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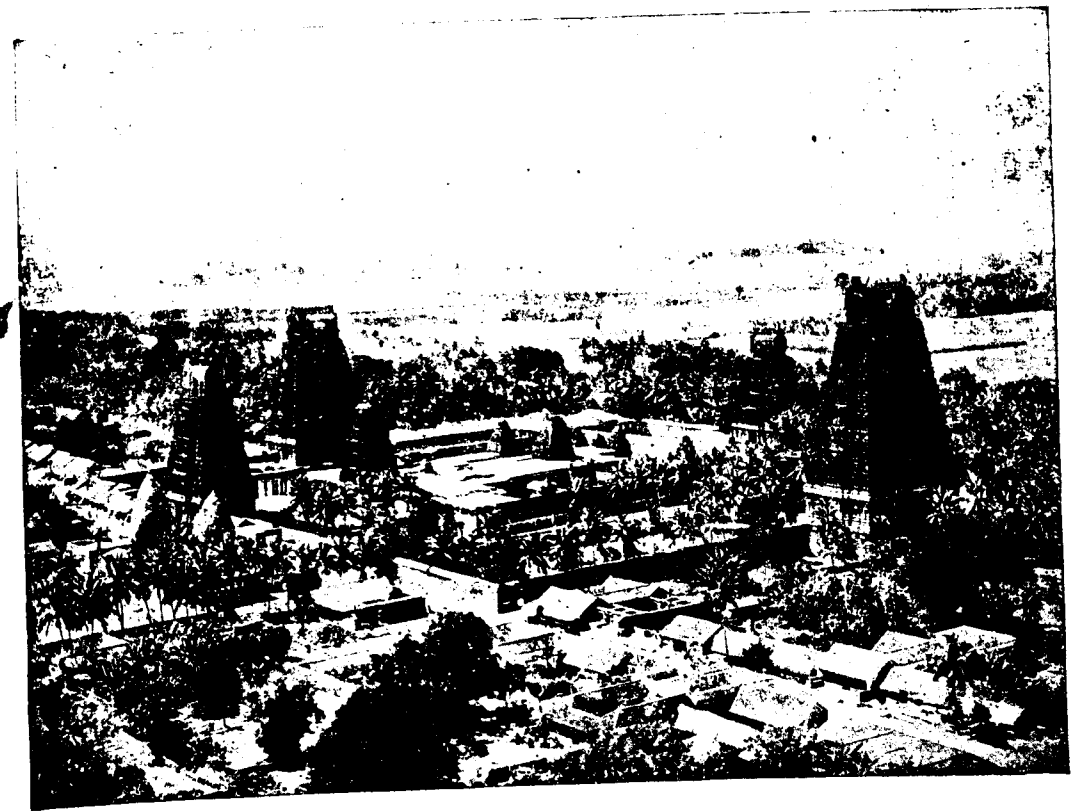
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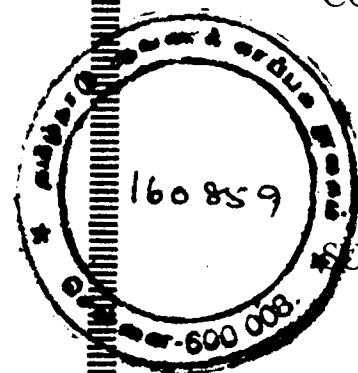
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The Mineral Wealth of India

The total value of minerals produced during 1936 in India (including Burma) was about 26 crores of rupees, an increase of nearly Rs. 10,80,000 over the previous year's figures, according to the Records of the Geological Survey of India, Vol. 72. part 3, recently published.

The average number of persons employed daily during the year in the production of minerals was nearly 3,85,000—an increase of over 13,500 over the figure for the previous year. To have a more correct appreciation of the amount of employment created by the industry account should be taken of the additional employment provided in the transport, smelting and refining industries.

The two principal minerals of India including Burma are coal and petroleum. In the case of petroleum, though the actual amount increased to about 355,000,000 gallons, the highest figure yet recorded for the industry, the value fell down by 0.7 per cent.

The following are the eleven OTHER IMPORTANT MINERALS with outputs valued at over £100,000 annually:—

	46.3% Increase.
Manganese ore	25.6 „ „
Lead & Lead ore	14.2 „ „
Mica	13.2 „ „
Iron ore	6.2 „ „
Zinc	5.9 „ „
Nickel	3.7 „ „
Tungsten	2.3 „ „
Tin	0.7 „ „
Gold	

Silver	32.6 „ Decrease.
Salt	14.9 „ „
Building Materials	7.9 „ „
Copper ore	2.1 „ „

Coal

Coal tops the list as the most important mineral of India. As producer of coal in the British Commonwealth, India comes second to the United Kingdom and ranks ninth in the world. Coal output during the year was a little over 22,500,000 tons, valued at nearly Rs 6½ crores.

The Jharia coal-field accounted for 39.05 per cent., of India's production, the Raniganj coalfield 32.31 per cent., Bokaro 6.27 per cent., Pench Valley 5.57 per cent., Giridih 3.09 per cent., and the other fields less than 3 per cent., each.

The average number of persons daily employed in the coalfields during the year was nearly 182,000.

The development of iron and steel industry in India on modern lines has led to the erection of several plants for the manufacture of hard coke of metallurgical quality.

The true cause of the depression in the Indian coal industry, says the record, is overdevelopment of the coal-fields, with reference to India's requirements. Every new coal-field that is opened at present merely serves to accentuate the depression.

Petroleum

Although petroleum is the second in importance of India's minerals, India produced only 0.64 per

cent. of the world's output, her place on the world's list of oil-producing countries being thirteenth. Of the total production of nearly 335,000,000 gallons about 65,000,000 gallons came from Assam, 4.4 million gallons approximately from the Attock District in the Punjab, and the remainder from Burma. Over 196,000,000 gallons of kerosene and fuel oils were imported.

Gold

There was a small but increased production of gold from Manbhum and trivial outputs from the Punjab and United Provinces. The Burma output as a whole decreased, though there was a slightly increased production in the Northern Shan States. But these figures are quite insignificant compared with the output at Kolar which makes up 99.5 per cent. of the Indian total.

Of the four mines that are producing gold in the Kolar Gold field, the Champion Reef and the Ooregum Mines, the two deepest on the field, reached vertical depths of nearly 8,000 feet below the field datum. This development has opened up a number of shoots of payable ore. Owing to the great depths and the consequent high temperatures, the maintenance of adequate ventilation at the working places is an extremely complex problem, but it has been partly solved by sinking deep, smooth-lined vertical shafts, circular or elliptical, and by an extensive use of large electricity-driven fans in the course of main air currents. Though rockbursts cannot be eliminated altogether in deep mining, the more rigid forms of support, such as packs of masonry and sand or waste rock filling, which are generally used in the mines, have resulted in the reduction of heavier rock-bursts, which were causing considerable damage to person and property in the past.

The average number of persons employed on the Kolar Gold field during the year was nearly 15,000, of whom roughly 14,600 worked underground.

The gold output during the year was 333,385.6 ounces, which, though 2,723 ounces less than the production of 1933, was valued at over Rs. 3,06,00,000, the highest value on record. Over 25,000 ounces of silver valued at Rs. 34,000 were also produced in the Kolar Gold field.

Iron

As in the case of coal, India is the second largest producer of iron-ore in the British Empire, and fourth in the world.

India's output is, however, completely dwarfed by the production in the United States and France, and her reserves of ore are not much less than one-quarter of the estimated total in the United States, and there is every hope that India will eventually take a much more impor-

tant place among the world's producers of iron ore.

The production of iron ore during the year was over 2,500,000 tons, valued at nearly Rs. 40 lakhs. The mines are mainly in Singhbhum, Bihar, and Keonjhar and Mayurbhanj States.

There was an increase in the production of pig iron which stood during the year at over 1,540,000 tons. This increase was accompanied by a substantial rise in the quantity exported, from nearly 473,000 tons in 1935 to nearly 606,000 tons in 1936. Japan is the principal consumer of Indian pig iron; the proportion taken fell from 70.8 per cent. in 1935 to 60.6 per cent., in 1936, though the actual amount rose by 9.9 per cent. There were larger increases in the exports to the United Kingdom and the United States also, but the export to China was halved.

Lead

Lead produced during the year was over 73,000 tons (including 1,240 tons of antimonial lead) valued at nearly Rs. 1,72,00,000 extracted from nearly 469,000 tons of ore, mined at Bawdin and smelted at Namta in the Northern Shan States from which were also extracted nearly 6,000,000 ozs. of silver, valued at nearly Rs. 69 lakhs, 77,000 tons of zinc concentrates valued at over Rs. 40 lakhs, 4,325 tons of nickel-spices (containing also cobalt, copper and silver) valued at nearly Rs. 15 lakhs, and 7,500 tons of copper valued at over 20 lakhs.

Copper

Copper produced from the ore mined at Ghatsila in Bihar during the year amounted to 7,200 tons of which 808 tons were sold as copper and the remainder used in the rolling mill to manufacture yellow metal sheets and circles, the whole of which was sold.

Manganese

Of manganese ore, a little over 813,000 tons were mined, valued at nearly Rs. 1½ crores. The steel works of India used a little over 46,000 tons and nearly 743,000 tons were exported to the United Kingdom, the United States, Japan, France and Belgium. India and Russia are the two principal sources of the world's manganese. Though the value of the output is still less than half of 1927, there was some measure of recovery during 1936. The recovery is due mainly to increases in production in the Balaghat, Nagpur and Bhandara Districts of the Central Provinces and the resumption of work in Panch Mahals.

The inter-dependence of manganese & iron

The continued fall in the price of manganese from 1924 to 1933, it is said, is to be correlated with the fact that from 1924 to 1927 the rate of increase of the world's production of manganese ore was much

greater than the rate of increase in the world's production of pig iron and steel. The world's available supplies of manganese ore are now therefore much in excess of normal requirements. Russia is able to place large quantities of ore on the market at a price with which many Indian producers can hardly compete. The Indian trade has accordingly suffered disastrously. The Gold Coast has also become a serious competitor of recent years. The large deposits of high-grade manganese ore discovered in South Africa are also being developed and it may be anticipated that eventually South Africa will secure a substantial portion of the world's market. Substantial supplies are also coming from Cuba, Brazil, Japan and Czecho-slovakia.

The opening of the new port of Vizagapatam has been of great benefit to the Indian manganese industry during the last four years, on account of easy access afforded by it from the Central Provinces to the sea.

Mica

Mica produced during the year was nearly 87,000 cwts., valued at nearly Rs. 32½ lakhs, but the production figures are incomplete, and the export figures of nearly 178,000 cwts., valued at nearly Rs. 92 lakhs give a better idea of the size of the industry. India is overwhelmingly the world's chief producer of high grade mica, an indispensable accessory in electrical manufactures. Most of the mica is exported to the United States and the United Kingdom which absorbed during the year 51.8 per cent., and 24.2 per cent, respectively.

Ilmenite

Ilmenite is another mineral in which India is the world's chief producer. It occurs with monazite and zircon in beach sands in Travancore State, and over

140,000 tons, valued at nearly £ 62,500 were produced. The output has doubled in two years. The metal is in demand for the manufacture of titanium paints.

Tin

Tin and wolfram (the ore of tungsten) occur together to a large extent in Burma and in both these minerals the production during the year was the largest on record.

Limestone

Amongst the minerals for which accurate statistics are not available, limestone and Kankar of which nearly 3½ million tons were quarried, would rank next to coal in importance, if weight of material won were the criterion. There has been an increased output of limestone in recent years which is due partly to its use as a flux in the iron and steel industry, and in the manufacture of cement.

Gems

In gem stones the production of diamonds, mostly from Panna State, rose slightly to 1,457 carats, valued at Rs 62,171. In Mogok, Burma, 155,381 carats of rubies valued at Rs. 97,103 (£ 7301) and 172 carats of sapphires valued at Rs. 242 (£ 18) were reported to have been mined. One thousand six hundred and seventy-one cwts. of jadeite and 32.4 cwts. of amber were reported to have been produced in Upper Burma. Ninety-eight tons of beryl were produced in Ajmer and 5 tons of garnet in Travancore. These are, however, not used as gem stone; the former is used as an ore of beryllium and the latter as an abrasive.

Other minerals of which India produces varying quantities on a commercial scale are antimony, chromite, magnesite, salt, saltpetre, soda, asbestos, barytes, bauxite and felspar, fuller's earth, graphite, gypsum, kyanite, ocher and steatite.



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Exports of Metals and Ores in 1936-37

Manganese Ore

In connection with the article on The Mineral Wealth of India, the following statistics of exports of metals and ores in 1936-1937 taken from The Review of the Trade of India in 1936-37 will be found very informative. The total exports of ores amounted to 748,000 tons in 1936-37, or 45,000 tons less than in the preceding year. Manganese ore represented 91 per cent of this total, exports of which declined from 729,000 tons in 1935-36 to 677,000 tons in the year under review. As in the preceding year, the United Kingdom was the best customer. As a result of the increased activity in her steel industry, she increased her requirements from 197,000 tons to 216,000 tons. Shipments to Belgium also advanced from 72,000 tons to 98,000 tons. On the other hand, Japan reduced her takings from 174,000 to 128,000 tons, France from 106,000 tons to 87,000 tons and Germany from 17,000 tons to 15,000 tons. The export trade was confined to Bengal, Bombay and Madras, which accounted for 36 per cent, 16 per cent and 48 per cent of the total in 1936-37 as compared with 32 per cent, 9 per cent and 59 per cent, respectively, in the preceding year. There were no exports of ferro-manganese, and those of ferruginous manganese ore were insignificantly small in the year under review.

Wolfram Ore

Exports of wolfram ore advanced from 7,800 tons to 9,000 tons of which the United Kingdom took 7,000 tons, or about 100 tons, more than in 1935-36. Smaller quantities were also exported to Germany and Belgium. As usual, the shipments were entirely from Burma.

Chromite

Exports of chromite declined from 26,000 tons to 23,000 tons. Norway and the United Kingdom increased their purchases from 4,400 tons and 750 tons to 5,200 tons and 1,800 tons, respectively in the year under review. Sweden required much smaller quantity viz., 300 tons as against 5,100 tons in 1935-36. Exports to the United States of America also fell from 4,800 tons to 3,100 tons. Canada, which had obtained 4,000 tons in 1935-36, required nothing in the year under review.

Tin Ore

Exports of tin ore, entirely to the Straits Settlements, declined by 1,200 tons to 3,000 tons in quantity and by R 29 lakhs to R 52 lakhs in value.

Pig Lead

Shipments of pig lead advanced from 1,309,000 cwts. valued at R 1,78 lakhs in 1935-36 to 1,410,000 cwts. valued at R 235 lakhs in the year under review. Exports to the United Kingdom increased from 827,000 cwts. to 1,019,000 cwts. Apart from the growth in the internal consumption of the United Kingdom, due particularly to re-armament and also to activity in building and electrical industries, there were larger re-exports from that country, especially to France and Italy, which were largely dependent on the London market in the absence of supplies from Spanish sources. Direct shipments to Germany, Belgium and other continental countries were insignificant in 1936-37, their aggregate purchases in 1935-36, being 38,000 cwts. Japan reduced her requirements from 393,000 cwts. to 313,000 cwts. while Ceylon increased her takings from 25,000 cwts. to 29,000 cwts.

Pig Iron

Since 1934-35, exports of pig iron continued to advance, and in the year under review totalled 574,000 tons valued at R 1,29 lakhs as compared with 538,000 tons valued at R 1,24 lakhs in 1935-36 and 417,000 tons valued at R 93 lakhs in 1934-35. There was a marked expansion in the exports to the United Kingdom which amounted to 182,000 tons as against 66,000 tons in 1935-36 and 98,000 tons in 1934-35. Japan, the principal customer of Indian pig iron, reduced her takings from 397,000 tons to 306,000 tons but the United States of America required 56,000 tons or about 4,000 tons more than in the preceding year. Exports to China declined from 8,700 tons to 8,100 tons.

Spelter

The main improvement in the exports of zinc or spelter noticed in 1935-36 was fully maintained in the year under review, the exports amounting to 1.7 million cwts. or 50,000 cwts. more than in the preceding year. The value of these exports showed an increase of R 4 lakhs to R 39 lakhs. Belgium, as usual, took the largest quantity viz., 1.2 million cwts. as against 1.4 million cwts. in 1935-36. Shipments to Japan advanced from 239,000 cwts. to 437,000 cwts.

Scrap Steel

Export of scrap iron or steel for remanufacture during the year under review were valued at R 29 lakhs as compared with R 13½ lakhs in 1935-36 and 14½ lakhs in 1934-35. Japan is the principal market.

Indian Rubber Production and Exports

The milky juice of plants is called latex (pronounced: "lay-tex"; plural; "latices"). The latices of some plants yield rubber. The name "rubber" was given to the stuff by the English Chemist, Priestley, in 1770, on account of its property of rubbing off pencil marks. Historically, the first known specimen of rubber was the Assam; Rambong, or East Indian Rubber, a product of *Ficus elastica* (rubber plant) which is a cousin of our own banyan tree, and which, like the latter, is supported by prop-roots. Hence the name *India Rubber*.

Rubber-yielding latices are numerous, but commercial rubber is drawn from a few plants only. These are chiefly tropical trees or vines which afford it in quantity, relatively free from deleterious mixture with resins and other undesirable substances. Till recently rubber was a product of the natural forest, but modern production centres on species which can be grown and continually cropped on large plantations located in the tropics, where abundant supplies of cheap and fairly efficient labour are available. Only the plantation, in fact, has made, the modern rubber-using industries possible.

Among other latex products of some technical importance are *balata*, *chicle*, *gutta percha*, and *jelutong*. Of these, only gutta-percha is cultivated the others are tapped from forests.

Gutta-percha

This is obtained from the large evergreen tree *Palaequium* (*Isonandra*) *Gutta* and related species occurring in Malaya. The destructive exploitation of forest trees has been nearly replaced by a plantation system. *Taban merah*, the most valuable variety, is grown from seed as a bushy shrub. The leaves are harvested and crushed while still fresh. The pulp thus obtained is treated with boiling water, which washes out the dirt and cellular debris. The resulting gum, amounting to 1.5 to 1.8 per cent of the fresh leaves, is pressed into blocks. Singapore is the centre of the gutta-percha trade.

Balata

This is a similar though usually inferior gum from *Mimusops Balata*. The trees are tapped by slashing with a cutlass in feather-stitch fashion to a considerable height. In British Guiana, the principal source, collection is stringently regulated by the Government.

Gutta-percha resembles rubber closely and is a leathery solid. It is very resistant to water and so it is often preserved under it to prevent its becoming brittle by atmospheric oxidation. Its principal use is in insulation for submarine telegraph cables. About 180

pounds of gutta-percha are used per nautical mile of cable; the total weight in use on the world's cable systems is estimated at about 26,000 tons. It is also used in other electrical connexions, surgical instruments, golf balls, and in dentistry as temporary fillings for teeth and for taking impressions.

Balata, though similar, is considered inferior for many purposes. But it is available in abundance, unlike gutta-percha, which is somewhat scarce. It is largely employed in beltings. For submarine telephone cables, balata is preferred to gutta-percha because of certain electrical properties which adapt it to the insulation of the currents of greatly varying frequency needed to transmit the human voice.

Chewing Gum

This is made from chicle which is derived from the latex of *Achras Sapota*. Chicle collection centres in Yucatan which is heavily forested with these trees. These trees are tall, and require 70 years to reach tapping size. The average yield of a tree is about 2½ pounds, and six or more years should elapse between tappings. America imports about 9 million pounds of chicle annually, costing nearly 13 million rupees.

Jelutong

This is derived from some species of *Dyera*, and has the closest resemblance to rubber. It is therefore used as a rubber substitute when the price of the latter is high. Recently attempts have been made to refine from it a chicle substitute for use in chewing gum.

But 95 per cent of the huge output of modern rubber is from *Hevea brasiliensis*, popularly known as the Brazilian Rubber Tree or Para Rubber Tree. This tree attains a height of 60 to 120 feet, a circumference of 8 to 10 feet, and an age of perhaps 200 years.

There was a considerable number of rubber-yielding plants in Africa, but the European colonists were so intent on "getting rich quick" that they almost exterminated the trees by their ruthless methods of collection.

Congo Atrocities

But far worse than the waste of the forests was the white savagery of Congo-rubber production. The territory known as the Congo Free State was neither free nor a state. It was a huge slave pen, and virtually the private property of Leopold II, the then "King of the Belgians." The story of the Belgian rule of Congo has been narrated in detail by the late E. D. Morel. Villages were "taxed" huge quantities of ivory and rubber; Negroes failing to

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supply their quotas were the victims of all kinds of sadistic attacks. Women and children were held as hostages against rubber supplies. The hands of literally thousands of natives were cut off for failing to supply what they could not get. As if European punishment was not enough, Cannibals were made policemen and encouraged to have a hearty 'go' at the natives.

It may be remembered *en passant*, that Great Britain (and therefore India also), took part in the Great War solely to protect defenceless Belgium, when the latter was overrun by German troops.

History of Plantation Rubber in India

Seeds of the Brazilian rubber tree were first obtained by an Englishman, Wickham. These were planted in Kew Gardens in 1876 and out of some 70,000 seeds only 3,000 germinated. Some of these seedlings, planted at Peradiniya, Ceylon, have now grown to considerable size. Others were later transplanted at Singapore. From such small beginnings has developed a plantation industry which now covers about 8 million acres of former tropical jungle, producing an annual crop of about 850,000 tons.

The boom in rubber was the direct consequence of the vulcanizing process, invented by an American, Goodyear, in the year 1839. The familiar Mackintosh (Water-proof cloth) is the name of the English inventor, who, in 1823, dissolved rubber in naphtha and water-proofed rain-coats with varnish thus obtained.

The Total World Production of Rubber

As mentioned before, this is about 850,000 tons per annum shared as follows:

British Malaya	450,000 tons.
Dutch East Indies	300,000 "
Ceylon	50,000 "
India and Burma	20,000 "

the balance of 30,000 tons being accounted for by French Indo-China, British Borneo, Siam, Congo and Brazil.

The Indian Acreage and Yield is made up as under.

	1934	1935
Total Acreage	225,900	228,800
Total yield (lbs)	37,156,300	48,545,000

Percentage share of Indian acreage and yield:

	1934	1935
	Acre	Yield
Burma	47	28.7
Coorg	0.8	0.2
Madras	5.7	3.02
Cochin	4.2	4.9
Travancore	42.4	62.9

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Since Burma has now separated, Travancore accounts for more than 80 p. c. of Indian production.

During 1936—37 India exported a little less than 30 million pounds of rubber costing more than a crore of rupees, the chief buyers being the Straits Settlements (35 p.c.), United Kingdom (26 p.c.), Ceylon (15½ p.c.), U.S.A. (9 p.c.) and Czechoslovakia (5 p.c.)

The Chief exporters of finished rubber goods to India

Are England (80 p.c.), Germany (8 p.c.) and U.S.A. (5) p.c.—Share of each class of Rubber articles imported during 1936-37:—

Motor tyres and Tubes	67 p. c.
Cycle tyres and tubes	16 p. c.
Miscellaneous	12 p. c.
Rubber in insulated wires etc.	5 p. c.

The following figures of Indian imports for 1936-37 are more detailed:—

Motor Tyres	Rs. 1,32,14,82
Cycle Tyres	" 23,17,834
Motor Tubes	" 14,06,451
Cycle Tubes	" 11,52,922
Value of rubber used in insulated electric wires & cables (1/3 of total value) approximately	" 10,65,894
Cushion Tyres	" 2,19,828
Motor cycle tyres	" 37,456
tubes	" 11,946
Other products (except apparel boots and shoes)	" 27,70,141

TOTAL INDIAN IMPORTS OF FINISHED RUBBER Rs. 2,21,97,362 (about 2¼ crores of rupees). India has of late begun the manufacture of rubber goods and almost everything is produced, except motor tyres. A beginning has been made in this item, also, in Travancore.

Rubber shoes are mostly manufactured in Calcutta, and sold at from about 5 annas a pair. Little wonder that foreign rubber footwear have been "given the boot."

India's self sufficiency

Unlike many other countries India need never be afraid of a shortage of rubber during critical periods. Whether it be synthetic, artificial or natural rubber, we possess all the necessary raw products, and supplies of the material can be made very elastic. Thus, for instance, the manufacture of synthetic rubber in Germany is based on 'acetylene' which is the illuminating gas of "carbide lamps." Now the raw materials necessary for the manufacture of acetylene are coal, limestone, salt and water, every one of which we have in plenty.

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Erythrene, divinyl, isoprene etc. are a few of the bases from which synthetic rubber is produced. But all these chemicals are derived from simple starch

which can be extracted from maize potato, arrow root and a host of other starch producers.

Share of the principal recipients of Rubber raw exported from India in 1913-14 and 1935-36.

Destinations	1913—14		1935—36	
	Quantity	Value	Quantity	Value
	lbs.	£.	lbs.	£.
United Kingdom	1718752	336113	10892489	240870
Ceylon	784112	171664	5428570	131732
Straits Settlements	75264	11891	7716851	147394
Holland	22400	4169		
United States of America	3696	519	212230	4527
Germany	1232	120	1937086	38432
Total (including other countries)				

In 1935-36 the United Kingdom took 35 per cent of the total, Ceylon 18 per cent, the Straits Settlements 25 per cent, Germany 6 per cent and United States of America 1 per cent.

Indian Lac

The lac insect (scientific name: *laccifer lacca*) is a sort of bug with no hum on top of it, for it means business and delivers the goods with great derring-do and no ca' canny. It settles on the tender branches of certain trees, mostly in the Provinces of Bihar and the Central Provinces, and produces a covering of a gumlike substance all over its body. It is this gum that constitutes the crude lac. The life-cycle of the insect is completed in 3 to 8 months according to the season and climate, when the branches are cut down and the lac is scraped off. Recently the Forest Department of the Government of Madras has extended the cultivation of lac in Salem and Madura.

Purification

The washed lac is melted in a cloth bag and the impurities are filtered off by squeezing the bag when the molten pure lac oozes out and is stretched into thin sheets called shellac. Both the washed lac and the hot-filtered pure lac are exported to foreign countries. Only about 2-3% of the total production of lac in India is consumed in the industries of this country, the rest is exported mostly to America, Germany, England and Japan.

Lac Trade

The following table shows the quantity and the

value of lac exported to foreign countries during the last ten years, in round figures:—

Year.	Tons.	Rupees
1927	25,900	6,67,00,000
1928	34,400	8,07,00,000
1929	34,800	7,75,00,000
1930	29,000	4,01,00,000
1931	24,100	1,95,00,000
1932	21,900	1,40,00,000
1933	28,200	1,60,00,000
1934	36,200	3,80,00,000
1935	23,600	1,81,00,000
1936	34,100	1,95,00,000

It would be evident from the above table that although the quantities exported have fluctuated between reasonable limits, the value has been steadily shrinking to about a quarter of that in 1928-29. Although India is the only country that produces lac (Indo-China and Siam are the only other countries that produce a small proportion) it is difficult to explain this serious decline in price. Competent observers have adduced various reasons, the chief among which are, threats of substituting synthetic resins by foreign consumers, lack of organisation among producers, over-valuation of the rupee, worldwide disturbance of the relation of prices between manufactured goods

and raw materials and the general industrial depression. The remedy lies in organising the producers, standardisation of quality, controlled marketing, propaganda for larger consumption in the West, and, most important of all, increasing the uses of lac in India and thus decreasing the dependence of India on foreign consumers. Chemical research may also help in finding out new modifications of lac with wider uses. The Indian Lac Cess Committee, consisting of an advisory board of eminent scientists and a governing body of large cultivators, manufacturers, brokers and shippers are running research centres at Ranchi, London, and New York for improving the cultivation, manufacture, utilisation and marketing of lac.

The chief uses of lac in India are : varnish or French polish used by carpenters for polishing wooden furniture, coloured toys made in Chennapatna and a number of places throughout India, filling hollow silver or gold bangles and jewellery, bangle making and sealing wax. Gramophone record manufactures in Calcutta use lac for the record material. Certain Ayurvedic preparations contain crude lac in a powder form or extracts of it in medicated oils. All these are of extremely minor importance considering the large quantities exported.

In foreign countries the most important outlet for lac is in the manufacture of gramophone records. Every year about 10,000 tons of shellac

are used at the rate of about 2oz. of shellac for each record. Felt hat dressings, top-hat stiffening, straw-hat finishing etc. are made of shellac solutions. Nitro-cellulose lacquers are plasticised and improved by an admixture of shellac. Paper and mica insulator boards, tubes and rings are manufactured by banding several laminae of these through shellac solutions. Leather dressings, glossy finish on playing cards, furniture polishes, sealing waxes, adhesive cements and waxes, water-proof coating for shell, fireworks etc., printing inks, insulating varnishes and cements and a large number of other applications, each takes small quantities of shellac. For moulded insulations shellac has been replaced by synthetic resins like Bakelite.

The future of shellac is very bright at present due to its comparative cheapness but even at higher price levels it will be difficult either to synthesise shellac or replace it by synthetics as long as sustained researches are carried out for modifying and improving it and finding new uses for it, in three continents, and with the progressive industrialisation of India the home market is likely to expand. Of particular interest is the possibility of moulding articles like bottlecaps, small containers, handles etc. out of shellac compositions, at least for the Indian market. Any further information on subject of lac and lac research could be had of the Director, Indian Lac Research Institute, Namkum, Ranchi, Bihar.

Distribution of exports of Lac in the Years 1913-14 and 1935-36

Country.	1913-14			1935-36		
	Manufactured.	Unmanufactured.	Total.	Manufactured.	Unmanufactured.	Total.
	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
United States of America	142 663	10 706	153 429	92 222	80 223	172 445
United Kingdom	91 160	6 404	97 564	65 746	16 169	79 915
Germany	52 298	466	52 764	45 041	9 557	54 599
France	12 202	81	12 283	10 925	1 624	12 549
Japan	4 246	37	4 283	54 101	..	54 101
Other Countries	18 299	539	18 838	89 443	25 530	113 972

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The Incandescent Mantle Industry.

India now Exports such Mantles to Africa and Australia

In the year 1891, the German Chemist Dr. Carl Auer von Welsbach made the important discovery that Thorium Oxide containing about 1% of pure Cerium Oxide emitted a brilliant light when introduced in the flame. Since then all possible combinations have been experimented with, but none have proved so successful as the Thoria-Ceria mixture of Welsbach.

The ordinary soft silk mantle now in use everywhere for petrol and kerosene lanterns consists of a knitted fabric of artificial silk which has been impregnated with a solution of Thorium and Cerium Nitrates in the right proportions. When the mantle is burned on the lamp, the silk burns off, leaving a residue of the Oxides of Thorium and Cerium which glow brightly and emit a brilliant light in the flame of the lamp.

The ash skeleton left on burning is very fragile indeed, and the attempts of the manufacturers have been directed to make it coherent and elastic so that it is able to withstand shocks and vibrations during use. This coherence primarily depends on two factors, viz., the purity of the chemicals used and also on the method employed in fixing the chemical on the fibre. These points will be referred to again in the latter sections.

Raw Materials,

The mineral, Monazite sand, which occurs in yellow grains along the sea-coast in the State of Travancore, is used commercially for the manufacture of Thorium and Cerium Nitrates. The monazite is freed from the other minerals associated with it, viz., Ilmenite and Zircon, by means of an electromagnetic process. It is then exported to Europe and America for the extraction of Thorium.

As mentioned above, the Thorium Nitrate required for Gas-Mantle manufacture should be extremely pure. Monazite contains only about 8-9% of Thorium and has thus to be separated effectively from the other metal associated with it. The actual process of manufacture is a closely-guarded secret and the output of Thorium is controlled by a Syndicate.

Mantle Manufacture in India

Since several lakhs rupees worth of mantles are being imported into India from Europe, attempts have been made for the last ten years to manufacture them in India itself. The process of making mantles being fairly simple and EASILY ADAPTED AS A COTTAGE INDUSTRY, several firms in Calcutta and Bombay have started manufacture. The machines used for knitting the so-called "Hill" type of hose are of German origin and this is in fact the only large item of expenditure in this industry. It has been found possible to import the Thorium Nitrate used for the mantles, from countries like America. The price of this chemical, which was as high as Rs. 20 per lb. a few years ago, has now been reduced to less than half this figure due to various causes.

Recent Development,

As the result of the work of a group of young chemists encouraged by the eminent Indian scientist, Sir C. V. Raman, a factory was started in Bangalore in 1933, to manufacture mantles and the chemicals required therefor. The superiority of the Bangalore mantles over all the other types consists in the special property imparted to it by the method of manufacture of the ash skeleton being elastic after burning. This property imparts a longer life to the mantle and this fact, taken together with the extraordinary brilliancy of the light emitted, has won the appreciation of all others. It is noteworthy to mention that these mantles have found a good export market, and regular orders are being received from such distant countries as Africa and Australia.

Manufacture of Thorium Nitrate

The factory at Bangalore occupies a prominent position in this field inasmuch as the chemicals, Thorium Nitrate and Cerium Nitrate of high purity required for mantle manufacture, have been produced on a large scale for the first time in India. This makes the factory quite self-sufficient for its requirements, and being also equipped with knitting machinery for producing the artificial silk fabric, has no need to import any costly raw materials from abroad. It may truly be called "Swadeshi" in every sense.



New Indian Products

New Jute Fibres

There is a very bright future before the Indian jute industry once science gets to work on a fibre which is known to be capable of all kinds of treatment.

This is the view of Dr. S. G. Barker, scientific adviser to the Indian Jute Mills Association, given by him in a recent address on "Scientific Research in Indian Jute Manufacture." He considers the real development in the processing of jute will take place in India because it is there that atmospheric conditions are most favourable. Dr. Barker explained that the mills were experimenting with methods of high-speed spinning, but in all these matters it was necessary to remember the physical limitations of the fibres being processed, and the atmospheric conditions under which they had to be worked.

The definition of the limit to which they could go in speeding up production was dependent upon fibre factor as much as anything else, and the definition of its limitations would be useful knowledge. Performance in Britain was no criterion of successful reproduction under Indian conditions.

Among the future uses of jute Dr. Barker suggested:

Waterproofed jute which will stand up to all the rigours of ordinary weather.

Jute sandbags which over long periods of storage will withstand the effects of rot and mildew.

Jute, as the centre of three-ply with hessian, which makes it flexible, strong and almost unbreakable.

Speaking of the research work on jute in India, Dr. Barker said:

"The question of the suppression of moulds, mildew and fungi on textiles has presented a problem.

In our researches we came to the conclusion that these characteristics could be attained by the use of metallic salts of organic acids of high molecular weight.

"Great success has attended the experiments, and after exposures under rigorous conditions in India, conducted officially for over twelve months, there has been no sign of rotting.

"We have purposely omitted discussion of softening and mercerising of jute, but we are fully alive to world progress in this direction. Blending with cotton and wool is an old scheme, and one which may yet find favour on the domestic market in India.

"Finally, the wisdom of the Indian Jute Mills' Association must be noted in making their research organisation a department of their association's activities, so that it becomes their own domestic affairs controlled and financed by practical men. Thus the application of science to the Indian jute-manufacturing industry becomes an integral part of the industry itself."

The chairman said that this great industry had hitherto done no scientific research. They had been content to take the cash and not worry about the future, and it had been a disaster in many ways.

But with a scientific research department they might have to recover from it. They must first learn all about the fibre before they had the knowledge of how to treat it.

They could not hurry a scientist, and if they had patience he believed they could start a new era for the jute industry.

New Beverage From Tea

A new beverage known as "Toc" was mentioned in the course of questions in the Central Assembly. Replying to Mr. B. N. Chaudhry, Mr. H. Dow, Commerce Secretary, stated that a net amount of 24,796 dollars had been spent by the Indian Tea Market Expansion Board from April 1934, upto date in experiments on this beverage. Mr. Dow added that it was understood from the Indian Tea Market Expansion Board that the beverage was like tea, tasted like tea,

had qualities like tea and that it was an aerated, bottled infusion of tea, prepared according to a secret formula.

Replying to a further question, Mr. Dow said the Government understood that the experiments had been successful to a point, showing that such a beverage could be prepared. It now remained for private enterprise to test the possibilities of its success on a commercial basis.

India's Industrial Development

India as Manufacturer of strychnine

A sharp fall in the price of strychnine may be regarded as a straw that indicates a new realisation by India of her opportunities.

This drug, commercially inconspicuous and commonly associated with the apparently contradictory purposes of toning up the human nervous system and the destruction of vermin, now is being made in India, where the raw material, nux vomica, is largely grown.

This venture into the making of strychnine is only one sign of India's ambition to develop industrially and to complete finished articles rather than be content with the export of raw materials.

—Birmingham Post

India Will Make her Own Munitions

A big munitions factory is to be erected at Jubbulpore, Central Provinces, to make India independent of imported shells and small arms. A site in the centre of India has been chosen on the ground of low vulnerability and convenience of distribution.

Recent investigations into India's lack of adequate coast defences in war time will result shortly in a comprehensive scheme of armaments at strategic points and a considerable expansion of the Royal Indian Navy.

—Daily Telegraph

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Orchis incarnata, saleb panja, hastanjuli

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 Calcutta Model Works, 6, Sibola Lane, P. O., Putally, Calcutta.
 Cawnpore Chemical Works, Anwar Gunj, Cawnpore.
 Indo Chemical & Pharmaceutical Works, Cawnpore.
 Chloragen Co., Pohumal bldg., Karnat Road, Mandvi, Bombay.
 Eastern Chemical Works, 25 Rani Branch Road, Calcutta.
 Health Protection Society, 80 Garpar Road, Calcutta.
 Indo Chemical Works, 6, Oliver Road, Lucknow.
 Metual & Co., Bareilly.
 Phoenix Drug House, 16 Bonfields Lane, Calcutta.
 Sar-desai Bros., Bilimora, Surat.
 Turner & Co., 4 Rose Cottage Lane, Mazagaon, Bombay.
 John Paterson & Co., (India) Ltd., Calcutta.
 Modern Chemical Works, Daryagunj, Delhi.
 Bhubaneswar Chemical Works, 10, Pran Nath Pandit Street, Calcutta.
 Calcutta Paint Colour & Varnish Works, 15, Clive Row, Calcutta.

Government Crocketing Plant, Shimoga, Mysore.
 Cooper & Co., 182, Rippon Road, Bombay, 8.
 Ewing & Co., P. O. Box No. 78, Calcutta.
 Indian Medical Laboratory Ltd., 49 Budur Bagan, Street, Calcutta.
 Ivan Jones Ltd., 8, Dalhousie Sq., Calcutta.
 Modern Antiseptic Co., 22, Collootola Street, Calcutta.
 Proprietary Industries Co., 45 Rhear Lane, Calcutta.
 Shibshanker & Co., 151 Harrison Road, Calcutta.
 Jain Ink Depot, (Poison Killing), 23 Beet, Bangalore.
 Peer Mohammed N., P. O. Box No. 3145, Bombay, 3.
 Bengal Immunity Co., Ltd., 153, Dharamtolla Street, Calcutta.
 Calcutta Insecticide Co., 127, Lower Circular Road, Calcutta.
 Indian Leather Factory, Tapri, Saharanpur.
 Chatterjee B. N. & Co., 26, 28th Street, Rangoon.
 Dr. Rose's Laboratory, 45 Amherst Street, Calcutta.
 Friends Chemical Works, Anwar Gunj, Cawnpore.
 Jallo Subsidiary Industries Co., The Mall, Lahore.
 Paul B. K. & Co., 1-3 Bonfields Lane, Calcutta.
 Rallia K. B. & Sons, 2nd, Sutar Lane, Madho Bagh, Bombay.
 Standard Chemical & Pharmaceutical Co., 26 Parel Road, Bombay.
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[Continued on next page]

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 Denham & Co., Nellore Dist., Dargampet, S. India.
 Jetmull Bhojraj, H. O. Darjeeling.

John Podger & Co., Ltd., Chatterbar, Kodarma Dist., Hazaribagh.
 Brindaban Industrial Syndicate Ltd., Mica Mine, Kodarama, Dist. Hazaribagh.
 Nagpur Mica Syndicate, Kodarma, Dist. Hazaribagh.
 Chowdhury N. C. Mica Mines, Jhumri Telaiya, Via Kodarma, Dist., Hazaribagh.
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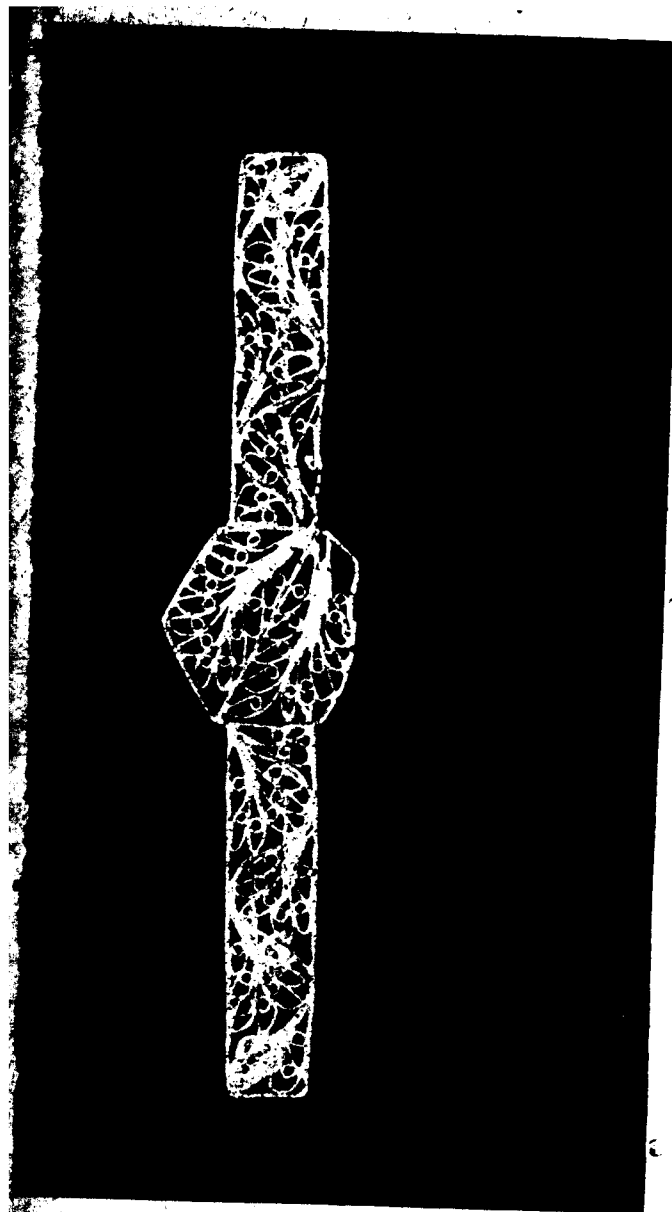
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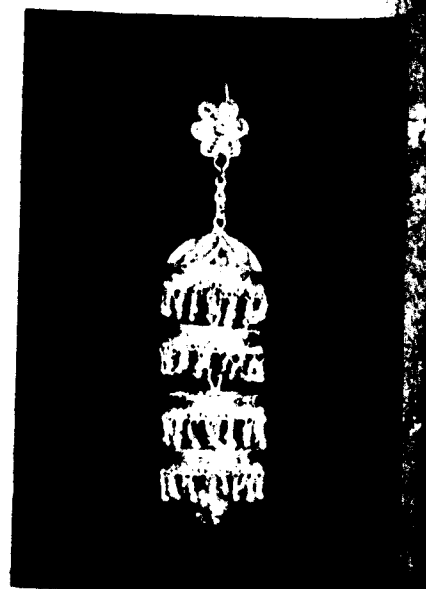


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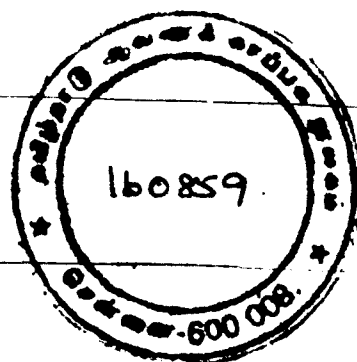
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May 1938

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