance, but a little less undulating in character. There is very little jungle except quite close to the hills.

East of this, the plain becomes more and more tame and the land sinks into an almost dead level, excepting where broken by the low scraps of the small plateau rocks belonging to the Cuddalore series which rest on the rocks of the cretaceous periods. The extensive portion of this plateau is in the Udayarpalayam Taluk. These scarps, though low, form rather marked objects on the northern and southern boundaries of the alluvial valleys of the Vellar. Where it is not cultivated the surface is covered by low scrubby and often thorny jungle. They terminate suddenly to the eastward, the alluvium resting against the foot of the low lines of cliff.

III. THE ALLUVIAL REGION

The region watered by the anicuts of the Vellar and the Coleroon has a surface sediment of alluvium. It is a flat country well watered, where paddy is grown extensively. Near the sea we find sand spits stretching along the coast.

There is little in the way of scenery in this region. Such beauty as this possesses is due less to the liberality of Nature than to the handiwork of man who has diversified the country with broad tanks and pleasant groves of trees. The irrigated areas of Chidambaram have at least the charm produced by a prosperous, if not a romantic landscape. The most uninviting parts of all this uninteresting side of this region are the alluvial plains in the dry season when the " sad-coloured " soil of the interminable level paddy flats, shorn of their crops and broken only by their low bunds and a few scattered babul trees, is revealed in all its monotonous nakedness.

But in the west the landscape is by no means so tame. All along the side of the mountain range, the hills provide an effective background to the scene, trees are more plentiful, and there is some scrub forest, and the country is more undulating and less wholly given up to the plough. The most beautiful part of this portion of the region is however the tract round about the scattered hills. Not only have these hills a strong fascination from the wildness of their outlines and setting, but the wonderful play of colour upon them and their surroundings is infinite in its variety.

THE HYDROLOGY OF THE REGION

The Hydrology of the region is very simple. The region is drained into the Bay of Bengal. The waters gathered from the Shevaroys, Kalroyans, Kollimalais and Pachaimalais are carried by its various tributaries into the Vellar.

The Vellar (White River) is formed by the junction, about four miles west of Toludur in the Vriddhachalam Taluk, of two rivers, the Vasishtanadi and the Swetanadi, which rise in the Salem District. The former of these drains the Tenandemalai and the western slopes of Kalroyans. The Swetanadi rises in the Kollimalais in the Salem District and drains the northern side of the Pachaimalais. The Vasishtanadi enters South Arcot District through the Attur Pass just south of the Kalroyans and becomes for some sixteen miles the boundary between that District and Trichinopoly. After the junction with the Swetanadi, the boundary still follows for another 25 miles the course of the united streams and then the Vellar strikes north-eastwards and flows through the Vriddhachalam and Chidambaram Taluks to join the Bay of Bengal immediately south of Porto Novo. Its banks are often high and steep. It is bridged at the Shatiatope Anicut and the South Indian Railway crosses it near Porto Novo. A new bridge, recently opened across this river between Chidambaram and Bhuvanagiri, facilitates through motor

traffic to Chidambaram. The river is navigable for small boats of some four tons burden for four or five miles from its mouth, and is affected by the tide for seven or eight miles. About 4 miles east of Srimushnam, it is joined by a considerable tributary, the Manimuktanadi, which drains the eastern slopes of the Kalroyans. To the north of this region runs the Penniar and Gadilam. The Uppanar or Paravanar has its source in the Vriddhachalam Taluk, flows eastwards along the boundary between Chidambaram and Cuddalore Taluks and falls into the Bay of Bengal by the north of the Gadilam. It is largely a drainage channel for the lands irrigated by the Shatiatope Anicut across the Vellar.

The Coleroon lies to the south of this region. It flows into the sea about six miles south of Porto Novo and forms the southern boundary of the flat region in the Chidambaram Taluk. Its waters from the Lower Anicut across it flow into the Veeranam Tank ; and together with the Vellar it irrigates the wet lands of Chidambaram Taluk.

THE SOILS OF THE REGION

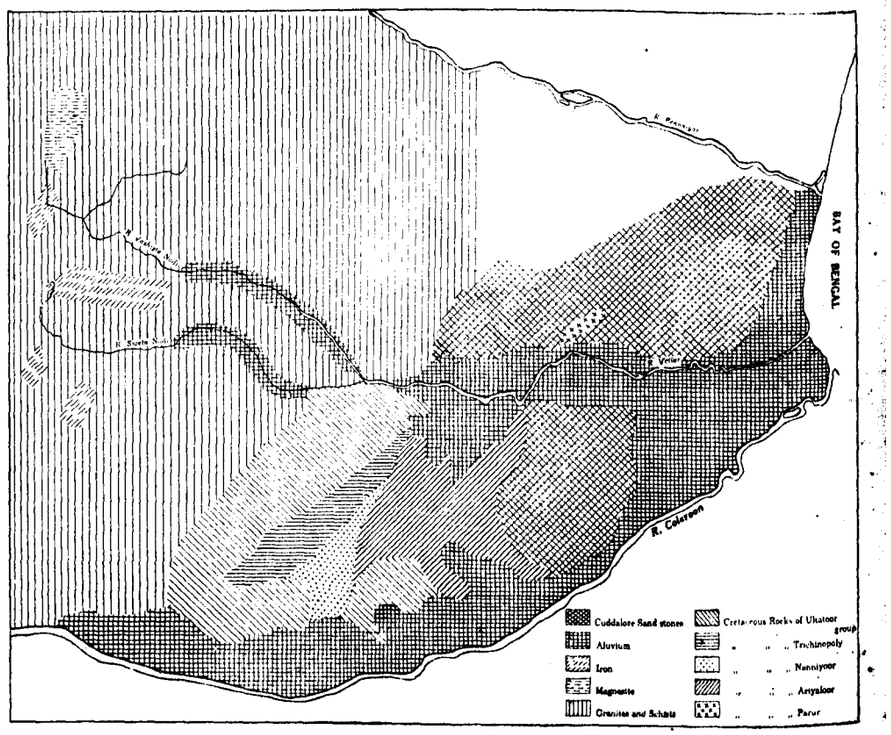
The soils of the region are classified into 3 main groups, namely, black or *regar*, red ferruginous and arenaceous. These are again subdivided into clays, loams and sands. The most fertile of them are the black earths, especially black loam, the next best the red kinds and the worst the sands. These last occupy a very small portion of the total area, while nearly one-half is covered by black and the other half by red. The former is very fertile, even when unirrigated. But the red soils here are not as barren as those of some other parts, e.g., Deccan. The black earth is commonest in Chidambaram, Vriddhachalam, Udayarpalayam and Perambaloor Taluks, and the great spreads of it in the valley of the Vellar are believed to have been formed in a huge inland lake caused by the backing up of the river by the line of high ground of which Mount Capper is the most prominent survival. The sandy soils are only found to any considerable extent in the low strip of country which faces the sea in the Chidambaram Taluk. They are largely used for the cultivation of casuarina and cashew trees.

GEOLOGY OF THE REGION

For a geological study of this region, it can be subdivided into the mountainous area and the low country. In general, the geological structure of the mountain region is very simple :

(*a*) By far the larger part is made up of rocks belonging to the great metamorphic or gneissic series of Southern India, which belong to the Archaean Group.

(b) Intrusive in these are (1) the older charnockite series, (2) the younger igneous intrusions of which the basic trap dykes and the Magnesium Series of the Chalk Hills are the most conspicuous features. The remaining part is occupied by the sub-aerial deposits and alluvia of the different rivers. The two forms of sub-aerial rocks are (*i*) Kankar and (*ii*) pseudo-laterite. They are not extensive. The former is formed by the decomposition of lime-hold-



MAP 2. SHOWING THE GEOLOGICAL STRUCTURE OF THE VELLAR BASIN.

ing rocks by rain water, and the latter is a ferruginous clay incrustation formed on the surface of ferruginous rocks weathering in a damp atmosphere.

Let us now consider **the important mineral resources** of this area for commercial purposes :

1. Magnesite : The Chalk Hills between Salem and Shevaroys are just outside the region ; but there is a magnesite belt near the upper course of the Vasishtanadi.

2. The iron ores of Salem District are well nigh inexhaustible. Most of these beds lie at the headwaters of the Vellar river.

Magnetic iron ore occurs in many localities on the Kalroyans. Till about 1855 local iron-smelting was carried on ; and in Kallakurichi Taluk alone there were 70 such places. There were many local blooms in the Attur and Salem Taluks of the Salem District.

3. Chromite is found in the Chalk Hills and Kanjamalai and was worked by the Porto Novo Company till 1860.

4. Steatite, an impure hard talc occurs in the Attur Taluk. It is used for the manufacture of culinary vessels.

The Geology of the lowland extending from the foot of the hills to the Bay of Bengal :

The general geological formation is simple. The greater part of it is covered by archaean rocks of the gneiss family, resting on which are three groups of sedimentary rocks belonging to different geological periods and overlying each other in regular succession from the coast on the east to the hills on the west. The lowest of these great groups is the fossil-bearing cretaceous limestone. Above this comes the younger group of sandstones which are known as "The Cuddalore sandstones" and form the Red Hills near Pondicherry and the Mount Capper Range south-west of Cuddalore. The uppermost are the alluvial deposits. They are formed by the deltas of the Vellar and the Coleroon. The former stretches from near Cuddalore to the mouth of the Coleroon and runs inland as far as Tittagudi, a distance of 40 miles. Near Lalpet, at the southern end of the great Veeranam Tank, the alluvium of this river unites with that of the Cauvery delta.

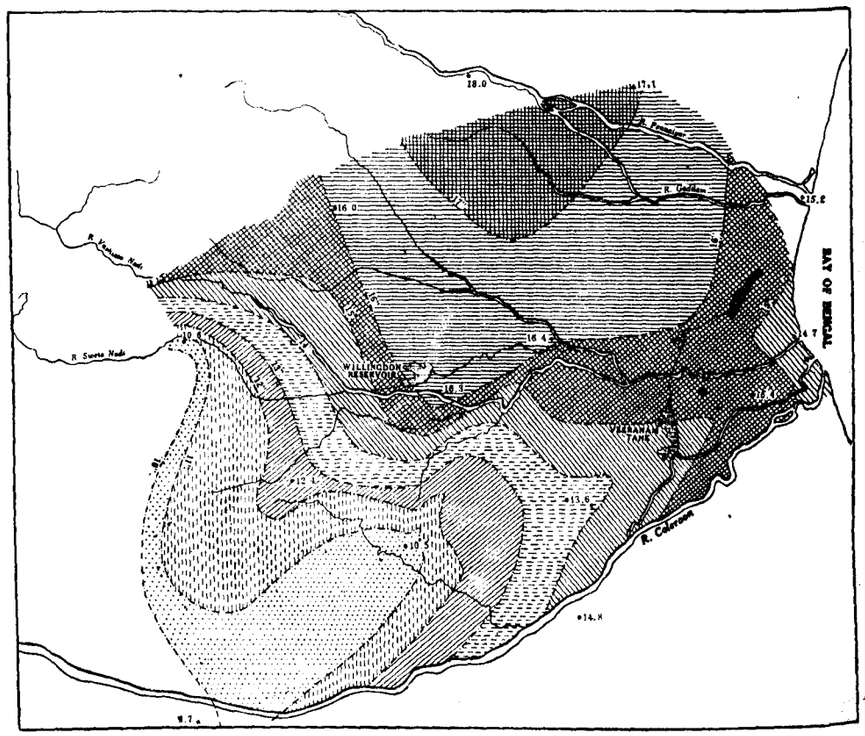
But none of the rivers are now forming deltas. The silt carried down by them is swept away by the strong current along the coast. Sand is blown up by the wind into considerable dunes and form prominent features in the landscape. They are utilised for the cultivation of casuarina and cashew trees. This region cannot be said to be remarkable for its minerals. The building stones only are of commercial importance. The temples show to what use gneiss can

be used for building purposes, especially as it lends itself easily to excellent carving. A visit to Vriddhachalam, Srimushnam and Chidambaram will prove this.

The laterites of the Capper Hills are quarried and sent to distant places as road material. The hard rocks are used locally for building purposes.

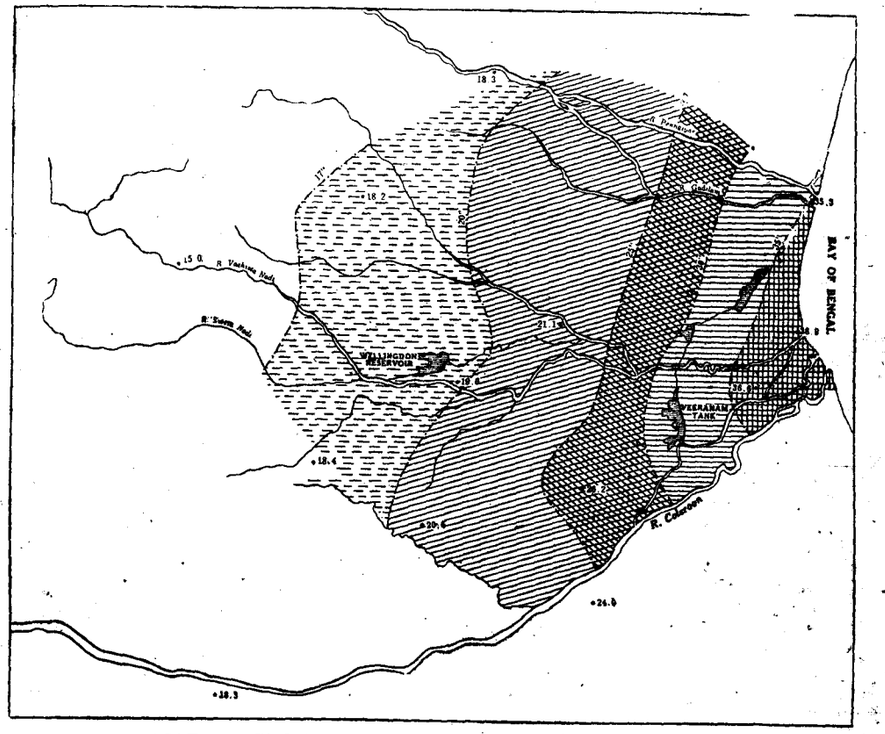
RAINFALL AND TEMPERATURE

The climatic conditions of this region can be easily understood from a general look at its situation in the Madras Presidency. It can be fairly well said that it is bound by the six important meteorological stations—Madras, Cuddalore and Negapatam on the coast, and Vellore, Salem and Trichinopoly in the interior. The region lies practically between Salem on the west and Cuddalore on the east.



MAP 3. SHOWING THE ISOHYETS FOR THE SEASON JUNE-SEPT — VELLAR BASIN.

The temperature is fairly high throughout the year and is more even near the coast and even in the interior it does not fluctuate very much. April, May and June are usually the hottest months, and with the setting in of the South-West Monsoon early in June the temperature drops gradually. Little rainfalls during this season, but the Attur Gap enjoys plenty of wind and rain; and the Perambaloor Taluk suffers because of the mountains lying to its west. The whole area is very dry during summer; and with the monsoon freshes the alluvial flats are cultivated and appear green, being supplied with plenty of water.



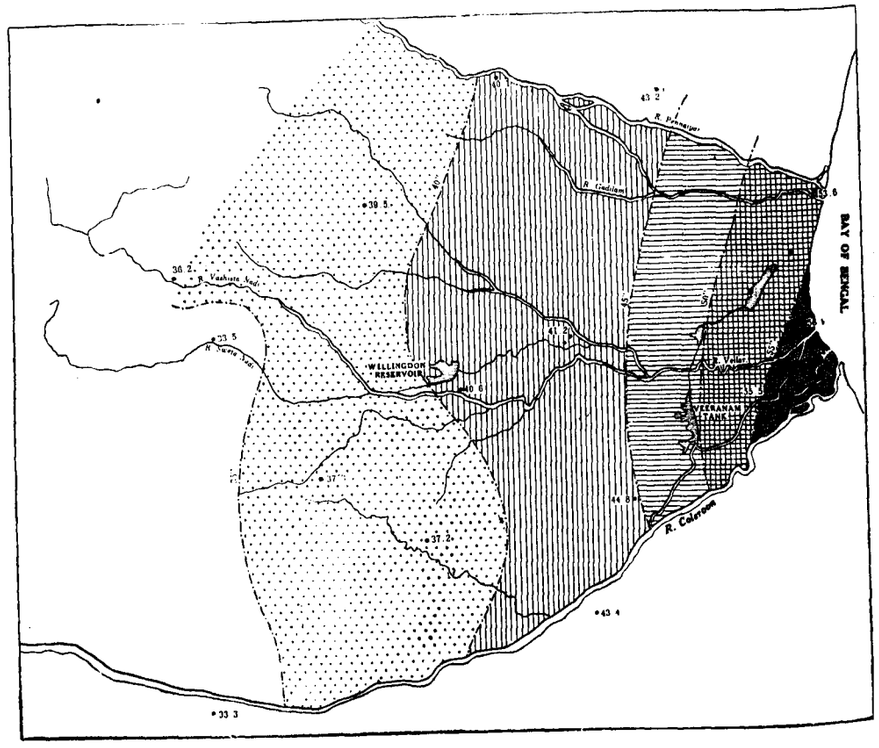
MAP. 4. SHOWING THE ISOHYETS FOR THE SEASON OCT-JAN — VELLAR BASIN

Then, during September, the North-Eastern Winds are expected. These bring the major portion of the rain. They continue till January, though the greatest amount falls in October and November.

The wind travels all round the compass in more or less regular stages during the course of the year. The interior regions are often

visited by hailstorms during the hot weather. Near the coast the heat in that season is never so severe as in other places, but the coolness in the cold season is always very slight. This region is more eqable than Nellore and Cuddappah. The effect of the sea breeze does not penetrate far into the interior to alleviate the heat of the sun. But the Attur Pass enjoys the South-Westerly Wind, and much milder temperatures are felt there than further east. The country next to the sea is moist and damp ; but on the whole the district is healthy. In fact, Cuddalore was formerly a health resort.

Climatically, the region can be subdivided into (1) the Attur Pass region, (2) the coastal region as far as Vriddhachalam which



MAP 5. SHOWING THE ISOHYETS FOR THE WHOLE YEAR—VELLAR BASIN

receives the effect of the sea breeze in summer and the North-Eastern Monsoon in winter, and (3) the land lying between the two abovesaid regions comprising mainly the Kallakurichi, and Vrid-

dhachalam Taluks of South Arcot District and the Perambaloor and Udayarpalayam Taluks of Trichinopoly District.

FLORA AND FAUNA

For this study also the region can be subdivided into (1) the mountainous region, (2) the sea coast and (3) the low country lying between these two.

The hills in the region have a variety of trees and shrubs. In the Shevaroys, Pachaimalais, Kollimalais and Kalroyans, one can see the variety of vegetation extending up to 4,500′ above sea level and flourishing on plenty of rainfall and sunshine. Coffee has been a new introduction in the Shevaroys. Kadukka (Gallnut), Bamboo, Sandal, Teak and a number of other kinds of trees grow there.

In the third region, i.e., the low country, cocoanut, tamarind and palmyra can be seen according to the amount of water available. Graft mangoes are grown in certain places. Jack, guava and orange are grown near the hills and on the hills. Illuppai (Bassia Longifolia) and Karuvel (Gum Arabic) are quite common. Scrub jungles contain deciduous and evergreen trees.

Near the sea-shore thorny grasses grow on the sands. They are useful sandbinders and common along the coast. There are also casuarina and cashew plantations. The salt marshes have their usual flora—the Mangrove ; and there are ever so many varieties of them.

Among the animals sheep and goats are prominent. Cows, oxen and buffaloes are kept in the wetter areas and are small in number. Most of the oxen needed for agriculture are brought in from surrounding areas.

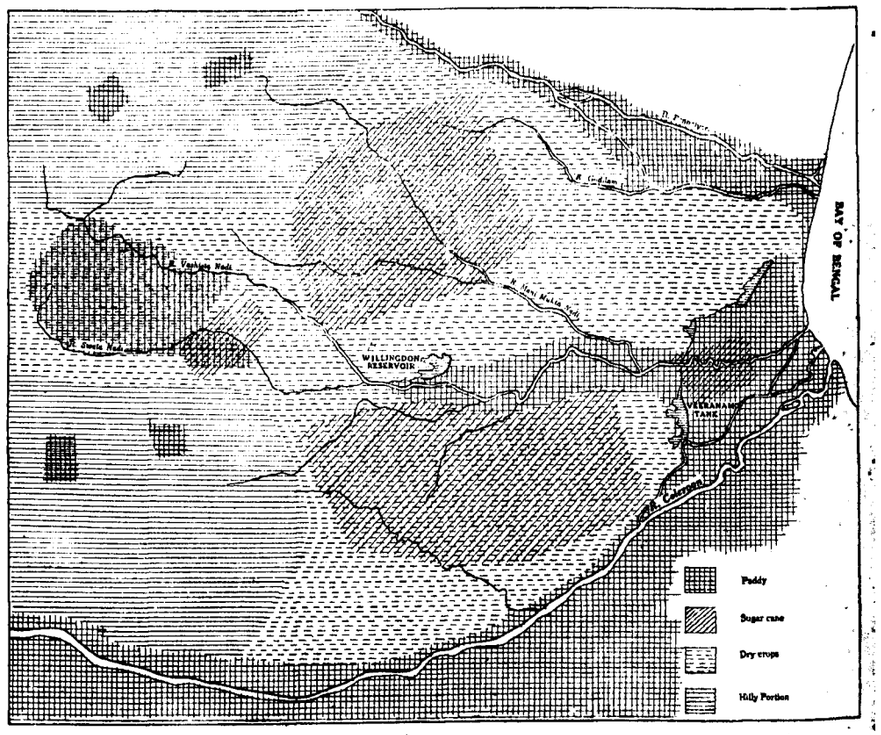
Among the game animals, elephants in the Kalroyans, and cheetas, tigers, foxes, etc., in the hilly country must be mentioned. Deer are in plenty in the scrub jungles in the low country. The tanks supply plenty of snipe and fish.

AGRICULTURE AND IRRIGATION

The agricultural year can be divided into 3 seasons : (*i*) *the dry season*—January to April, (*ii*) *the early rains* inclusive of the Mango Showers and South-West Monsoon, from April to September ; and (*iii*) *the later rains* of the North-East Monsoon from Sep-

tember to December. The break between the monsoons is variable in duration and in its time of occurrence. Each monsoon has its cultural occupations and operations.

The lands are divided into irrigated and unirrigated groups termed the wet and the dry lands. In Chidambaram Taluk almost the whole area is irrigated ; while in the other parts of the region, dry and wet are distributed according to the facility of water supply.



MAP 6. SHOWING THE AGRICULTURAL REGIONS OF THE VELLAR BASIN

The crops depend on the character of the land. The distinction between *dry and wet crops* is not inflexible. "Dry Paddy" is cultivated on a small scale all over the region where suitable rainfall conditions prevail ; and in some places even plantains are cultivated without irrigation. On the other hand, ragi, cumbu, cholam, gingelly and castor are cultivated both as dry and wet crops by irriga-

tion from wells, tanks and channels. Tobacco may be rain-fed or irrigated. Rain-fed paddy, plantains and tobacco are usually considered superior in quality.

An interesting feature is *the mixing of crops* on dry lands. Two systems of mixed cultivation are in vogue ; one is to sow broadcast, and the other is to plant in parallel rows with the help of a plough termed the " guntaka." By sowing together two crops of short and long duration, space and labour are saved, and the vagaries of the monsoon are alleviated and the soil is not exhausted. The short crop matures in 3 or 4 months ; and after it is being reaped, the long crop has time to mature.

The *broadcast system* is seen to perfection on the Kollimalais, where on the richest fields, in a good season, six or seven kinds of grain can be seen growing together in one rank tangle, aptly described as the " Riot of contending crops." Elsewhere it is not so prominent.

Under the *furrow system*, seeds are drilled in regular rows. Grams and cereals are mixed together with gingelly and castor. Ground-nut was very important in this region as a cash crop till recently, but of late it has lost its importance, due to trade depression and other international causes. Varagu is grown extensively in Perambaloor and Udayarpalyam Taluks.

In Attur Taluk the wet lands under Swetanadi bear five crops in two years and the rotation is judiciously selected. In the first season paddy, irrigated gingelly and kambu are raised, beginning in Adi and ending in Adi in the next year. The second year's crop series ends by Avani ; and the 3rd year paddy is sown in Krittigai and harvested in Chittarai and the gingelly and kambu follow up to Adi. Thus goes on the endless routine of cultivation.

There are a number of *varieties of paddy* grown in this region. Each is suitable to the local climatic conditions and the facilities for irrigation. In Chidambaram Taluk especially under the anicut irrigation a number of varieties are grown. In general, they can be classified as *Kar and Samba*. The samba is the choicer of the two and is usually white or golden in colour, while the kar is red usually. Samba stands longer on the ground, and requires careful cultivation and plenty of water. In Chidambaram the excellence of soil and irrigation enables paddy to be raised everywhere. It is cultivated all along the Vellar under river irrigation, and in many places under tank irrigation in Perambaloor, Udayarpalayam and Kallakurichi Taluks. The Artesian Wells of Vriddhac[illegible] Chidam-

baram Taluk have facilitated more acres to be brought under paddy. Toludur project (Yamaneri), known as Willingdon Reservoir has brought an extensive area under irrigated paddy cultivation in Vriddhachalam Taluk.

The lands near the hill regions have to be protected from wild pigs, birds, etc., and great precaution is taken against these.

Hill cultivation is different from that of the plains in so far as wet cultivation is concerned. The Malayalis of the Shevaroys are demoralised and slovenly due to the coffee plantations paying them fairly high wages; but in the Kollimalais and other places, cultivation is scrupulously clean; and on the best lands finer crops are grown than can be seen anywhere in the plains. The fields are carefully terraced and the cost of terracing is expressed in terms of grain. A sharp distinction is made between Ulavukadu (land that can be ploughed) and Kottukadu (that can only be hoed). On the Kollimalais nearly 500 acres are classed as wet. Some of this is situated in high level and depends for moisture on the water oozing from the hill-sides; some are situated in hollows where drainage is difficult. The high level paddy fields are firm and are ploughed; while those in pits are marshy and full of quagmire. The single crops of the bog-paddy flats yields as much as the double crop of the high level fields.

A small quantity of *wheat* is grown in the hills as a dry crop, and in the foot plains of Attur Taluk under well irrigation. *Sugarcane* is not so important in the Attur Taluk and the upper Vellar basin. But, it is more important in the middle and lower Vellar regions. It flourishes in black clays and black loams, but exhausts the soil. It is principally grown in Kallakurichi Taluk under small anicuts of the Gomukhanadi, round about Srimushnam under the Pelandurai Anicut, near Tittagudi under the Willingdon Reservoir, and in Vriddhachalam watered by the Manimuktanadi.

Two main varieties are grown (1) the white red cane, (2) the striped cane termed the namadhari. Of late, the new strains specialised by Nellikuppam Factory are being introduced in these places. In the Attur Taluk and Kallakurichi Taluk jaggery is made by special methods in bamboo baskets, unlike the balls of other places. Modern iron mills for crushing the canes are used everywhere. In Chidambaram the rotation is two years paddy and one year sugarcane.

Betel Vine is cultivated extensively on clayey soils, where paddy or sugarcane can be grown. The presence of lime in the soil is favourable to its growth. It is usually grown by local Musalmans known as Labbais.

Tapioca.—The only place on the east coast where tapioca is grown to any extent is on the alluvial damp banks of the Vellar and Coleroon. It is called Maravalli Kilangu, and the plant grows 4 or 5 feet, somewhat like a tree. It is cultivated as a garden crop with heavy manuring. It is propagated from cuttings six inches long, made from the woody stem and planted by hand from January to April. It takes 10 to 11 months to mature and then it is dug up. The tubers do not keep well, and so are dug up as needed and boiled or roasted or used with vegetables. Sometimes they are sliced, dried and pounded into flour from which cakes are made, mixed with jaggery.

There are a number of varieties of *plantains* grown in this region. Certain types are specialised in Attur Taluk, and certain others in the Perambaloor, Udayarpalayam, Kallakurichi and Vriddhachalam Taluks. Chidambaram has its own peculiar variety. This depends on the purpose for which it is grown and the quality of the land and water facilities. There are some varieties which bear 400 fruits in a single bunch. Where there is heavy rain on the hill-slopes, trenches are made crosswise, and plantains are grown as dry crops, e.g., on the Kollimalais. That region is noted for its choicer varieties, especially the Karuvalai or the black plantain and the pattuvalai, a big variety.

Of the dry crops, *castor, groundnut* and *cotton* must be mentioned. The two former are gradually dying out, due to want of a good foreign market.

Of the *cotton* grown in this area special mention must be made. The chord lines from Villupuram to Trichy, and Cuddalore to Salem serve this crop very well. Uppam and Nadam are the two kinds of cotton grown here. Nadam is more common, and is grown in red loamy soils. It is sown with Kambu usually. Nadam plant bears for 3 years, and usually twice a year. The Uppam or Semparutti favours black cotton soil. It is a single year crop. It was a very important crop in the economy of the land. Formerly they were ginned and spun in the villages themselves. Now there are a number of ginning mills established all over the area, at Attur, Labbai Kudikadu, Tittagudi, Vriddhachalam, Ariyaloor, etc., wherefrom it is exported. The old weavers still carry on their trade not with hand-spun yarn, but with mill yarn; and each taluk is noted

for its particular kind of Dhoti or Sari. The Kallakurichi, the Ariyaloor, the Vriddhachalam, and the Attur are special qualities produced in the region.

Indigo was once a very important agricultural product of this area. Even now one can see old discarded dye vats of this region in villages. The introduction of Aniline dyes has practically killed this trade ; and indigo is not at all cultivated now.

The implements of husbandry are the ordinary wooden plough, spade, hoe, sickle, the parambu or leveller ; the ordinary picottah and buckets are used as water lifts. They are worked by sets of 2 or 3 men and there are some worked by pairs of bullocks, termed the kapilai. There are two varieties of ploughs, one with a blunt spade for use in paddy fields and the other with a sharp pointed spade for use in dry land. The use of iron ploughs has received more encouragement during recent years ; and there are a number of them in use now. There is a Government agricultural farm at Palur in the Cuddalore Taluk and one at Aduthurai in the Tanjore District. These are making good effort to introduce new varieties of paddy into Chidambaram Taluk. The Coimbatore and Nellikuppam varieties of sugarcane are also gradually introduced.

Artesian wells are springing up in great numbers in Vriddhachalam and Chidambaram Taluks, and many new borings are being tried. Irrigation by oil engines is also spreading in Attur and Kallakurichi Taluks.

The methods of manuring vary with the locality, the status of the ryot and the nature of the crop. In general, it can be said that the Indian farmer does not pay much attention to manuring, due to so many causes, both economic and otherwise. Silt, sheep droppings, farmyard manure, house refuse, mineral manure and green manure from shrubs and trees are the common ones used everywhere in this region. Much of the cattle excreta is used as a fuel, but those of sheep and goats are specially kept on the land, and are exposed to wind and sun and rain, and lose much of their value.

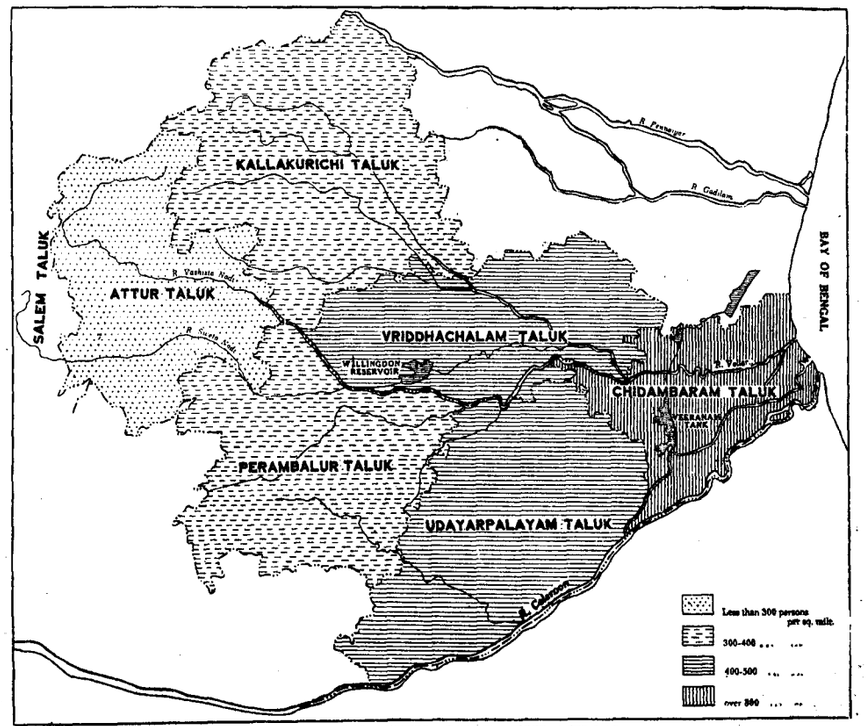
The ryots in this region especially in the drier parts are very hardworking, and are beginning to take advantage of the modern methods of agriculture. But the economic depression has severely told on their efforts ; and already many are not able even to pay the Government kist and prefer to sell their lands at whatever price it may fetch, to cultivating it at a great risk. The advantage of growing trees for fuel and fruit has not yet been realised. This area can

grow very well excellent fruit trees of very many kinds, but so far the ryot has not begun to appreciate the economic value of that kind of cultivation.

Monsoon rains are precarious and partial failure of crops is by no means rare ; and there have been a number of famines. But this region under study has not been very much affected as other parts of the Presidency where dry cultivation prevails. Attur Taluk has been the one taluk of the Salem District that has withstood all famines. The Chidambaram Taluk has never felt a famine, though its trouble has been one of economic struggle for the sale of its paddy. The dry areas have now and then suffered due to late rains or failure of monsoon.

PEOPLE

Chidambaram Taluk is the densest area with 807 per sq. mile, while Attur is the least dense with 295 per sq. mile. Perambaloor



MAP 7. SHOWING THE DENSITY OF POPULATION IN THE VELLAR BASIN

Taluk has seen a fall in population during the last decade. It is due to the industrialisation of Trichinopoly which has pulled out a number of people from this infertile area, as also to the fact that the agricultural people are going out of India as indentured labourers. Chidambaram is the only area that is almost saturated, and is not able to increase its population further.

There is an important fact about the *distribution of languages* in South India. The Telugu population is distributed in the Tamil Districts of the Madras Presidency along the region bordering the plains and the mountainous region. They seem to have spread along this line from North to the South. East of this line the Tamils predominate and the Telugu population is practically negligible. In the western parts of Attur Taluk, Perambaloor and Kallakurichi Taluks there are more Telugus than in the eastern taluks.

The religion of the people is mainly Hinduism. There are a few Labbais or local Musalmans scattered in groups, and their important centre is Porto Novo. The Christian population is very small in this region. The Brahmin population is far less than in the adjacent regions of the Cauvery and Pennaiar. They are concentrated mainly in the Chidambaram Taluk. The Adi-dravida or Harijan population of this region is, as elsewhere, very poor and uneducated. There are a few religious centres in this region, the important of which are Chidambaram, Srimushnam, Vriddhachalam, Chinna Tirupathi ; and a number of smaller ones are scattered throughout the area. The religion of the people is partly Vaishnavism and partly Saivaism. The bulk of the population are agriculturists. There are a few traders and local workmen. The weavers are gradually decreasing in numbers in spite of the Khaddar movement. The number of money-lenders seems, however, to be increasing, showing the indebtedness of the people.

The status of the peasant proprietors is still worse. The price of agricultural products has fallen, and they are neither able to pay the government kist nor to cultivate the land. Meanwhile they have to pay at least the interest on the loans, as everyone of them has practically borrowed on mortgage of his land.

The cattle problem is still worse, as the poor farmer is unable to maintain good bullocks, whose quality is very low. There are periodical cattle fairs in a number of places, where the peasants buy their bullocks. The cow is not usually cared for by the poor peasant except in the vicinity of towns, where he can at least supply milk to the innumerable coffee hotels.

In the central regions and the mountainous parts, a good number of *sheep and goats* are grazed. Much of the wool is exported, though there are local spinning wheels and hand-looms in Kallakurichi and Attur Taluks. In many of the fairs, one can see the crude black " cumblies " sold at a cheap price. This serves the purpose of the poor cottages on the hills or on the plains in cold weather.

Silk weaving is also carried on in certain places ; and a special kind of cloth termed " Kailis " worn by the Musalmans is woven for local consumption as well as for export to Rangoon, Singapore and other places.

The only other local industry is *oil crushing* in crude wooden oil mills. Even this is being threatened. The *hand pounding of rice* has vanished. There are a number of *mills*, small and big, distributed everywhere throughout the region. Each small place of note has a mill to serve the local area. The big mills in the Chidambaram area cater to exporting merchants.

Mats of date leaves were originally made in a number of villages ; but the industry has now practically died out. Reference has already been made to the killing of the indigo industry after the introduction of German dyes. But, the manufacture of *jaggery* has not decreased, though it is still carried on by crude old methods.

Rough grass mats and woollen carpets are woven in Perambaloor Taluk (Rajangudi). There is a ginning mill at Perambaloor.

Glass bangles were originally manufactured in great quantities in Perambaloor and Kallakurichi Taluks where the special materials were easily obtained. The industry has almost died out, though it is being kept alive by a few families here and there.

Steatite is cut into culinary vessels in the hilly regions of the Attur Taluk. It is being taken to far-off places in Tanjore District and even as far as Madras.

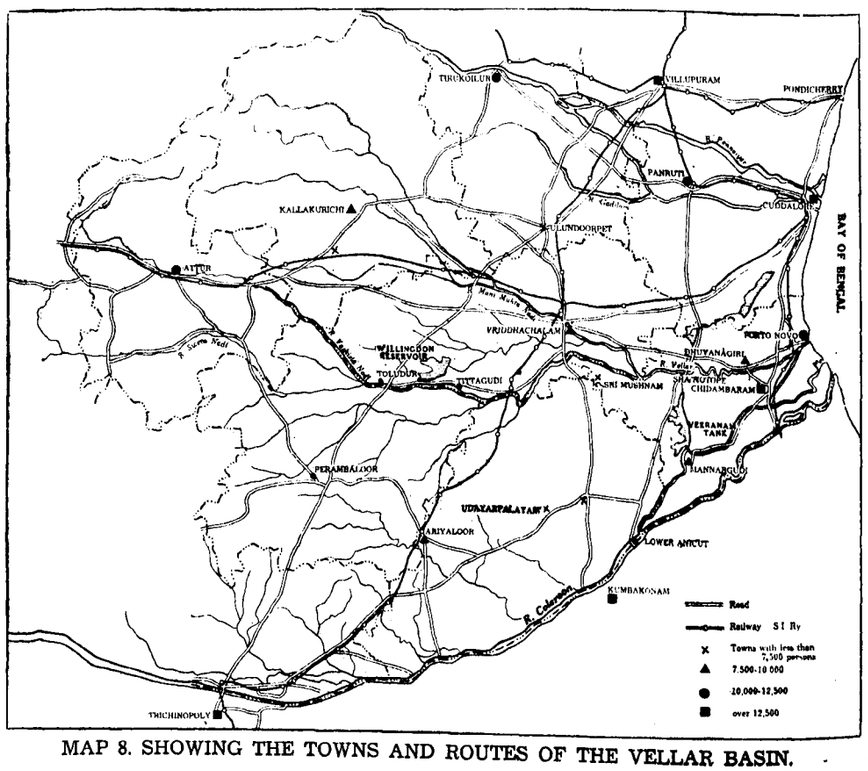
Trade in hides is carried on in important fairs, though there are no important tanneries anywhere.

The health of the people is tolerably good, compared to their poverty, apparently due to the excess of sunshine and fresh air they are forced to take in. But fever in some form or other is endemic. Cholera breaks out in seasons, and carries its toll regularly every year. Better conditions of sanitation and good drinking water facilities will surely control the disease. Plague is unknown in this region. But small-pox rages during summer, and it has its victims

every season. In spite of compulsory vaccination, the death role due to this disease has not diminished, thus proving the uselessness of this process of safe-guarding the health of the people. Guinea-worm is prevalent in the Kadarambam parts i.e., the dry forested interior. Malarial fevers prevail in the hilly tracts of the Kalroyans, Pachaimalais and Kollimalais, and of Kallakurichi and Vriddhachalam Taluks. With the introduction of better sanitary conditions, the Kollimalais can be converted into a sanitarium like the Shevaroys. The fevers of the hill tracts are not so dangerous to the local hill-men, as they are to the men from the plains.

COMMUNICATIONS

Two important roads run across the region, one north to south from Villupuram to Trichy and the other east to west from Cuddalore to Salem. They have local connections to all the various places, and are the two main arteries of the region, for exchange of produce and movement of men and things. They also connect the southern



MAP 8. SHOWING THE TOWNS AND ROUTES OF THE VELLAR BASIN.

regions with the northern regions, and the coastal areas with the Mysore Plateau and Upper Cauvery areas.

There is one other important *road* running along the coast from Pondicherry to Cuddalore and thence to Chidambaram : but the bridge over the Coleroon was destroyed by the floods in 1903 and ever since this road has lost its importance. Even Chidambaram was not directly connected to Cuddalore till a few months back when the bridge over the Vellar near Bhuvanagiri connected it to the northern parts of the region. There is the alternative road from Cuddalore via the Shatiatope Anicut to the Lower Anicut over the Coleroon and thence to Aduthurai and Kumbakonam. This has been used very much. The proposal for a bridge across the Coleroon between Chidambaram and Shiyali has been discussed so often. It has been felt to be a definite need, but it is a question of " who is to spend and how much is to be spent."

The old South Indian *Railway* main-line follows this road from Cuddalore to Mayavaram. The two Railway Chord lines across the region opened recently follow the two trunk roads from north to south and east to west. Vriddhachalam has thus become an important junction.

After the introduction of *bus service*, this area has profited very much from this means of transport. A number of routes are now having regular service. The roads are all well maintained. There is cheap road material available everywhere in the whole region. The roads cannot be classified as class I, but they serve the bus service fairly well.

CONCLUSION

A study of the Human Geography of this region is a vast subject by itself. There are very many different tribes and communities in this area. Each group has its own social and religious customs. I do not propose to deal with this aspect of the subject at present.

Again, a study of the political history of the region is a fairly big subject. The history of the rulers of this region from ancient times to modern days, the part this region has played as the policeman's arena in the early days and the important invasions of the coastal regions, the Carnatic Plains through the Attur Gap and the final cataclysm of the wars between the British and the French in this area, and how it settled once for all the fate of the French

in India, are all to be studied in detail, but will unnecessarily lengthen this paper.

Finally, the importance of this region can be gathered from its varied agricultural activities, from its mineral resource, from its focal position between the two important regions on the north and the south and the two important regions on the west and the east. This has been an important region in South India that has resisted the vagaries of the Monsoon and has withstood the ravages of recurring famines.

A Geographical Study of Manganese with Special Reference to India

By

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INTRODUCTION

As manganese ores form one of the four important mineral products of India the values of which exceed one million pounds sterling in normal years, and as manganese is an indispensable metal for certain key industries, it has been felt that a concise account of it viewed from the point of Economic Geography may be useful not only to Geographers but also to others.

OCCURRENCE OF MANGANESE IN INDIA

Occurrence and Relief.—Manganese occurs in nature only in the form of compounds as oxides, manganates, carbonates or silicates. As in the case with many heavy metals, manganese minerals also occur in highly folded and denuded regions; for, in the original cooling of the earth's crust from the molten state these heavier minerals seem to have sunk as the result of their greater specific gravity. During the folding of the earth's crust by orogenic or mountain-making movements and later denudation, these inner layers rich in various useful minerals have been brought nearer the surface and partly exposed together with igneous intrusions. Besides, various economic minerals are deposited by ascending heated waters and vapours which carry them in solution and as during the folding of the outer crust many cracks and crevices are formed, these facilitate the ascending and deposition of these metals. It has, further, been found that plenty of igneous intrusions accompany periods of severe folding; these molten intrusions by their great heat bring about various chemical changes which may result either in the formation of new economic minerals or in the concentration of the already sparsely distributed metals in the country rock. Moreover, the ever active forces of denudation, which are all the more energetic in mountainous regions, remove the lighter materials as quartz and aluminous clays to be deposited in the plains leaving the heavier metals as gold, platinum, silver, copper, etc., which may be recovered by further hydraulic washing.

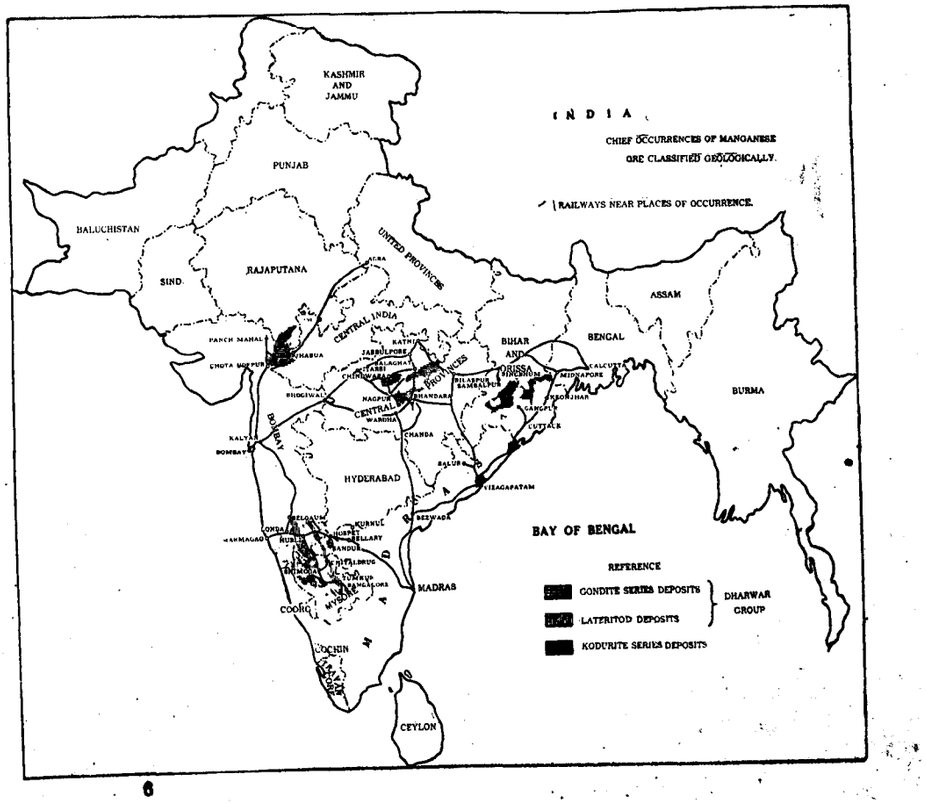
Occurrence and Age.—There is also a close relation between the occurrence of useful metals and the age of the rock in which they are found: as a general rule, the older the rock the more abundant is it in metallic minerals; for, as has been pointed out, denudation is responsible for the exposure as well as for bringing the ore bodies nearer the surface; and denudation would have been the more effective the greater the interval of time it had been allowed to act. Further, the degree of mineralisation of a rock depends upon the extent to which the rock has been affected by igneous intrusions and other changes: usually, the older the rock the greater is the chance of its being affected by plenty of intrusions and other changes called metamorphism. Besides, the work of various atmospheric agencies, both mechanical and chemical, consists in the concentration in places of useful metals which form important workable sources of these metals; and the older the rock the more perfect is the concentration. This is true of many minerals like iron, aluminium, manganese, etc.

Careful Observation Necessary.—All the above characteristics are clearly brought out in India in the occurrence of various heavier metals as gold, iron, manganese, etc. But in these cases the real folded or mountainous nature of the country may not be made out at first, because these regions have been denuded to such an extent as to become practically peneplains; yet, the gentle unevenness of the surface, the nature of rocks and the intricate folding and plication of the strata would reveal to a careful observer that these are 'relicts' of once very high mountains.

Occurs in Peninsular Region.—Bearing in mind the above facts, we can easily correlate the occurrence of all workable deposits of manganese in India with the geological age of the rocks; as geologically very old rocks as those belonging to the Archaeans do not occur either in the extra-peninsular area or in the Indo-Gangetic alluvium, we do not find any economically important deposits in these two regions; hence, all the important manganese deposits of India are confined to the peninsular part of India. It may be remembered here that the Peninsular part of India in the geologic sense not only includes the Geographical peninsula, but also extends as far as the Aravallis on the North-West, Gwalior in the North and Bihar and Orissa in the North-East.

Chief occurrences classified geologically.—The following table gives the chief occurrences of manganese in India:—

Age.	*Formation or Series.*	*Important producing areas.*
Dharwar.	Lateritoid series.	Sandur, Chitaldrug, Tumkur.
		Singhbhum, Bellary, N. Kanara.
		Shimoga, Jabalpore.
	Chilpighat series.	Balaghat.
	Champaner series.	Panchmahal.
	Aravalli series.	Jhalna.
	Gondite series.	Balaghat, Bhandra. Chhindwara, Nagpur.
?	Kodurite series. (Intrusions into the Khondolites).	Vizagapatam.



Four Important Manganese Minerals.—There is a large number of minerals which contain manganese to a less or greater extent: of these some are so rich in metallic manganese content as to contain only traces of other metals; but even among these many are not important economically on account of their rarity. Hence, of the various manganese-bearing minerals, which have been identified in India, only *four* are the most important as well as the most widely distributed; these are Psilomalane, Braunite, Pyrolusite and Wad; of these Psilomalane and Braunite form probably 90 per cent. of the manganese ores exported from India.

Resources of Manganese ore in India.—In 1909, Dr. L. L. Fermor stated that within a short period of 30—50 years the first grade manganese ore in India would have been mined, leaving only second and third grade ores. This he calculated at the rate of production of manganese ores in the early years of this century.

In the light of later discoveries, this prophetic statement has been found to be incorrect, so much so, Dr. Fermor himself in reviewing Indian resources of minerals and metals stated that in the case of manganese data are not available for the correct estimation of ore resources, and " all that can be said is that resources are far in excess of probable requirements for many years to come."

THE USES OF MANGANESE—USES IN METALLURGY

Introduction.—By far the largest proportion of the world's output of manganese, in all probability more than 90 per cent of it, is used in the manufacture of iron and steel. The first use of manganese in this industry is, likely to be of interest to any investigator. It is interesting to note that one of the early successful investigators on a larger scale in this direction was Mr. J. M. Heath, who left the Madras Civil Service in 1839, and succeeded in transforming the low grade wootz steel made by the Indians of the North Arcot District into excellent steel. He first smelted a mixture of manganese oxide with coal tar and then got an impure form of metallic manganese with some carbon; this he used in the manufacture of steel; he improved his method afterwards by mixing manganese oxide and tar, and making them into bricks which were then sold to the steel manufacturers of England. This gave a great impetus to the steel industry of England, where the best and costly iron from Sweden was being used in the manufacture of steel; for, with the invention of the Heath's process (i.e., the use of manganese in steel manufacture), steel of equally good quality could be manufactured with less cost from the low grade iron of English manufacture.

Manganese for Steel manufacture known to Indians.—It is also interesting to note here, that the use of manganese in the manufacture of steel was practised by the Indians from time immemorial; this is proved by the facts that some smelted iron in India revealed on examination the presence of manganese; that the Dhavads or iron smelters of the Western Ghats have a special name for manganese ores—' waral '; that the iron smelters of the Jabalpur district make use of manganese ores even to-day in the manufacture of a variety of steel known as Kheri, which has a great demand among the local blacksmiths, who weld it into ordinary country-made soft iron to form edges of scythes and axes; and that there is a tradition amongst the Dhavads that the Phoenicians carried away from this country manganese ores evidently for the same purpose. It is also quite probable, that Mr. Heath himself would have taken the hint from the iron smelters of the North Arcot District. Dr. L .L. Fermor relates how he visited a small native furnace at Ghogra in the Jubulpore district, where such steel was being made.

Manganese in Bessemer process.—With the introduction of the Bessemer process in the manufacture of steel in 1858, the use of manganese in the form of the alloy spiegeleisen, which contained 5 to 27 per cent of manganese and 4 to 5 per cent of carbon, became necessary. The Bessemer process consisted in burning away all carbon and silicon in the convertor by blowing cold air into the molten pig-iron; and the necessary amount of carbon was afterwards added to the molten iron by a repetition of the blowing. This process as invented by Sir Henry Bessemer, yielded steel which was very brittle. Mr. Mushat modified the process by adding ferro-manganese alloys, which removed the brittleness from the resulting product. Manganese may be introduced either in the form of ferro-manganese alloys or in the form of iron ores rich in manganese as those occuring in the Siegerland district in Germany, in Spain, Sweden and Greece. The amount of manganese in spiegeleisen was not found to be sufficient for several purposes in the manufacture of steel; hence, alloys of iron containing manganese from 25 to 90 per cent were invented; such alloys are called ferro-manganese. This naturally increased greatly the demand for manganese.

Manganese as Desulphurizer in Iron Smelting.—As manganese has a great affinity for sulphur it is also used to desulphurize iron

in the manufacture of the latter metal from highly sulphurous ores as occuring in Luxemburg and Lorraine ; the resulting phosphoric pig-iron is then converted into steel by the basic process. The presence of manganese in foundry pig-iron, provided the amount does not exceed 2 per cent, is said to be beneficial ; for, it makes the pig not only harder, but also closer grained ; the manganese present also prevents the absorption of sulphur from the coke during smelting.

Manganese Steel.—Manganese steel was invented by Sir Robert A. Hadfield in 1883 ; it contains 11-14 per cent of manganese and 1.25 per cent of carbon ; the effect of manganese in such steel is to make the steel more brittle, if the amount be 1 to 7 per cent, but renders it strong and ductile without any decrease in hardness if the amount is 7 to 30 per cent ; carbon steel is brittle and less ductile. Its principal characteristics may be summarised as follows :—

Properties.—(a) It is practically non-magnetic, notwithstanding the fact that it contains about 36 per cent of iron. Hence, it has been employed in armoured and other structures near the magnetic compass in ships and aeroplanes.

(b) Its electric resistance is seven times that of pure iron and its ductility only 1/6th that of pure iron ; this makes it useful for the manufacture of resistance coils.

(c) The alloy is greatly toughened by quenching instead of being hardened, and made comparatively brittle, as in the case of carbon with steel.

(d) It has a high tensile strength (60-70 tons per square inch) when suitably heat treated, combined with extraordinary elongation (50 or even 70 per cent exceeding that obtained with purest iron).

(e) Its resistance to wear by abrasion is greater the more severe the service to which it is applied. The jaw-type crushers for crushing rock in the Cauvery-Mettur Dam, having a crushing capacity of 200 tons of stones per hour were made of cast steel with the wearing part of manganese steel. Manganese steel is used in special railway and tramway trackwork, the wearing parts of excavators, and dredgers, wheels of mine cars, wireline sheaves for oil machinery, sprockets, clutches and other articles exposed to severe shock and abrasion.

During the War thousands of British and allied troops owed their lives to the protective helmets made of manganese steel. In addition, it has excellent casting qualities as regards fluidity and ability to fill moulds of intricate shape ; articles made of this alloy are free from blow-holes.

Effect of Manganese on Steel.—The effect of manganese and manganese alloys on the steel manufacture by acid process has been summarised as follows :—

(a) The prevention of over-oxidation of the steel by the reduction of small quantities of oxide in the bath.

(b) The addition of the requisite amount of manganese necessary in the finished steel.

(c) The hindering of the formation of blow-holes.

(d) The elimination of sulphur from the bath.

(e) The making of iron slag fluid and easy to run off.

(f) The addition of carbon to the bath ; this, however, is incidental and is allowed for when recarbonizing.

No other substitutes.—Silicon and aluminium, indeed, remove oxygen more easily from iron than manganese, but do not pass away into slag easily. Without the use of manganese, mild steel (with ·10 to ·25 per cent of carbon) and medium steel (with ·30 to ·60 per cent of carbon) of to-day cannot be manufactured. Further, the presence of manganese makes the steel finer in structure with higher elastic limit and with low ductility.

No other substitute has yet been found for manganese in the manufacture of steel ; indeed, when Germany was cut off from the import of manganese ore during the war, she tried various substitutes, but with little success. It is remarkable also to note here, that in spite of the great mineral wealth of U.S.A., she is not rich in manganese minerals and that her iron and steel industry has to depend to a very large extent on imported manganese ores, chiefly from Brazil and from elsewhere.

Other Manganese Alloys.—Of the other manganese alloys mention may be made of *manganese bronze* containing 75-76 per cent of copper, 16-17 per cent of manganese and 5-6 per cent of tin ; it is tough, malleable and brass yellow in colour ; the addition of about

5 per cent of aluminium is said to increase the strength and elasticity. On account of its *toughness, strength and non-liability to corrosion by sea-water*, it is used for ship-propellers and other parts of the ship where this quality is necessary. *Manganese, German Silver* or *Silver-Bronze* with 60 per cent of copper, 15 per cent of zinc, and 40 per cent of ferro-manganese with 80 per cent of manganese is used for the manufacture of bearings, valves, and cocks. *Manganni* is an alloy of manganese used for electrical resistances; it contains 82 per cent of copper, 15 per cent of manganese and about 3 per cent of nickel and iron.

In smelting gold, silver.—Manganese dioxide is also used in the Kolar Gold Fields to help the oxidation of impurities of zinc in the final smelting of gold after recovery by the cyanide process. Similarly, it may be used also in the smelting of silver and lead as a flux.

CHEMICAL USES

Chemical uses.—As an oxidiser, the value of the ore depends upon the available quantity of oxygen; very rarely pyrolusite which is used for this purpose contains as much oxygen as required by the Chemical formula (MnO_2S); when other minerals are used as psilomalane (Mn_3O_5), their value will depend on the amount of oxygen which is expressed in terms of (MnO_2) pyrolusite and the chemist buys his ore at so much per nit (1 per cent. of MnO_2). The chief chemical use to which it may be put is for the manufacture of chlorine and bromine; for this purpose the ores should be not only free from impurities of iron oxide, but also contain no carbonates; for, these involve greater consumption of acid. Ores from Kodur in Vizagapatam and Mysore are sometimes exported for this purpose; but with the coming into practice of the electrolytic process for the manufacture of chlorine from sea-water, the demand, on this account, has dwindled greatly.

Savon de verre.—Pyrolusite of very great purity containing no or only a trace of iron often fetches a high price for decolourising green colour in the manufacture of glass.

Other chemical uses.—Manganese may also be used in India for the manufacture of bleaching powder, which has a great demand in paper manufacture, cotton textiles, etc. As a disinfectant manganese is used very widely in the form of permanganates under the name of Condy's fluid both in India and elsewhere; it is, indeed,

a deplorable fact that a great amount of potassium permanganate is imported when it can be prepared with less cost in India with her large resources of manganese. Further, potassium permanganate, in addition to being useful for general purifying purposes, may also be used for bleaching vegetable fibres. Pyrolusite is also used in dry electric batteries and in Leclanche cells; as yet, much money is washed in importing dry cells from foreign countries, which use to a less or greater extent Indian Pyrolusite; but Russian ore on account of its soft nature is said to be more suited for dry cells than hard Indian Pyrolusite. Pyrolusite may also be used in the preparation of oxygen.

Colouring of glass, enamel, etc.—As a colouring material, manganese is used in glass, enamel, tiles, bricks and pottery manufactures; the violet, green or brown colour in glasses is due to its presence; violet colour of enamels is due to ($MnCo_3$) manganese carbonate. It gives highly attractive and beautiful colours to pottery and ornamented tiles; the deep brown glaze of tea-pots and the chocolate colour of certain ornamental tiles are due to its presence. It is also used in calico-printing, dyeing and in the manufacture of certain paints of brown, green and violet colour.

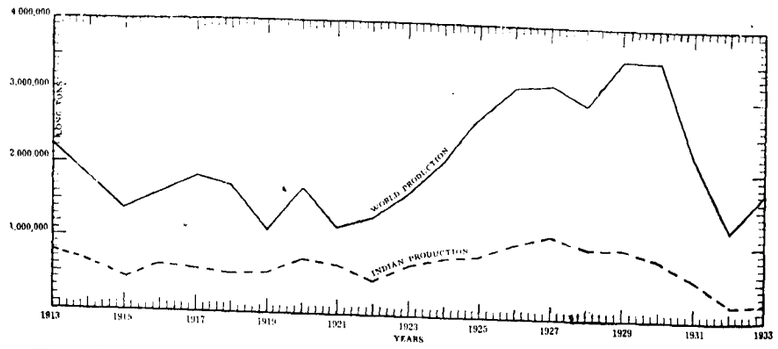
Ornamental purposes.—Some manganese minerals like rhodonite ($MnSiO_3$) and Spessartite (Mn garnet) may be useful as ornamental stones, if found in large quantities. Pure and clear spessartite is sometimes used as a gem-stone, which is violet or red in colour; rhodonite is pink or flesh-coloured.

As manure.—Dr. Oswald Shreiner of the Bureau of Chemistry of Soils, Washington has found out that manganese helps the formation of Chlorophyll in certain unhealthy plants growing in alkaline soil, which lack manganese. Thus, manganese seems to produce healthy and fully vitalized plants. But manganese should not be used in acid soils. The same authority says also that an addition of 50 lbs. of $MnSO_4$ per acre increases the yield of oats by 20 per cent., rice 30 per cent., and other products proportionately as barley, wheat, corn, peas, carrots, etc.

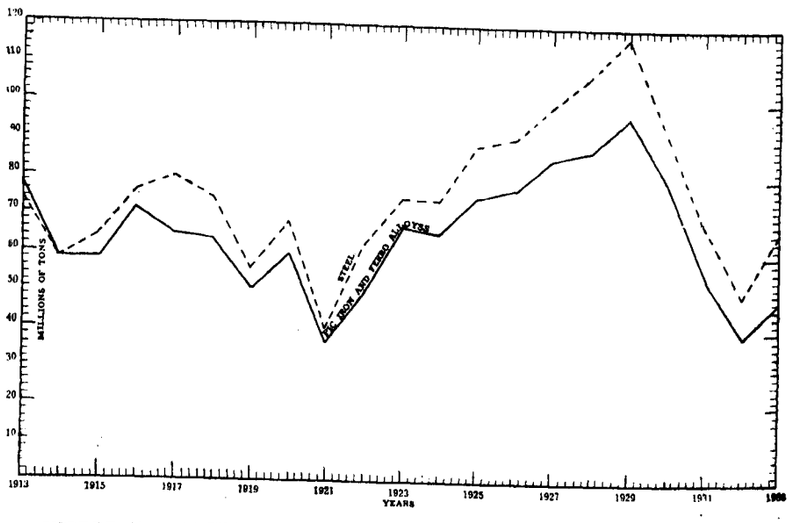
Useful to plants.—As manganese passes into solution in the surface water, it is easily absorbed by plants through the root-hairs. Hence, manganese has been found in many plants as radish, turnips, beet-root, carrot, sugar-cane, bamboo, oats, potatoes, etc. In all these cases manganese probably helps the plants in the extraction of oxygen from air and thus takes part in the vital activities.

Useful to animals.—Manganese is also said to be present in hair, bones, etc., of animals ; it is found in minute quantities in the liver and spleen of human beings and also in the human blood with iron in the ratio of 1 : 20. Here also, probably its presence is beneficial to the system.

The Development of the Trade in Manganese of India.—With a view to bring out the close relationship between the world production of steel, pig-iron and ferro-alloys and the world production of



WORLD PRODUCTION OF MANGANESE AND INDIAN PRODUCTION.



WORLD PRODUCTION OF STEEL, FERRO ALLOYS, AND PIG-IRON.

manganese, separate graphs in the same sheet are drawn (see graph) ; the close relationship can easily be inferred from the fact that more than 90 per cent. of the production of manganese is used in the manufacture of iron, steel, and manganese steel. From the graphs it will be noted that the maxima of iron and steel production coincide with the maxima, and the minima with the minima of manganese production of the world except in the war quinquennium (1914-18) when the minimum of manganese production lags one year behind the minimum of iron and steel production ; this is, of course, due to over-production and the consequent accumulation of stock during the years of lessened demand. In order to compare the Indian production with the other graphs, it is also drawn in the same sheet ; the same fact namely, the lagging behind of the Indian minima of manganese production from the minima of the world production of iron and steel can be more clearly noted.

DEVELOPMENT OF MANGANESE TRADE IN INDIA

We shall now consider the development of the manganese industry in India under the following six periods which have more or less well-marked characteristics :

1st Period-Earlier to 1892.—Though there appears to be no ancient records, it seems probable that the existence of manganese ores in India was known to the Indians from time immemorial. They probably regarded them as a sort of iron ore which made them to be used in colouring glasses, enamels and also in iron smelting ; it appears, that they also confounded this with " Surma " (Sb_2S_3 or antimony sulphide), which was used in colouring eyebrows ; they, however, distinguished manganese ore used for this purpose from true surma (Sb_2S_3) by paying lower prices for them. As referred to by Dr. L. L. Fermor, there is a tradition among the Dhavads or iron smelters of the Western Ghats, that the Phœnicians used to carry away manganese ores from this country. Various native names have been in use for manganese ore in the various parts of India as " Charcoal Stone," Iron Stone, Surma, etc.,"

IInd Period : 1892-1913.—Manganese ore mining began in India in 1892 in the Vizagapatam district when 674 tons were exported for the first time ; the existence of manganese ores, however, was known in the district as early as 1851 and in the Central Provinces since 1829. Till 1899, Madras was the only province which exported manganese ore, and the progress was steady and a figure of

84·652 was reached in 1899. Production in Central Provinces began in 1900 and in Central India in 1903; Bombay began next in 1905 and Bihar and Orissa and Mysore in 1906. The progress was rapid and by 1905, the industry had maintained a position of comparative stability. The zenith was reached in 1907 with an output of 902,291 tons of ore, and India took the lead amongst the producers of the world in 1900, hitherto held by Russia, which, however, temporarily again took the lead between 1912-1915.

The year 1908 saw a marked check in the world's production of manganese both in India and Russia due to the fall in the demand for steel.

IIIrd Period : 1914-1918.—This period roughly coincides with the great war and is hence different from the other ordinary years in several respects. The period was characterised by a great restriction in the export of manganese ore from India; this was necessary in order to avoid manganese and manganese alloys which were so important in the manufacture of iron and steel reaching the enemy country. In spite of this annual average for the quinquennium was 577,457 tons.

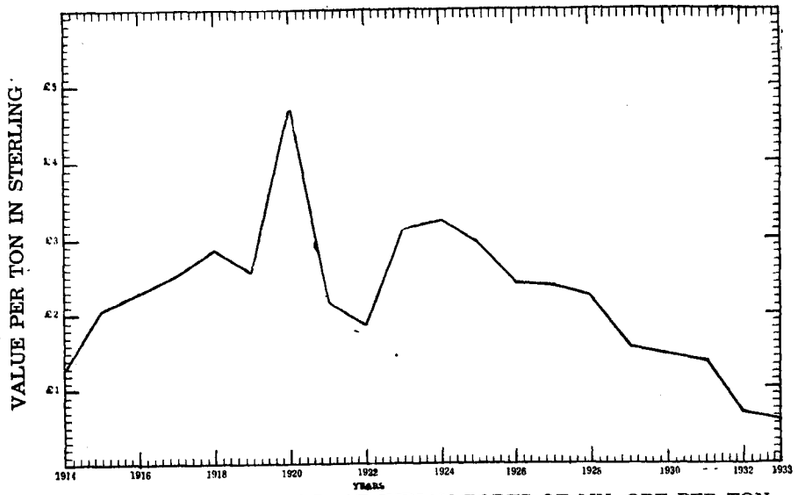
Russia.—Russia retained her position as the leading producer till 1914, but subsequently the closing of the Dardanelles which isolated Russia from friendly consumers, and still later her own internal political troubles combined with the system of giving priority to shipments of food-stuffs, reduced the production to the actual internal needs of the country. The disappearance of Russia from the allied market was not of much importance in the allied market, for not only one of the chief consumers of manganese, namely, Germany became isolated, but also the increased production in India and Brazil partly compensated for the decrease.

Manganese 'boom.'—Exports from Brazil chiefly went to the United States of America; in spite of this, the great demand for manganese ore in America increased so much chiefly for the manufacture of munition of war, that all the poorer sources of ore bodies were tapped so much that Brazil became the third country in 1918 in the production of managanese ore, and that the composition of standard ferro-manganese was reduced from 80 per cent. to 70 per cent. of metallic manganese. The great demand for ferro-manganese may be easily understood from the fact that many smelters in the U.S.A. used Spigeleisen in the absence of ferro-manganese. Indian ore was not able to reach U.S.A. in large quantities on

account of the lack of shipping. Production was accelerated during this period in Cuba, Italy, Japan, Spain and Sweden, and new producers as the Gold Coast and Egypt also came into the field.

IVth Period 1919-1923.—As the result of various causes, the war period was marked by a great restriction in the export of manganese ore from India; this resulted in the accumulation of stock during this period which entered now into the world market.

The quinquennium 1919-'23 was in several respects an interesting one; consequent on the cessation of hostilities, there was a

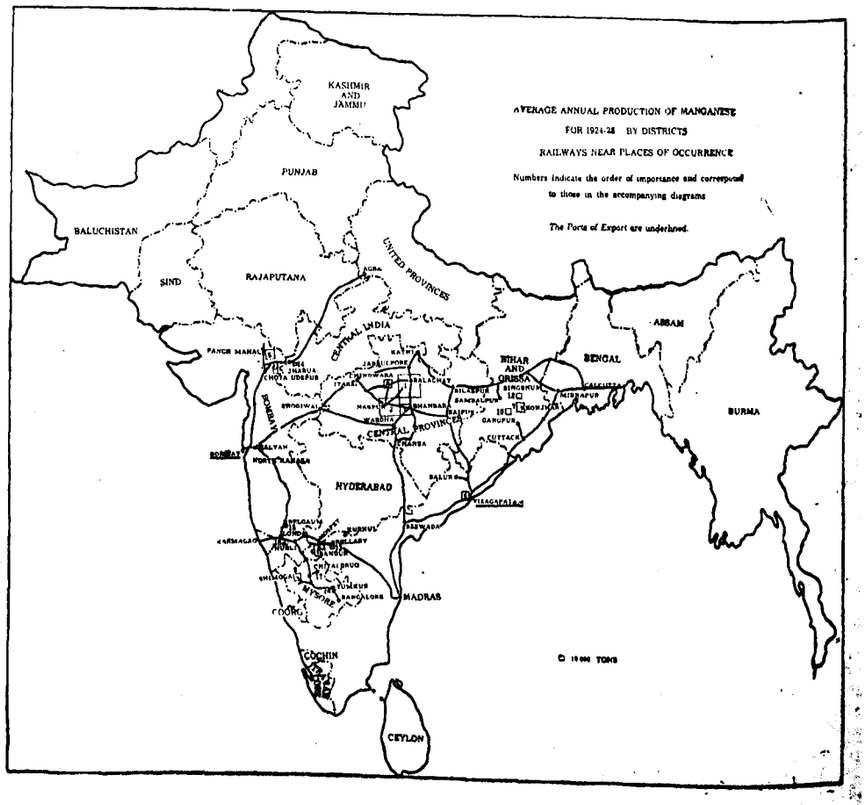


EXPORT VALUE F.O.B. AT INDIAN PORTS OF MN. ORE PER TON.

rapid decrease in the world production of iron and steel in the year 1919; as a result though the price and freight charges also fell, the Indian production was as low as about 53,800 tons. The record for the quinquennium was reached in the next year (736,439 tons), as the result of the increase in the out-put of world production of iron and steel in general and in particular of ferro-manganese in the U.S.A.; this was in spite of the great rise in ocean freights and the high increase in the price per unit of manganese. The year 1921 was one of world-wide trade and business depression with the world's output of pig-iron and steel lowest since 1896 and 1904 respectviely. In spite of the great fall in the ship freight, and the depreciation of the rupee, there was a heavy fall in the export, probably due to the low price of manganese per unit and the lack of demand. The trade depression continued in the earlier part of

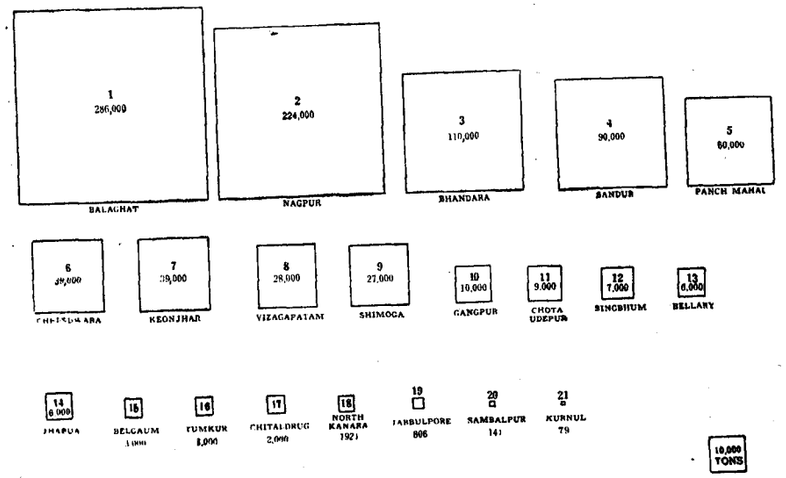
the next year. But conditions improved towards the close of the year ; and as the result of the gradual recovery of the iron and steel industry and the rising prices, the exports increased ; anyhow, this recovery came too late for the Indian manganese industry. However, full advantage was taken of the accumulated stock of the mining companies. 1923 was a prosperous year for the iron and steel industry. Freights remained low but the price of manganese rose considerably.

Russia vs. *India*.—During the years 1915 to 1923, Russia ceased to be a serious competitor with India in the production of manganese. The disappearance of Russia in the world manganese market was, however, not of much significance as one of the chief importers of the Russian as well as to a less extent Indian ores, namely, Germany, also became isolated.



Brazil vs. *India*.—The production of Brazil, however, fluctuated even as that of Indian production ; but, as compared with her exports during the earlier years the increase was so great that she became the second in importance in manganese production in the world, the first being India. Her chief market was U.S.A.

Vth Period, 1924-27.—The years 1924-'27 were prosperous for the manganese industry in India ; for, there were little variations during the whole period as the result of the return to normal conditions. There were no serious fluctuations in exchange. The



AVERAGE ANNUAL PRODUCTION OF MANGANESE FOR 1924-28. BY DISTRICTS (to be studied with Map)

world's output of pig-iron, ferro-manganese alloys and steel increased continuously. But the rate of increase of the world production of manganese was much greater than the demand as revealed by the rate of increase of the world iron and steel industry. This was shown by the lowering of the price of manganese.

VIth Period 1928-1933.—This period was not at all a prosperous one for the manganese industry in India. Probably no other industry was so much affected by the trade depression as the manganese industry, as the result of the great slump in the iron and steel industry. The intensity of the depression cannot be better, expressed than in the words of Dr. L. L. Fermor : "The full magnitude of the slump may be best realised from the fact that whilst the quantity of the production in 1933 was little over 1/5 of

that of the peak year 1927, the value was less than 1/22 part of the value of the 1927 production. In fact, in none of the major Indian mineral industries have the effects of the slump been so seriously felt as in the manganese industry. ..... During 1932 and 1933 the majority of mines in the Central Provinces were closed including several mines that had never been closed since the commencement of work in 1900 and 1901. There was a total cessation of production in the Nagpur district and almost total cessation in Bhandra."

The chief causes for the decline of prices of manganese ore may be summarised as follows :—

(1) The increase in the world production of manganese ore was much greater than the rate of increase in the world production of pig-iron and steel in 1924-'27. And although there was a fall in 1928 in the production of manganese ore, yet in 1929 the increase was greater than was justified by the increased production of iron and steel.

(2) The non-economic methods of exploitation and finance of Russia make it posible to place manganese ore at very low prices.

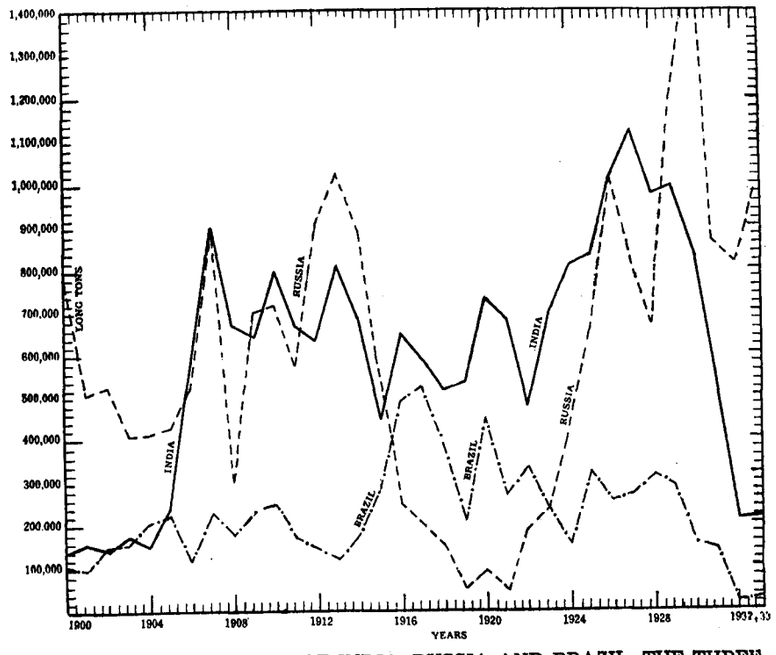
(3) The finding of high grade ore in South Africa at Postmarburg and the consequent competition of South Africa in the world market.

(4) Lastly, the great trade and business depression was also one of the chief causes. It is, hence, no wonder that in spite of apparent prosperity of the Indian manganese industry in 1929 and 1930, the industry fell into such a slump that in 1931 and 1932 many of the companies which had not stopped working since their formation in the early years of this century had to suspend work. The fall in the world production of steel in 1932 to 50 million tons from 122 million tons in 1929 gives some idea of the magnitude of the depression.

Ports of Export.—From the map it will be seen that the chief producing region, namely, Central Provinces is more or less equally distant from the ports of Bombay and Calcutta. The only district of production in Central India (Jhalna) is, however, nearer Bombay than to any other port. Hence, Bombay and Calcutta are the two important ports of export of manganese ore ; Bombay has the further advantage of being nearer the European market than Calcutta. Vizagapatam is the chief port for manganese ores

produced in the district. Marmagao is the nearest port for mines situated in Mysore, Sandur, and Belgaum. It may be noted from the map drawn to show the average production of manganese by districts for 1924-28 and important railways for transport that actually Vizagapatam is nearer to the chief producing areas in Central Provinces than either Bombay or Calcutta ; but the lack of proper railway connections to the former port makes it impossible to take advantage of the shorter distance. Secondly, the shipping facilities also seem to be less at Vizagapatam than either in Calcutta or Bombay in other years.

Competing Countries.—The graphs drawn to show the production of manganese in the three principal countries namely, India, Russia and Brazil clearly indicate the nature of the competition. The chief competitor with India in the European market has been



MANGANESE PRODUCTION OF INDIA, RUSSIA AND BRAZIL, THE THREE PRINCIPAL COUNTRIES.

Russia ; for, Brazil chiefly supplies the needs of U.S.A., though to a certain extent Indian ores are also exported to North America. It is difficult to forecast the position of Russia in the manganese industry of the world, though it appears likely that she may cap-

ture the world market by underselling India. But there are certain obstacles to progress in Russia as (1) the still ill-organised and individualised nature of the workings; (2) the Russian ore requires washing before export; (3) the ore is too soft to be used separately in smelting without mixing with hard Indian or Brazil ore: it is also too impure to be used for chemical purposes, for which its soft nature may be very useful.

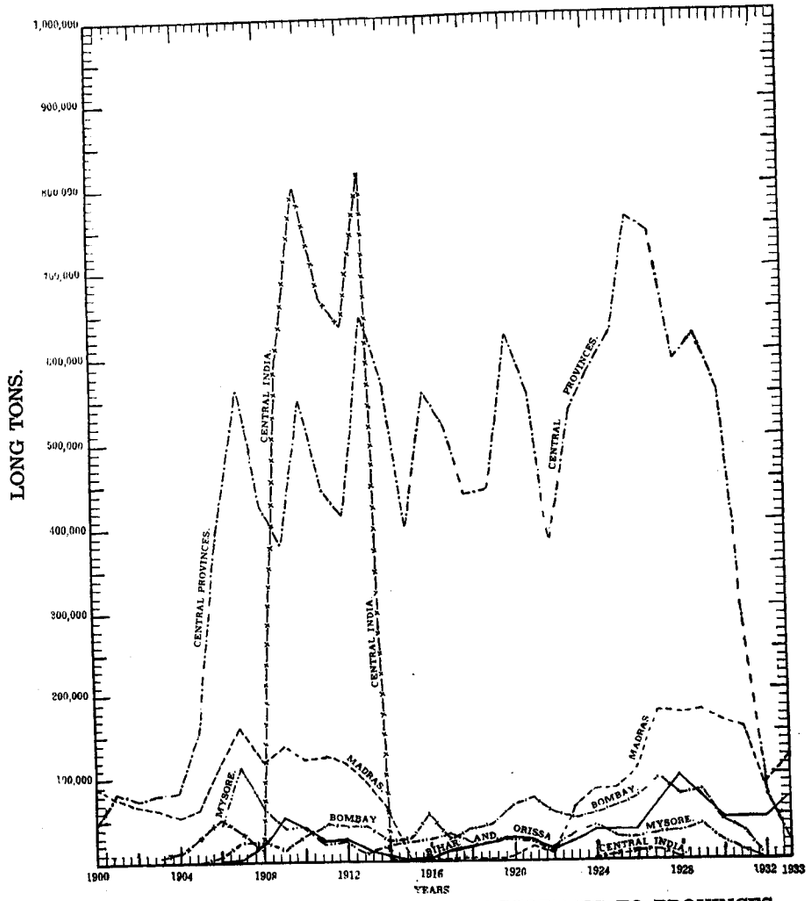
Other competitors.—The other likely competing countries will be Egypt, where the manganese deposits occur only 10-15 miles from port Abuzenina with the ore containing 32·3 per cent. of manganese and 25 per cent. of iron, and the Gold Coast which yields first grade ore with 52 per cent. of manganese. Rich deposits of manganese ore have also been discovered near *Postmarburg in Griqualand in South Africa*; the ore is as compact as that occurring in Central Provinces in India.

Manganese and World Peace.—Sir T. Hotland in a paper read before the British Associaiton at Johannesburg in 1929 spoke about the International Relationship of Minerals; he pointed out that the British Empire and U.S.A. which have the largest and in some cases almost exclusive resources in certain important minerals, by refusing to export these to belligerent countries could prevent wars of long duration. As has been already pointed out, the importance of manganese in the manufacture of iron, steel and other alloys used in the manufacture of war materials is very great, and as yet no other substitute has been discovered. Indeed, it was probably one of the reasons which made Germany in the last Great War to come to terms. It is to be noted that though manganese is produced to a certain extent in most countries, the larger deposits, with the exception of Russia and Brazil are concentrated in the British Empire—in India, South Africa, the Gold Coast and Egypt; thus a working agreement between these mineral powers will go a great extent towards the ensuring of the peace of the world.

THE DEVELOPMENT OF THE MANGANESE INDUSTRY IN INDIA

Central Provinces.—The most important province from the point of view of production is the Central Provinces. As already pointed out, the depression has affected this region very deplorably. This region, though having the richest ore bodies has the disadvantage of being far from ports of export; for this reason in the

recent severe depression only mines nearer the ports of Calcutta and Bombay were able to export some ore in spite of the fact they produced only second-grade ore, and several fields producing first-grade ore were not able to export anything at all, on account of the distance from the ports of export, and the consequent light railway freights. This points to the great necessity of granting some con-



MANGANESE PRODUCTION IN INDIA ACCORDING TO PROVINCES.

cession in railway freights for manganese ores. The chief districts of production are: Nagpur, Balaghat, Bhandara, Chhindwara and Jubbalpore; except Jubbalpore the other districts are close round Nagpur.

Central India.—The next important province was Central India. where the only district of production was Jhalna. But in the last five years this province has not produced anything.

Madras.—Madras was the first province to begin production in India and till 1899 was the only province. The chief district of production was Vizagapatam which had the advantage of being near the sea. Till about 1904 Vizagapatam was the only producing district when new fields were opened in Sandur and other parts of Bellary.

Other Provinces.—The chief districts of production in Bombay are Panch Mahal, Belgaum, Chota Udepur and Ratnagiri. Both Mysore and Bihar and Orissa began production in 1906. The production in all the three provinces has been more or less steady when compared to those of Central Provinces and Central India. The districts in Mysore are Shimoga, Tumkur and Chitaldrug of which Shimoga is the most important. Singhbhum, Gangapur and Keonjhar are the chief districts for manganese ore production in Bihar and Orissa.

Lack of proper communication.—Lack of proper communication is one of the chief reasons against the rapid development of the manganese industry. As already pointed out, the heavier mineral occurs in very old rocks which are mostly unsuitable for human settlement, resulting in the chief occurrences being far from the lines of communication. It will be seen from the map drawn to show the production of manganese ore and important communication, that most of the deposits are unfavourably situated; thus Vizagapatam harbour is the nearest port to the chief places of occurrence in Central Provinces; yet, on account of lack of proper communication, ore is exported either *via* Calcutta or *via* Bombay. All deposits in Bihar and Orissa are situated far from railways and hence were affected first in the recent depression. Even in the case of places whcih appear close to the railways in the map, they are situated a few miles away and in many cases light trams of 2 or 2½ feet gauge are laid to facilitate ore transport; thus in Central Provinces nearly all the deposits are found to be fairly distant from railways, the distance varying from 8 or 9 to as much as 33 miles. In Central India, the deposits of Jhalna district are situated about 5½ miles, in Sandur at least 6 miles (served by an extension of the Madras and Southern Maharatta Railway) and at Kumsi about 20 miles from the Shimoga railway station.

THE MANUFACTURE OF FERRO-MANGANESE IN INDIA

Industry equivalent to loss.—It was pointed out as far back as 1905 by Sir T. Holland that India sustained a great loss by exporting manganese and getting back the same in the form of finished steel from the chief steel producing countries, (U.S.A., England and Germany) which import Indian manganese, and that if an iron and steel industry existed in the country itself, this could be avoided. Also, it would be much more profitable to India to export ferro-manganese than manganese ore itself. Dr. L. L. Fermor has calculated that till the year 1906 India has suffered a financial loss of more than 9 million pounds sterling.

History of Ferro-manganese production.—The manufacture of ferro-manganese began in India in the year 1913 at Sakchi, Jamshedpur; the starting of the industry was the result of the high price of ferro-manganese during the war-time. Only one blast furnace with a daily output of 80 tons was used for this purpose. In 1917 the manufacture was discontinued on account of the necessity of using the furnace for the manufacture of pig-iron. From November 1917 one of the similar blast furnaces of the Bengal Iron Company at Kulti was engaged in the production of ferro-manganese with a guaranteed minimum of 74 per cent. of metallic manganese and .55 per cent. of Phosphorus. The average monthly output was 1,150 tons and the balance after satisfying the home requirements at Sakchi was exported to France, U.S.A., Italy and Natal. With the cessation of the war, ferro-manganese has been manufactured both at Kulti and Sakchi.

FUTURE OF FERRO-MANGANESE

Indian ferro-manganese is unusually rich in phosphorus which amounts to ·55 to ·66 per cent., while the acceptable maximum in the western countries is ·30 per cent. With better selection of ore (e.g. as those occurring in Balaghat) and coke (e.g. as those from Giridih coalfield) the phosphorus content may be reduced; but the future possibilities are small, as Indian coke as well as manganese ores contain a lot of phosphorus. With electric furnace, probably better ferro-manganese may be manufactured.

MANGANESE ORE USED IN INDIA

With the establishment of Iron and Steel industry in India, manganese ore is also used in the country in their manufacture.

Thus in the quinquennium 1924-1928, 389,418 tons of ore were consumed at Tatanagar, Kulti and Burnpur. In the case of Tata Iron and Steel industry, manganese ore is not only used in the manufacture of ferro-manganese to be used in steel making, but also in the manufacture of pig-iron. As pointed out elsewhere, manganese ore is also used in India to colour enamel and pottery ; it is also used in the Kolar Gold Fields in the final smelting of gold in the cyanide process.

THE FUTURE OF MANGANESE INDUSTRY

As has been already pointed out, the resources of India in manganese are far in excess of probable requirements for many years to come. The present serious fall in the price of manganese ore is more the result of over-production and lack of demand than of any other cause. We may also note that at present the iron and steel industry of the world has more manganese than it can possibly consume ; this also excludes the possibility of the discovery of some other cheaper substitute for manganese in the iron and steel industry. The chief producers of manganese ore at present in order of importance are : India, Russia, the Gold Coast, South Africa, Brazil, Egypt and Czecho-Slovakia. India, besides being the chief country for the production of manganese in the world, is also the most important in the British Empire ; yet, the position of India is by no means enviable ; for within the British Empire she has to compete with South Africa, the Gold Coast, and Egypt and outside with Russia and Brazil. Hence, India would do well to consider seriously the possibility of the manufacture of ferro-manganese (and manganese steel) which will bring her greater profit besides reducing unemployment in the country. With the development of cheap electric power in several parts of the Madras and Bombay Presidencies, I should think that this must be a paying proposition ; for, the lateritic ores, besides having the advantage of containing less phosphorus than those of Central Provinces, and thus being more suited for the manufacture of ferro-manganese of saleable quality, are also rich in iron which may amount to 20 per cent. Recently in December 1935, the author of this paper was deputed by the Government of Madras to investigate the possibilities of developing the iron ores of the Kanjamalai Hills, Salem, when electricity becomes available from the Mettur Project : the author is of opinion that with very cheap electric power the manufacture of *high grade steel* and ferro-manganese may be possible.

Notes of a Geographical Excursion in and Around Madras

By

Miss H. T. Scudder, M.A.

N.B.—Please trace out the tour on the map before we follow it as closely as possible on the way.

1. From St. C.T.C. to the Kirk Bridge. Then a sharp turn to follow the river Cooum. Notice the rate of flow of the river, the winding course of it and especially the difference between two banks. Notice also the *traffic* on the river, and any signs of how it is used by man.

2. Notice the arm of the river which goes to the north. This continues into the *Buckingham Canal*. Also this is the beginning of the island. Continue along the river to Govt. House bridge. Notice on the map that the Government House and the Fort are in a straight line. Why ?

3. Across the bridge and to the island. Notice the development of the island. Can you account for it ? Continue along Wallajah Road.

4. The Fort. Why is it just here and nowhere else ?

5. The Harbour Arm. Notice the direction of the opening. Why is it here ? What is the wall made of ? Why ? What evidence of trade is there to be seen here ? Notice the difference in the water on the outer and the inner side of the wall. Why has the little arm been built.

6. Look at the coast from here. Notice the difference between the north and the south coasts. Make a mental note of the width of the beach here and at all other places where we see it. Notice the position of English Madras and Portuguese Madras, and try to account for their location in these relative positions. (i.e., you can see these positions by looking for the church spires). Why is the harbour north of the Fort ? In what direction is Madras spreading now ?

7. On leaving and entering the harbour notice the trade activities.

8. From the harbour continue along the coast to Napier bridge. Notice here the " mouth " of the Cooum, the islands in the river, the beach vegetation, and classify it as a type of natural vegetation.

9. Along the Marina, notice the width of the beach, the fishing activity (the historical occupation) the modern recreational facilities. Try to find out about the Recreation Ground scheme. Notice the number of little fishing villages which Madras has swallowed in its growth. Notice the typical village development, with palmtrees, a well, and the thatched houses.

10. Near the rifle-range is a very interesting formation of sand dunes. Read up Lake on the formation of sand dunes. Contrast this part of the beach with the more northern portion. Notice the water, the lagoons. On a very small scale this is a type of coastal formation found on a large scale in the S. E. coast of the U.S.A. *i.e.*, sand dune and lagoon.

11. We now come to the Adyar. Compare it with the Cooum. Notice the same points as before.

12. Between here and Saidapet, notice tanks, cultivation and natural vegetation. In regard to the tanks, look for the embankments. See which side they are on, and how they are bound together. Guindy, the Governor's country house.

13. St. Thomas' Mount. What is the height ? Which is the steep slope ? Which the gentle ? Notice the road going between the two peaks. Notice the rocks, and the vegetation on the sides of the hill.

14. From the top, after orienting the map, pick out as many tanks as possible, the race course, the railway, the roads, the coastland, etc. Notice also the difference between cultivated and uncultivated. Look at the hills to the south and identify as many as possible from the map. The hills to the north are not on the maps we have. We shall look at them on the 1/M map before going.

15. Along the Poonamalle Road to the Adyar (if time) and then back through Mambalam. A purely modern city a " garden " city. At the river, we shall try to get the rate of flow in the centre and at the sides, and see the various actions in miniature, denudation, deposition and transportation, tributaries joining the main stream etc., etc.

The Madras Geographical Association

SUMMER SCHOOL OF GEOGRAPHY, APRIL—MAY, 1936

The Secretary of the Association has the honour to present the following Report to the Working Council regarding the organisation and conduct of the Summer School of Geography held in April-May, 1936 :

In accordance with the resolution of the Working Council, passed on 25th January, 1936, the Secretary prepared a Prospectus of the Summer School which was sent to all the Headmasters of High Schools in the Presidency and published in the local dailies. 36 teachers were selected including 18 ladies. 18 of the teachers were graduates and the remaining were undergraduates.

Mr. R. M. Statham, M.A., C.I.E., Director of Public Instruction, Madras, opened the Summer School at the Teachers' College, Saidapet, on Wednesday, the 15th April, 1936. At 10 a.m., on that day the teachers attending the course and the guests invited for the occasion assembled at the College Hall. Mr. N. Subrahmanyam, the Secretary of the Association, made a statement (Appendix I), tracing the history of the Summer School and explaining the aims and objects of the course.

M.R.Ry. Rao Bahadur R. Krishna Rao Bhonsle, Avl., I.S.O., Vice-President of the Association, then welcomed Mr. Statham and requested him to open the Summer School. Mr. Statham then delivered his Address (Appendix II), after which he formally opened the Sixth Summer School of Geography.

Mrs. P. S. Sundar Raj then delivered her Inaugural Address (published in the April number of the Journal). The meeting then closed with vote of thanks.

The work of the Summer School went on steadily for three weeks. The following Scheme of Work was gone through :—

(a) *The Pedagogy of Geography (including Syllabuses).* By Mr. N. Subrahmanyam.

(b) *Elementary Surveying.* By Mr. George Kuriyan, assisted by Mr. K. Srinivasaraghavan.

(c) *Map Work.* By Mr. B. M. Thirunarayan.

(d) *Diagrammatic Methods.* By Mr. S. Balakrishna Ayyar.

(e) *Mathematical Geography.* By Mr. S. Muthukrishna Ayyar.

(f) *Land Forms.* By Mr. P. Sridhara Rao.

(g) *Climate and Weather.* By Miss E. D. Birdseye.

(h) *Economic Geography.* By Mr. B. M. Thirunarayanan

As part of the course, the following special lectures were also arranged :—

(a) *Plant Geography.* By Mr. M. S. Sabhesan.

(b) *Animal Geography.* By Mr. R. Gopalan.

(c) *Distribution of Man.* By Mr. George Kuriyan.

(d) *Map Projections.* By Mr. K. Srinivasaraghavan.

Excursions were conducted to the following places : Ennore Backwaters, Pallavaram Hill, Madras Harbour and Red Hills Tank.

At 5 p.m. on Monday, the 4th May, 1936, Miss J. M. Gerrard, M.A., Vice-President of the Association, distributed the certificates to the teachers who attended the course and delivered the Valedictory Address (Appendix III) with which the Summer School was brought to a formal close.

The total collection of fees amounted to Rs. 360, out of which a sum of Rs. 230-4-0 was expended on the travelling and carriage allowances of lecturers. This account will be audited as part of the general account of the Association for the quarter ending 30th June, 1936. The net balance of Rs. 129-12-0 has been carried to the Association Fund.

The thanks of the Association are due to the lecturers for their honorary work in the Summer School as well as to the Director of Public Instruction, Madras, and the Principal, Teachers' College, Saidapet, for permitting the Officers of the Department to work in the Summer School and for allowing the classes to be held in the Geography Department of the Teachers' College, Saidapet.

N. SUBRAHMANYAM,
Secretary.

APPENDIX I

SECRETARY'S STATEMENT

The Madras Geographical Association was founded in 1926 with varied aims and objects ; and in pursuance of them it has been carrying on varied activities. The Association journal, which has been a clearing house of geographic thought and original geographical research work done in South India, has just completed its tenth volume. Geographical Conferences have been held in half-a-dozen districts, in each of which the particular district in which it is held has been the subject of study with several papers on various aspects of its Geography prepared by specialists—all the papers being published in the Journal. Excursions have been conducted and popularised in the Presidency.

To meet the sudden demand of the teachers of Geography when the subject was included in the remodelled S.S.L.C. Scheme, a series of Summer Schools have been organised and conducted in 1928, 1929, 1931, 1932 and 1935 at the Teachers' College, Saidapet, and some outside Madras—at Madura, Trichinopoly, Nellore, Gooty, Palaghat and Trichur.

The aim of these Summer Schools has not been for teaching Geography for those who had altogether no touch with it at all, but to catch the actual teacher of Geography who has been doing his work without any kind of technical qualification, and who wishes to get guidance and light in the way of practical work and modern methods of handling the subject. This aim is sought to be achieved by undertaking to provide for the teacher, who has already had grounding in Geography work, the training which would normally require two terms' work, in the course of a short period, by means of intensive effort along a concentrated course of studies, judiciously chosen for their value and importance from the point of view of the teacher. The course consists mainly of practical work, field work and excursions, and presents the salient points in such essential matters as map-making, map-reading and map-correlations, the study of land-forms, climate and weather, use of graphic methods and statistics, and construction of diagrams, models and appliances. A few general lectures, illustrative of geographic method and viewpoint are also delivered.

In the first three or four Summer Schools, the needs of the High School teacher of Geography were kept in view ; but in view

of the recent issue of a revised scheme and syllabus for Forms 1 to 3, by the Madras Department of Education, in the last Summer School the needs of the Middle School teacher has also been specially attended to. The same course will be followed in the present one also.

The best way of pulling up the teaching of Geography in the Middle School is to have specialists in Geography among the staff of Secondary Training Schools. But as this is a financial problem which cannot be solved immediately, it is suggested that a Refresher Course in Geography for the teachers in Training Schools who happen to handle the subject there, and explain to them the aim and scope of the new Middle School syllabus in addition to all the other practical work done in the Summer School. Such a course may be organised by the Educational Department itself; or, the Association would be glad to do so with the sympathy and support of the Department. In view of the urgent need for such a training, steps will be taken to run the next Summer School with this aim in view.

Before concluding, I wish to state that the Summer School course is only a compromise that satisfies a real need; but it cannot take the place of a full year's course at the Teachers' College, in which the teacher of Geography gets a knowledge of, and training in the pedagogy of the subject. But even this is not a full qualification for handling Geography in schools. It is a case of putting the cart before the horse—of learning the pedagogy of a subject, whose subject-matter has not been learnt; or it is nearer the truth to say, that it is a case of cart alone without the horse to draw it, for there is no subsequent attempt to take the Diploma or Degree in Geography. A full qualification for one who proposes to become a teacher of Geography is to take first the Degree in it, or until provision is made for it in Colleges, the Diploma in Geography which the University of Madras has already provided for, and then to undergo training in the Teachers' Colleges. It is to be hoped that such fully qualified teachers of the subject will be forthcoming in larger numbers in the years to come.

APPENDIX II

SPEECH OF R. M. STATHAM, ESQ., M.A., C.I.E., DIRECTOR OF PUBLIC INSTRUCTION, MADRAS, OPENING THE SUMMER SCHOOL OF GEOGRAPHY

MR. KRISHNA RAO BHONSLE, LADIES AND GENTLEMEN,

Let me at the outset express my gratefulness to the Madras Geographical Association for having invited me to open the Sixth Summer School of Geography. I need not say how happy I am to be present here and to associate myself with the function of this day.

The Madras Geographical Association is nothing new to me. I have known about its varied work and activities in earlier years; and I appreciate very much the real and valuable propaganda work which it has been doing in this Presidency as well as in other parts of India, in favour of Geography. The journal of the Association is a good production, and can stand comparison with similar productions in other countries. I am very happy to note that the Association and its journal are well known even outside India, in Europe, America and Australia.

By taking up the running of the Summer School course, the Association is serving a very real need indeed. Unfortunately in India there are not many degree courses in Geography; and seeing that the curriculum of schools and the syllabuses have been recently changed, I consider the work of the Association of very great benefit to the Department of Education, particularly at this juncture. Let me congratulate the Association for working on its own resources without expecting Government grant. In this connection, let me also state how much I appreciate the hard work that the Secretary, Mr. N. Subrahmanyam, and his colleagues in the Association, have been doing even in their spare and leisure moments.

In olden days Geography was not taught in the manner in which it ought to be taught; and students were simply asked to remember the names of principal towns, rivers, etc., by mnemonic methods; and the result was that they did not learn Geography in the sense in which it is thought of at the present day. There was a moral from such experience, and that was that they had to go a long way in studying the subject of Geography in the right way. But now partly due to the work of your Association and partly due to other circumstances, the knowledge of Geography in South India is now very much better than what obtained in the days which I can recollect.

Ever since I came to this country, it was my privilege to work with a number of Professors, and I was a teacher in the Teachers' College also. But there were two things which were worrying me. One of these is that those who have gone through high academic courses lacked the power of observation and general knowledge. I do not know if the same state of affairs continues at the present day, for, I have been out of this place for quite a long time. It was very common a few years back to notice that first-class honours graduates were entirely ignorant of what was going on around them, which was passed over as meaning nothing. It was also a common knowledge that when they competed for the Public Service Examination tests, amazing and astounding answers were produced for what may be considered as very simple questions on general knowledge. I sincerely hope and believe that the work of the Summer School of Geography will be aiding a great deal to alter that condition and to teach among all the other aspects, the power of observation, love of Nature and widely extended general knowledge. For that reason, if for no other, I welcome tthe practical training which will be a special feature of the Summer School.

One of the good things that the Association has been doing is its encouragement of travel and excursion. But travel requires a preliminary knowledge of the land you are going to travel through as well as a training in geographical observation. Recently I did a good deal of travel, going home through Australia and New Zealand. I personally feel that if I had done all this travel as a Diploma-holder in Geography or after a training in the Summer School of Geography, I could have come back with a far better knowledge of and understanding of the countries through which I travelled. I am very pleased to know that this Association has popularised school excursions in South India ; but let me suggest to you the desirability and usefulness of visiting other parts of India as well outside the Presidency, especially where Geography is taught as a live portion in the Universities. For instance, it will be a source of interest and personal inspiration to the members of the Association if they can see the enthusiasm put into the Geography Degree course in the Aligarh University.

Regarding the note of personal touch in your speech, Mr. Rao Bahadur Krishna Rao Bhonsle, I desire to express my thanks for your kindly references to me. I say that I am really glad to come back to India and be amongst you in Madras to work again in the field of education.

The Association has had a splendid record of achievement ; and I wish it still further success in the work of the future. I wish the students undergoing the course in this Summer School a very interesting and happy time. Let me also assure the Association of my best help and co-operation in all its work.

I declare the Sixth Summer School of Geography open.

APPENDIX III

VALEDICTORY ADDRESS TO THE TEACHERS OF THE SUMMER SCHOOL OF GEOGRAPHY

By

Miss J. M. Gerrard.

Ladies and Gentlemen,

This occasion marks the close of a course of concentrated study which reflects great credit, it seems to me, upon all those who have taken part. Sacrificing time and money, teachers have collected from many parts to become students together for a short time ; and others have elected to give up of their energy and spare time in preparing and delivering special courses of lectures and practical work, without any gain or profit to themselves. The course seems to have been a very full one indeed ; and one of its features is, I think, the number of specialists in different branches who have collaborated together thus affording the students opportunities of coming into contact with many minds.

2. It seemed to me that in sounding the farewell, I ought to emphasize some of the points that the lecturers have been driving home in the course of their lectures and practical classes to you. But, on the other hand, it is possible that you have absorbed as much Geography as you can stand for the present. A dose of 56 lectures and practical classes with 8 sessions of Surveying and 3 after-noon excursions is a pretty strong one when taken in the short period of 17 days. I can recall even now my own state of physical and mental exhaustion after attending a Summer School of Geography at Oxford, 20 years ago. So, probably you too are feeling somewhat limp after this breathless chase after knowledge, and are eager for a rest.

3. The time has come, therefore, for digestion. There is no danger, I feel sure, that you will go from this course in the belief

that you learned all there is about Geography. The aim of the course has been to set you upon the right lines of attacking the formidable mass of knowledge yet to be made your own. I do not doubt but that you are taking away with you lists of references which will be the means of your carrying on the study of Geography to a further stage. I do not think either that you need be warned against the temptation to pass on what you have learned here, in exactly the same form to your pupils. It is not the contents of the subject matter you have learnt that will prove so valuable as the method of approach to Geography. The value it will have for *you* depends upon the insight you have now got into the relation of Geography to human life and experience. The measure of its value will be found in your teaching hereafter, in the extent to which it becomes alive and vivid and the extent to which Geography becomes real and interesting to your pupils.

4. One of the immediate results will be, I hope, the breaking of the shackles that makes your lessons depend upon the text-book. One can understand this dependence when teaching a subject where the foundations are not very secure. The teacher is *afraid* to stray from the text lest he find himself floundering, like a man astray and stumbling in unknown country, full of pitfalls. Will your teaching continue to be nothing but a ré-chauffé of each chapter in the text-book ? This method tends to deaden teaching, and fear prevents the teacher from probing his own deficiencies and at the same time brings boredom and dissatisfaction with one's work. We are all entrapped at times into accepting text-book statements ; and I am reminded of a recent experience in my own teaching. In Form IV we had been discussing in details the crops found growing around Madras, including the explanation of how pulses helped to enrich the soil in which they were grown. In the terminal test the question was asked " Why are pulses grown amongst crops of cereals and cotton ? ". Only two gave the answer expected by the examiner, which was that the pulses helped to enrich the soil. There were a great variety of answers, including statements like the following :—

(a) " Pulses cannot be grown in separate places as it will be too expensive."

(b) " It will be a waste of soil to have only pulses."

(c) " Because pulses are dry crops and they grow between to protect from much sunlight."

(d) " Because they grow quickly, so they plant in between the rows of cotton."

(e) " Because they need little care ".

I realised as I read these answers that my knowledge of the economy of mixed crop farming was far too superficial to be able to deal adequately with these, and that I must set to acquire a far wider and deeper back-ground about crops around Madras than the ordinary text-book treatment demanded.

6. Teaching successive portions in the text-book puts the teacher into the position of that guide, which is a figure of fun in Mark Twain's " A Tramp Abroad ". It is all right as long as he can follow the sequence presented and arranged for him ; but an unexpected question is apt to put him out completely. So, the teacher needs to digest the chapter portion very thoroughly, he needs to take it to pieces, to re-arrange it and then perhaps he is ready to link up and straighten out where necessary all the queer puzzling notions that arise in 30 or 40 different young minds that are listening to his presentation of the facts.

7. And it is these unexpected questions posed by the pupils that are more important than the text, because they are the ways by which the pupils are learning, and their variety is astounding. No doubt you have heard of " the ships and schools scheme ". It began as an experiment in 4 London schools, each of which adopted a cargo-boat, and by keeping in direct correspondence with the Captain and the Officers and crew, the pupils have been enabled under the guidance of their teachers to follow the course of their adopted ship, to study trade-routes, to learn about ports, countries, climates, customs and peoples, and to obtain direct information regarding trade and the destinations and sources of imports and exports. The children's interest was stimulated by the answers to the questions they had themselves posed :—

1. How do you clean the hold of the ship after carrying a cargo of coal if you have to carry a cargo of wheat ?

2. How long does it take to unload 5000 tons of coal ?

3. To what extent do you rely on wireless reports of the weather ?

4. If a country has a fever, such as malaria, and a boat called at that place and the crew caught it, would they receive compensation ?

5. We often wonder if the ship's crew sing sea-shanties now-a-days, and please how many miles does your ship do on a ton of coal in fair weather ?

How many of these questions could most of us answer straightway ? They are questions which provide evidence of real thinking about things that puzzled the pupils in their learning. And I have quoted these to indicate how various were the ways in which these children were building up their individual concepts of geographical meanings.

8. Such a course as this will help us to enrich the teaching and in so doing helps to give us a deeper satisfaction in our work. Teachers are often assessed wrongly on their capacity to teach. Different judges tend to stress different factors and sometimes the criterion is a superficial one such as the ability to give a lesson in front of a class. To the observer the lesson may seem satisfactory, but who can tell *at that moment* that the exposition was sufficiently linked up with the pupils' experience, and sufficiently stimulating, that it set the thoughts of individual members racing along to build up concepts and to formulate ideas ?

9. All this then is to point a moral,—how extremely important it is for the Geography teacher of whatever class to lay his foundation both deep and wife.

10. Let me quote from" *an open letter to College Teachers* ":— " The only good way of judging the college or college teaching is by means of the products of the college. We should ask whether the students have grown as a result of their own efforts ; have they come out better educated, better men and women in the broader sense ; have they been better citizens ; have they learned to solve problems ; have they been stimulated to do greater things ? " I think it is on lines such as these that the teaching in the school is to be judged also. And Geography is one of the subjects which when taught properly can lead the pupil to think and to grow, which can awaken in him the consciousness of his own environment and make him aware of other types of human environment.

If this intensive course of Geography will have helped to make Geography real and vital to your pupils, and if it brings you satisfaction in your teaching, then all the time and the effort expended on the course by all concerned will indeed be worth while.

News and Notes

Though this issue of the Journal has been somewhat delayed owing to certain unforeseen circumstances, it is pleasing to note that the varied activities of the Association have been at full swing during the quarter, with regular periodical meetings and with committees functioning in several ways as detailed below.

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The first meeting of the Association for the quarter was held on 1st August, 1936, in the New University Buildings, when Mr. K. Srinivasaraghavan read a paper on *The Vellar Basin* with Mr. B. M. Thirunarayanan in the chair. (Paper included in this issue).

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The second meeting for the quarter was held in the Geology Department of the Presidency College, when Mr. P. G. Dowie read a paper on *the Manganese Industry in India* under the presidency of Mr. K. C. Ramakrishnan. (Paper included in this issue).

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The third meeting for the quarter was held in the History Department of the Presidency College, when Dr. P. S. Loganadhan read a paper on " *Some Recent Trends in the Cotton Industry in India* ", with Mr. J. Franco, in the chair. (Also included in this issue).

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The Standing Committee of the Association examined the replies to the Questionnaire issued in March, 1936, by the Association regarding the conditions of teaching Geography in the Secondary Schools of the Presidency. The Report of their findings has been communicated to the Director of Public Instruction, Madras, in accordance with his Proceedings R. C. No. 231 E-36 dated 20-2-36, for information and necessary action.

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The Standing Committee continued its deliberations on the preparation of a Syllabus in Geography for Elementary Schools in the Presidency. Owing to the different standards and attainments of the pupils in different localities, it was decided *not to prepare a uniform SYLLABUS* for all localities, but only *to issue a Scheme of Work*, suggesting the main principles and topics, with alternative courses suitable for different types of localities.

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The Excursion Committee has been preparing a scheme of excursions for the study of the Madras Region. But as the work is still incomplete, it will be published in the next number of the Journal.

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The Madras Presidency Tamil Sangam had prepared a list of Tamil Equivalents for Geographical Terms as part of their general work. At the time of its recent Conference in Madras, the list was scrutinised and revised by a Committee, presided over by the Secretary of the Association. On his suggestion, this list was sent to the Association for classification, supplementing and further revision, for which purpose the Working Council appointed a Committee consisting of the following members with power to co-opt :— (1) Rao Bahadur R. Krishna Rao Bhonsle ; (2) Mr. S. Balakrishna Ayyar ; (3) Mr. K. C. Veeraraghava Ayyar ; (4) Mr. M. S. Sabhesan ; (5) Miss A. Devadasen ; (6) Sri Krishnaveni Ammal ; (7) Mr. S. Muthukrishna Ayyar ; (8) Mr. B. M. Thirunarayanan ; (9) Mr. K. Srinivasaraghavan ; (10) Mr. K. M. Subramaniam ; (11) Mr. K. Sundaresa Ayyar ; (12) Mr. V. Kalyanasundaram ; (13) Mr. S. S. Krishnaswami ; (14) Mr. Narasimhan ; and Mr. N. Subrahmanyam (Convenor). The Committee already met more than half a dozen times ; and as many more meetings will be required for completing the work, which is expected to be finished by Christmas.

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The Seventh Conference of the Association will be held at Tanjore in May, 1937, when papers on various aspects of the Geography of Tanjore District will be read and discussed. Members of the Association and others who desire to contribute papers for the Conference are requested to inform the Secretary about it before 15th January, 1937.

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It is proposed that the next Summer School of Geography may be conducted specially for the benefit of teachers of Geography in Training Schools with reference to the scheme of work in Geography for Forms 1 to 3. Meantime, it has also been suggested that the course may preferably be conducted in a Hill Station. The possibilities of the latter suggestion are being explored ; and the question is expected to be decided by the end of January, 1937.

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The question of reorganisation of the Secondary School-Leaving Certificate Course will not be undertaken till the expert Committee on Education appointed to study the question in all provinces finishes its work. The existing scheme will in all probability continue in force for some time longer. Meantime, some of the Headmasters are sponsoring a scheme, according to which an extra year's study after completing the School Final Course will be required for entering the University.

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It is understood that several papers on Geography have been submitted to the newly constituted Geology and Geography Section of the Indian Science Congress, whose next session will be held at Hyderabad in January, 1937. It is hoped that in the course of a short time, owing to the increase in the number of papers on Geography, a separate Geography Section will be constituted in the Congress. Specialists in the subject can help to hasten the time of creation of such a separate Section.

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The All-India Teachers' Federation will hold its next session at Gwalior during the ensuing Christmas holidays. It has been suggested that a section for Geography may be constituted in it, wherein papers concerning the position and teaching of Geography in the educational systems of the various Provinces and States may be read and discussed.

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The Seventh World Conference of the World Federation of Educational Associations will be held at Tokyo from 2nd to 7th August, 1937, for which sectional committees are already being constituted. The Committee for Geography consists of 16 members under the Chairmanship of Dr. Takeo Kato, Professor of Geography in the Imperial University, Tokyo.

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We rejoice to find that railway companies in India are vying with each other, following the example of Western Countries, in the grant of holiday concessions to travellers. It is hoped that teachers, and teachers of Geography especially, will take advantage of them to visit different parts of the country, and thereby enrich their own knowledge and experience for the benefit of their pupils.

Reviews

Europe. By E. M. Sanders. (George Philip & Son, London). 1936.

This is an elementary geography of the Continent of Europe, (excluding the British Isles) for English children of about the Junior School standard. The book is divided into two parts—the first part dealing with the general geography of the Continent as a whole, and the second part with the separate countries. Only central facts of outstanding value have been presented to give the right perspective without burdening the children with unnecessary details. The treatment is descriptive and the language very simple. The volume has been superbly illustrated with typical large-sized pictures, which have been made the basis for a good part of the text, as well as for several of the exercises. Eight simplified coloured maps of Europe make the volume self-contained. Like the other books of Miss Sanders, the book has been made very attractive to children with bold print on glazed paper and fine get-up. In Indian schools, it can be used with great advantage by children of the middle school standard, either as text-book or as supplementary reading book.

Nature Study Reader for fourth year pupils. By Phyllis S. Darling. (Oxford University Press), 1936. Price As. 10.

This is a continuation volume to the author's Nature Study Readers for the second and third year pupils, already reviewed in earlier numbers of the Journal. We appreciate greatly the insistent emphasis on the observational method of study, which forms the basis of the whole series. Most of the chapters in this book, which deal with plant and animal life, may not be directly geography; but, they inculcate habits and methods, which are invaluable in the study of geography. The first four chapters and the last three, however, deal with what is strictly geography in the characteristic method of the author of insisting on observation and doing. The five charts at the end of the book, together with the description of the figures, will be found highly useful. In this age when mugging up is the usual method of study, a book of this sort is a welcome and healthy corrective.

Longmans' Descriptive Geography; Books I & II (Tamil). By L. D. Stamp. (Longmans, Green & Co., Madras), 1936. Price As. 10 and As. 12.

These are the first two books of a series of three books for forms I to III, prepared in accordance with the syllabus recently issued by the Madras Educational Department. The treatment is direct, clear and simple; and only facts of outstanding value have been presented. The volumes are copiously illustrated by a large number of good pictures and several diagrams; and exercises have been given at the end of each section. The print, paper and get-up are attractive.

Life of Man on Earth: Books I, II and III. (Tamil). By T. S. Sundaram Ayyar. (Teachers' Publishing House, Madras). 1936.

This is another series of three books for forms I to III, written in accordance with the same syllabus of the Madras Educational Department. The author, who is an experienced teacher of Geography, has taken trouble to present the subject in an interesting manner; and has illustrated the volumes well with pictures, (some of them coloured) maps and diagrams. The treatment, however, appears to be somewhat unequal, being too full in some places and meagre in others.

Descriptive Geography: Books I and II (Tamil and Telugu). By N. Subrahmanyam. (P. Varadachary & Co., Madras). 1936. Price As. 10 and As. 12.

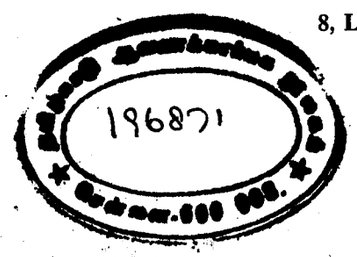
These are the first two books of another middle school series prepared in accordance with same syllabus, written by a specialist on the subject. The instructions and principles, accompanying the syllabus have been closely followed, including the descriptive treatment; and the volumes have been well-illustrated by choice pictures, maps and diagrams. The suggestive exercises given at the end of each chapter not only test the knowledge of the subject-matter but also supplement it in a way. The bold print on glazed paper with the fine get-up make the volumes attractive.

The New Model Pictorial Atlas Geography of the Madras Presidency. By C. S. Subbaratnam. (V. K. Arunachalam, Trichinopoly). 1936. Price As. 8.

This book has been prepared for use in Class V of schools in the Tamil Districts of the Madras Presidency. It has been divided into four parts. Part I deals with certain general features such as winds, rain, sun's position in the sky, etc., together with the practical work connected with them. Parts II and III deal with the Geography of the Presidency—Part II in a general way and Part III regionally. The last part gives a very brief account of the life of man in some important natural regions of the world. The plan is well conceived, and the treatment is clear and interesting, though, we fear, it is above the standard in some places. The book is well illustrated with blocks and diagrams though some of the blocks have not been well printed.

Books and Journals Received

Europe: By E. M. Sanders.
Nature Study Reader for fourth year pupils : By P. S. Darling.
Longmans' Descriptive Geography : Books I & 2 : By L. D. Stamp.
Life of Man on Earth : By T. S. Sundaram Ayyar.
Descriptive Geography : Books 1 & 2 : By N. Subrahmanyam.
Pictorial Atlas Geography of the Madras Presidency : By C. S. Subbaratnam.
The Educational Review : July, August, September and October 1936.
The Scottish Geographical Magazine : July and September 1936.
The Geographical Magazine : August, September and October 1936.
The South Indian Teacher : July, August, September and October 1936.
Akademiya Navk—U. S. S. R. Trudi Instituta Fizicheckoi Geografii : Books 16, 18 and 20.
Problemi Fizicheckoi Geografii : 1936. III.
Journal of Indian History : April and August 1936.
Kalaimagal : August, September and October 1936.
The Geographical Journal : August, September and October 1936.
Foldrajzi Kozlemenyek (Hungary) : 1935, Bk. LXIII, Parts 1 to 8 ; and 1936, Bk. LXIV, Parts 1 to 5.
,, ,, Back Volumes 1926 to 1934.
Educational India : August, September and October 1936.
The Indian Educator : August, September and October 1936.
Mysore Geological Department Records : Volume XXXIV—1935.
Triveni : September 1936.
The Indian Co-operative Review : July 1936.
The Muslim University Journal : April 1936.
The International Observer : Vol. I, No. 1.
Geography : September 1936.
Proceedings and Addresses of the First Indian Cultural Conference : 1936.
Indian Culture : October 1936.
Indian Journal of Economics : July and October 1936.
Geographical Review : October 1936.
Journal of the Manchester Geographical Society : 1935-1936.
Our Home Magazine : October 1936.
The Journal of the Annamalai University : October 1936.



THE
MADRAS GEOGRAPHICAL ASSOCIATION
RULES

1. The name of the Association shall be 'The Madras Geographical Association'.

Objects.

2. The objects of the Association shall be :—
   (*A*) To promote geographical knowledge ;
   (*B*) To secure for geography its proper place in the High School, the University and its constituent and affiliated colleges ;
   (*C*) To help to improve the methods of teaching geography ;
   (*D*) To work for a school of geography being started ;
   (*E*) To promote studies about South India from various standpoints.

3. These objects shall be secured by :—
   (*A*) Holding meetings and conferences, and publishing periodicals and occasional bulletins ;
   (*B*) Organizing geographical exhibitions and excursions ;
   (*C*) Helping in the preparation of geography books in the languages current in the Presidency ;
   (*D*) Forming a central library of geographical literature, and collecting maps, charts, plans, models, slides and instruments ;
   (*E*) Providing for circulation to members, of books, periodicals and other collections ;
   (*F*) And by such other ways as are deemed necessary to effectuate the objects of the Association.

Membership.

4. The membership of the Association shall be open to all those who are interested in the promotion of geographical knowledge or in the teaching of geography.

5. There shall be two classes of members, honorary and ordinary.

6. Honorary members are those who shall be so elected by the council by the majority thereof present at its meeting. They shall be exempt from liability to pay subscription, and shall have all the privileges of ordinary members, except voting.

7. A person shall become an ordinary member upon the proposal by a member, the seconding by another member and approval by the council by the majority thereof present at its meeting. He shall pay an annual subscription of rupees two, payable in one instalment or in *two* equal half-yearly instalments at his option.

8. Those who pay an amount of hundred rupees in two years become LIFE MEMBERS, and they shall be exempt from payment of any further subscriptions.

G. S. PRESS, MADRAS.