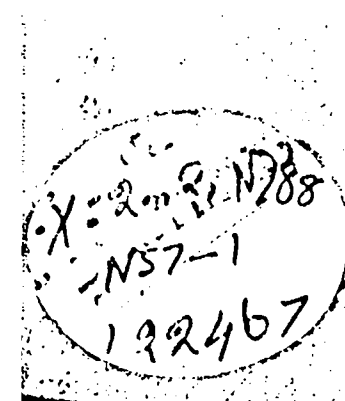




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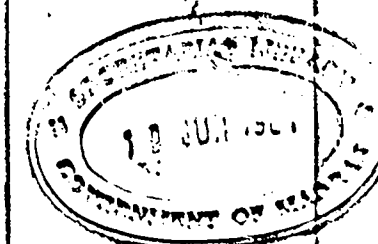
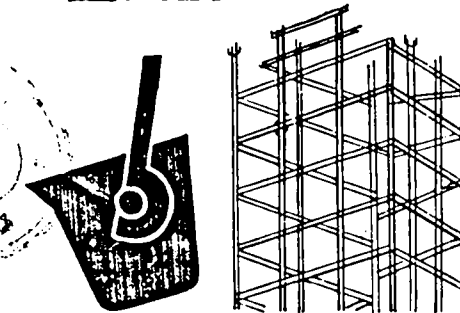
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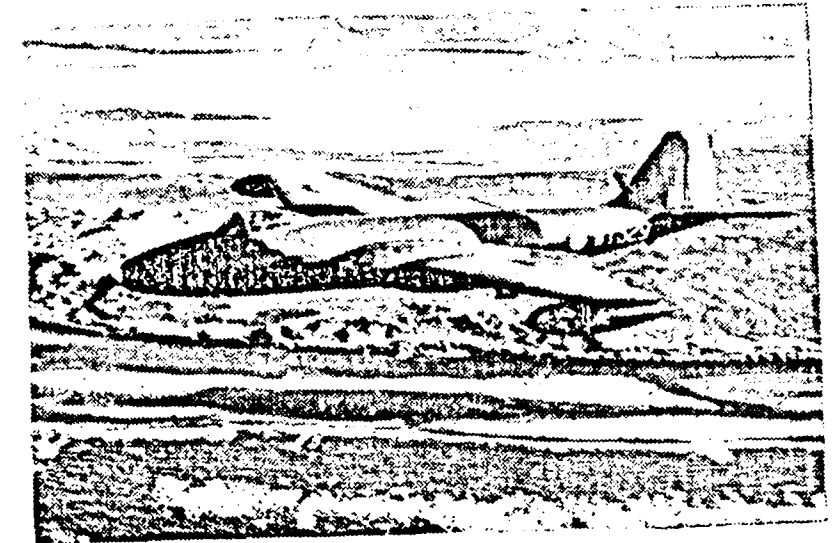
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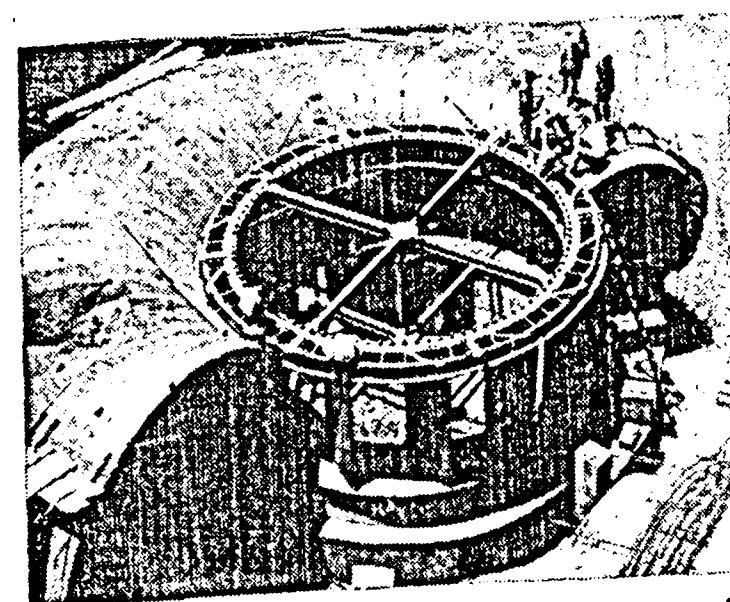
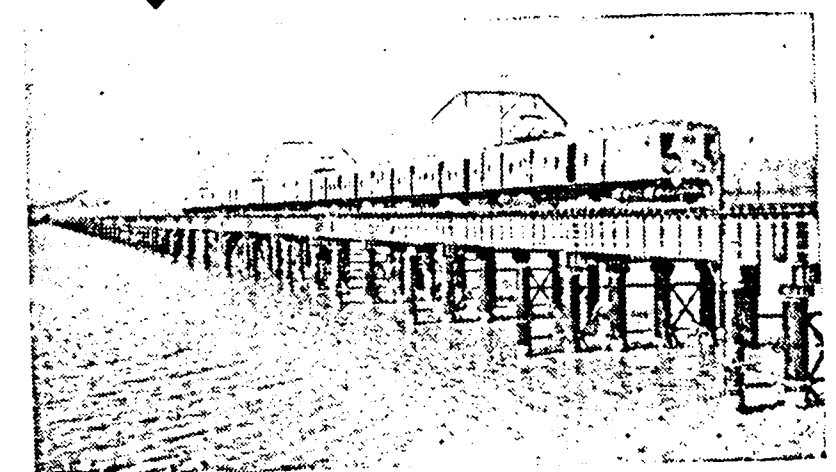
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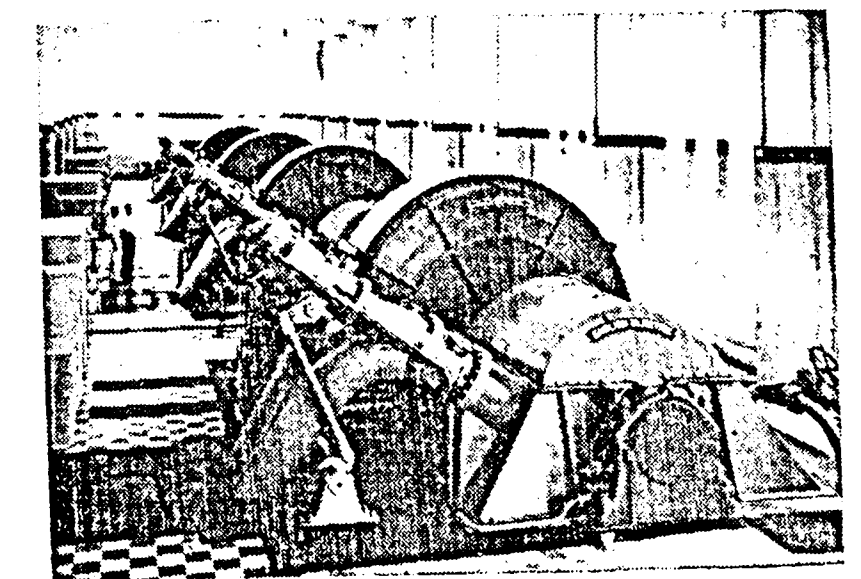


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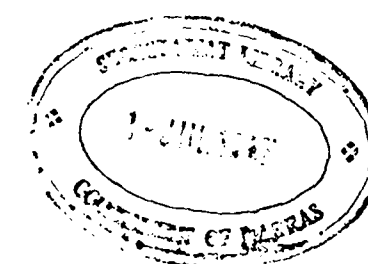
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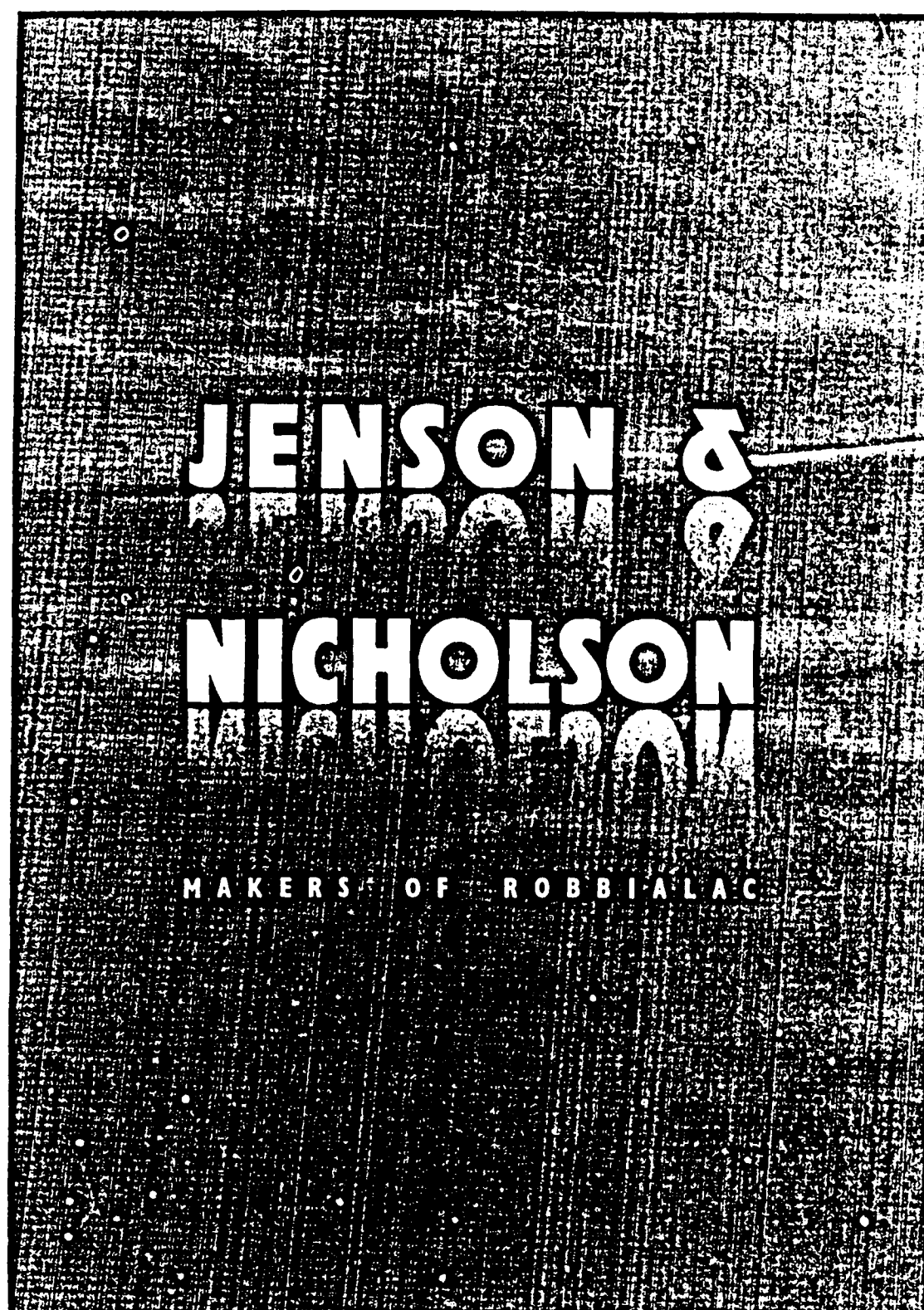
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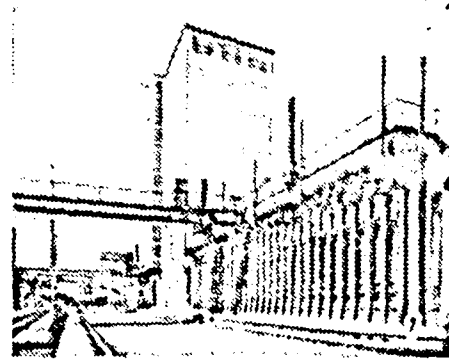
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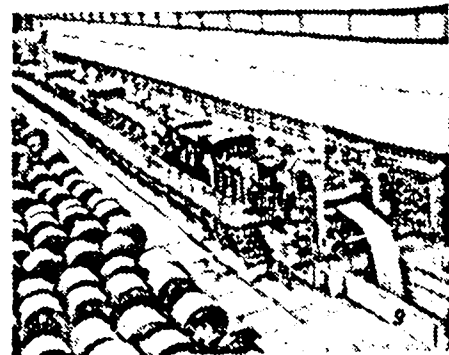
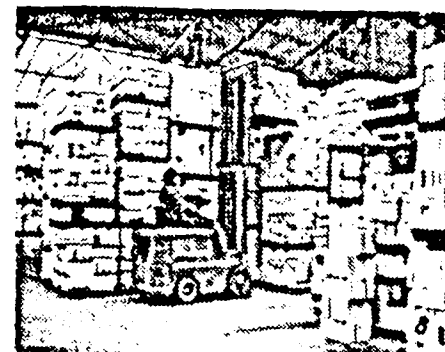
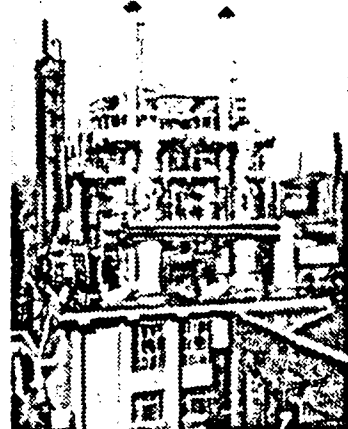
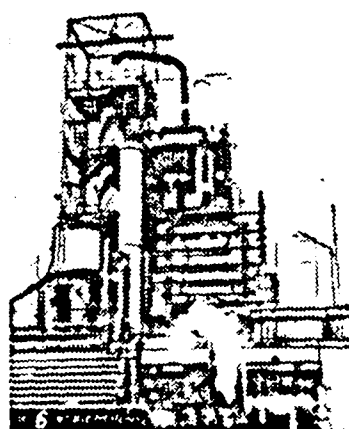
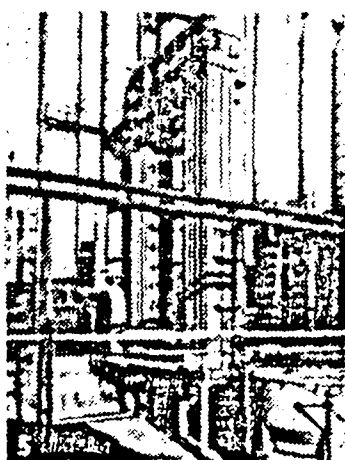
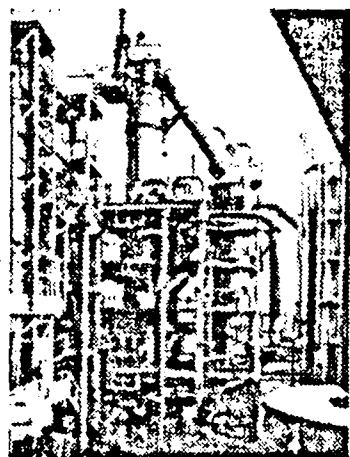
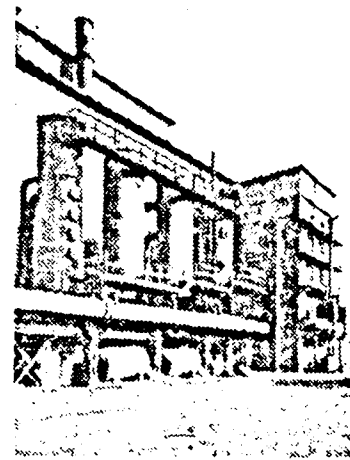
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THE political dispute about how far a developing country should emphasise heavy or light industries in its planning has gone on so long, from Moscow to Canberra via Delhi, that one would think that the economists should be able to provide some general rules on the subject. At least (it is popularly believed) even if the economists cannot agree on a general theory about priorities for heavy and light industries, there does exist a clear problem here, on which the economists can take sides. This is not the case; economists do not admit the existence of a heavy-versus-light dilemma, to which solutions can be provided that will apply to all or many developing economies. Their discussions of the issue soon take us back to the familiar but important banalities about the inflationary dangers attending any form of substantial investment. Within the limits set by the well-known difficulties of food, exchange and inflation during planned development, economists approach the question of how much heavy industry a country should establish quite empirically and allowing that the answer will vary widely from country to country depending on available resources and potential markets. In other words, they reject two well-worn and old-fashioned views. The first was that a backward country should on no account attempt to set up heavy industries. The second was that a developing country must begin by establishing all the heavy or basic industries known in advanced countries. The origin of the first of these myths is in imperialism. The origin of the second is in Russian Communism.

The dogma that heavy industry cannot take root amidst a peasant economy but must await reorganisation of land tenure and marketing systems is the theoretical form of the traditional discouragement of competitive industries by colonial powers. The British classical economists spent a century proving the impossibility or the unsuitability of industrial development in north America, Asia and latterly Australia. Meanwhile, the impossible and the unsuitable occurred, so the dogma has been abandoned. Not only that, but the industrially advanced West is today the enthusiastic assistant of any backward country that chooses to industrialise, being willing to provide, given the necessary guarantees, both the finance and the know-how for the heaviest industrial venture anywhere in the world. India's achievements, both present and planned, and the assistance she is receiving from abroad, show how dead is the first and oldest myth about heavy industries in backward countries.

Communist Policies

The second myth, that development must begin with heavy industry, and the heavier the better, is enjoying a longer life. In its most doctrinaire version, it is a Russian product, although within the Russian Communist Party itself opposition to it has been constant and tenacious. Indeed, the popular notion that there exists a clear and general problem about the choice between heavy and light industry is derived from the history of the last 50 years in Russia and more recently in the newer Communist countries. The Stalin-Trotsky and Khrushchev-Malenkov disputes are represented as chapters in the heavy-versus-light debate. This is, in fact, quite false. Stalinist slanders aside, it should be recalled that Trotsky had even more ambitious projects for heavy industry than Stalin; while it is absurd to connect Khrushchev particularly with heavy industry when his career and reputation in Russia depend on agriculture. There has indeed been acrimonious dispute in Russia about heavy and light industry, but then in a one-party State where politics are supposedly banned, cliques fight within the monolithic party under various banners. To take these banners seriously would be like assuming that in the United States only the Democrats represent democracy and only the Republicans stand for republicanism. In so far as there has been genuine difference of economic opinion in Russia about which industries should be promoted first, this difference has been set in the particular

context of Russian development and cannot be applied automatically to other countries, even if they are Communist. Certainly, the Marxists encourage this uncritical transfer of Russian conceptions to other countries' cases, but their views on the matter are unimportant because in official Marxist theory there is no difference between the economic problems of Albania and China, which is an absurdity. This dogmatism has produced some monstrosities, such as show-piece heavy industries in backward eastern Europe, but on the whole Communist policy, as distinct from propaganda, has favoured a more or less rational division of labour within their bloc, "rational" here having the special meaning: "of most benefit to Russia".

So, although the heavy-light dispute is of peculiarly Communist origin in our day, Communist experience has little to teach other developing countries about the degree of heavy industrialisation they can and should undertake. All of Russian and east European experience can be subsumed under the familiar banalities referred to already: the dangers of inflation generated by excessive investment that is slow to mature, the need for adequate food supplies for a growing proletariat, etcetera. There is no specifically Communist lesson about heavy industry.

Non-Marxist Literature

Turning now to non-Marxist economics, one might expect that from the mass of literature on the theory of economic development that has appeared since the war we would be able to draw some lessons about the place of heavy industry in an expanding economy. But this literature, although highly interesting, is ultimately disappointing, both on this and most other subjects. The main concern of contemporary economists has indeed shifted from the trade cycle and the related problems of short-term equilibrium to long-term problems, to secular trends, to factors of economic growth and decline. But it is the general view that even such classics as W. W. Rostow's *Process of Economic Growth*, or Arthur Lewis's *Theory of Economic Growth*, or the many excellent monographs on economic development in Japan, contain precious little in the way of comprehensive theory and next to nothing that can be applied to a particular case such as India's. Study of such works is nevertheless strongly to be recommended to Indian economists, as encouraging an empirical and differential approach to each country's problems and a cautious use of such concepts as capital-output ratios.

Two exceptions can be made to this depressing conclusion and they are both drawn from the book of Arthur Lewis just referred to. They concern two points about the rôle of heavy industry in economic expansion which may not have been fully appreciated yet in this country.

The first begins by looking familiar, but has less familiar implications. Professor Lewis asserts (and this is the argument we have already accepted) that in a backward economy heavy industrial development need not wait upon completion of the slow process of reorganisation of land tenure, provided something energetic is done right away to increase agricultural output. Given active work on agricultural extension services, fertilisers, new seeds and pesticides, Professor Lewis concludes that rapid and substantial industrialisation is quite compatible with peasant agriculture. The Indian Government has acted on precisely this assumption, though we might still question whether enough is being done to increase agricultural efficiency in relation to the amount of industrialisation projected in the plans. But if this aspect of the argument seems commonplace, we need to look at it from the other side too, and reversing Professor Lewis's conclusion, say that the continuance of a backward peasant agriculture, with all the social and political facts that that implies, is perfectly compatible with substantial heavy industrialisation. This is a way of recalling what is forgotten in moments of optimism: that the success of our plans for heavy industry can

still leave untouched a host of social and political ills, especially in a country where the population is growing quickly. Successful completion of even the most ambitious industrialisation plans so far mooted in India would not change the face of the country. Although this detracts nothing from the grandeur and excitement of the industrial achievements documented in the following pages of this special number of *Capital*, it is a conclusion to which we invite our readers to return when they have finished the volume—and this applies particularly to our politicians. In fact, the case of industrial development in Italy suggests that industrialisation can exacerbate regional inequalities very severely, and in India, where politics already have a heavily regional slant, this fact needs to be remembered. In a word, the expansion of heavy industry in India is possible and necessary, and is already well advanced as the ensuing articles show; but anyone who expects that this will solve all our economic problems or any of our political problems is destined to disappointment.

Construction and Public Utilities

The second fact drawn from Professor Lewis's book is of more immediate practical interest, and is one that has been largely ignored in India. In spite of the wide variations in the effects of investment in different industries (i.e. the dispersion of capital-output ratios), Professor Lewis shows that some two-thirds of investment has necessarily to be on construction and public utilities. This leads him to the vital generalisation that since investment is crucial to economic growth and since investment is largely construction, therefore it is the bottleneck of the building industry that is the true limit to expansion. This cuts right across the traditional dispute about heavy and light industries, because building includes both. There is no substitute in a growing economy for steel, cement, bricks, timber and skilled building labour, and it is the supply of these factors that must be increased fast enough if expansion is to proceed. Several of these materials are in fact included in Indian plans for heavy industries, notably cement and steel. But is enough attention being given to bricks and timber? And how much attention, if any, is being given to the supply of skilled builders? We must guard against an infatuation with heavy industries that could lead us to the position of producing all or many of the heavy materials required for expansion while we lacked the lighter materials and above all the constructive knowledge and skills necessary to convert such materials into working instruments of production.

Limiting ourselves henceforth to the particular case of India, we shall draw attention to several important facts about the rôle of heavy industries that are frequently overlooked in current discussion. The first of these is that one of the most potent forces favouring heavy industrial development has nothing to do with economics, finds no avowed place in our national plans and indeed lies outside the competence of economists and planners. This is the armaments industry—or more generally, defence preparations dictated by the danger that India might be directly involved in a limited war or might suffer economic paralysis from a general world war. This is a subject that is approached (or more commonly not approached at all) with some hypocrisy, for reasons connected with the ideology of the Congress Party. But although ideology has been respected verbally, it has fortunately not been allowed to blind us to realities. It is no secret that in the midst of planned economic expansion, about 40 percent of the Central Budget still goes to defence, and that many of the industries actively promoted in the five year plans (several of which are referred to in later articles) have a thinly disguised armaments importance.

The Defence Ministry, to which one of our leading politicians has lately been promoted, has, very properly, more say than is commonly realised in certain planned projects in the heavy industrial sphere. There is nothing peculiar in this, nor (whatever certain sentimental ideologists say)

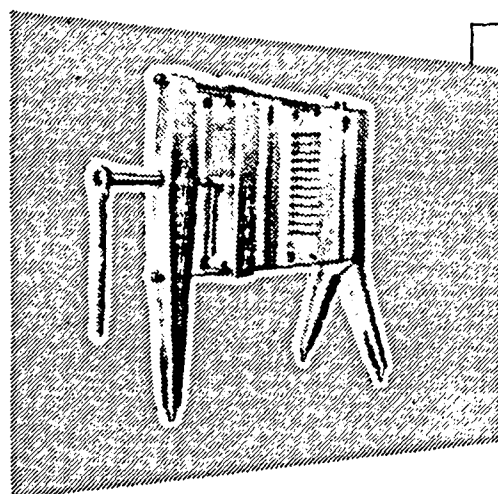


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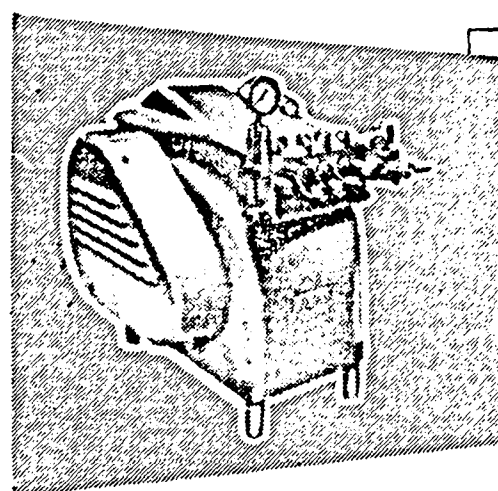
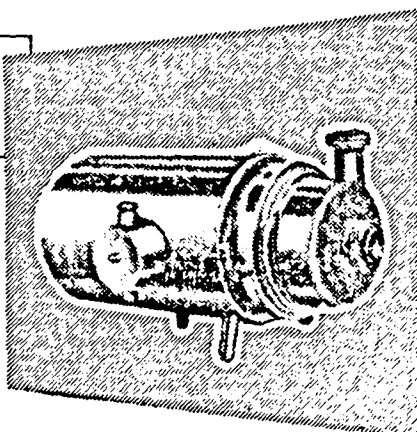


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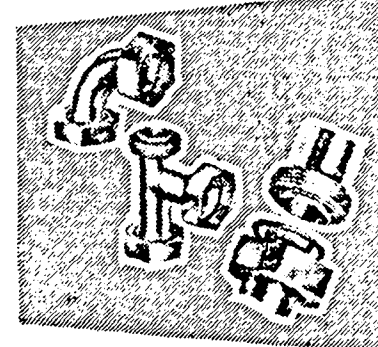
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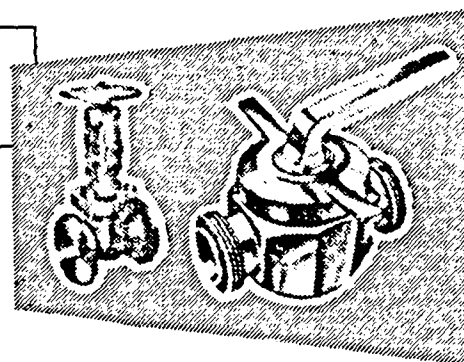


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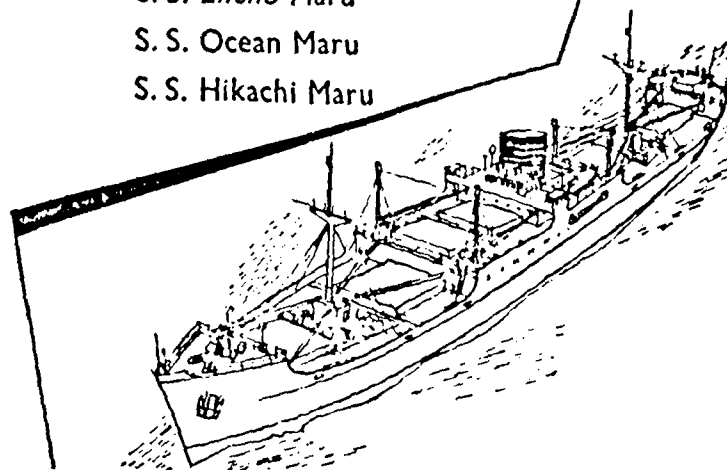
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anything shameful in it. Only the sedulous hypocrisy of the classical economists refused to admit the immense rôle of "defence" needs in British industrial development; the history of the Royal Navy's secret subventions to the British shipbuilding and shipping industries forms an interesting chapter in the history of "free" enterprise. The fact is that "heavy industry" and "armaments industry" cannot be separated, which is why proposals for the disarmament of Germany covered plans for her economic ruin and, conversely, the economic rehabilitation of Japan and Western Germany means that those countries could today very quickly be restored to their former military power. The point of recalling these facts here is to emphasise that "heavy industry" is never a purely economic question, but also a political and strategic one, and that any discussion for or against heavy industrialisation in general, or the establishment of a particular heavy industry, will be unrealistic as long as it does not take account of defence needs which yet may not always be avowed or written into a public plan. We are accustomed to hearing this asserted of such countries as Russia and the United States, but it is as well to remember that similar considerations apply in India.

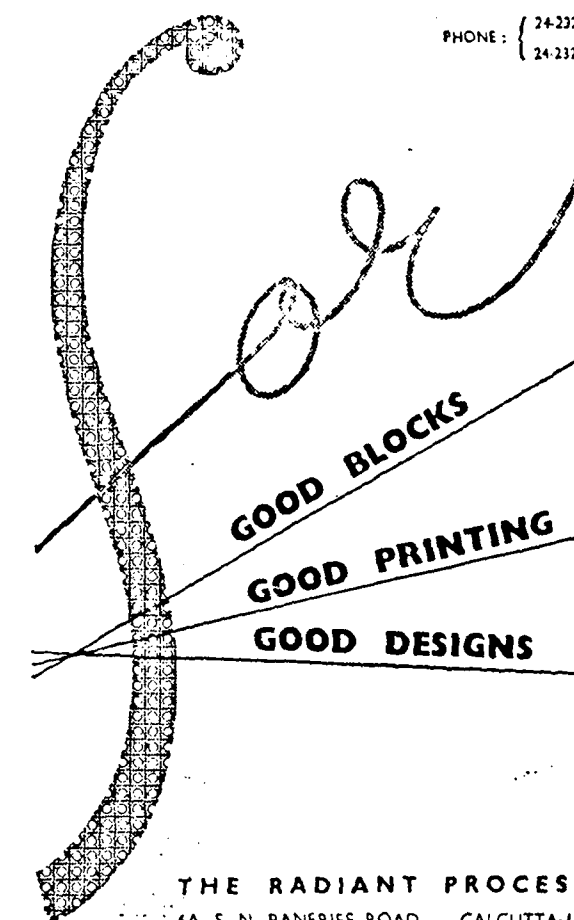
Increases in Population

On the other hand, it is necessary to emphasise facts that count against the more ambitious advocates of heavy industry in India. The first concerns our peculiar position as a nation industrialising while the population multiplies at a rate unknown in the smaller countries of the West during their period of expansion. A growing population demands more food, particularly if living standards rise at the same time; and when the point of diminishing returns is attained in Indian agriculture, this food has to be imported. The cost of such imports has then to be added to the cost of heavy industrialisation itself in foreign exchange, and to the cost of importing the increased quantities of industrial raw materials required by multiplying factories. The very considerable (and usually unforeseen) exchange problems that thus arise are already familiar in India, and there is no prospect of their early resolution. These exchange problems are the reflection in external trade of the internal difficulty of balancing heavy industry with agriculture. They admit of only one solution: the promotion of exports. But in the Indian case, the export industries are precisely light industries: tea, cotton textiles and jute goods. This amounts to saying that the key, the only possible key, to the problem of expanding heavy industry in a populous and agriculturally poor country is held by the light industries, which are usually neglected by the heavy industry enthusiasts, or at least are only mentioned for their ability to soak up inflationary purchasing power released by investment in heavy industry.

A more general warning has to be registered against the advocates of determined heavy industrialisation, because the doctrinaires of this sect fall into a confusion between the static and dynamic pictures of a national economy. Because certain Western or advanced economies are today "based" on such and such heavy industries, it does not at all follow that they achieved their present position by beginning with those heavy industries—much less that India, in seeking to attain a similar position, has to begin by establishing such industries. Much Western capitalism which nowadays presents a heavy industrial base was in fact developed from light industries, such as cotton textiles and the sailing ship. Heavy industry fanatics of course know this, but reply that we shall "save time" by skipping the light industries that admittedly formed the historical base and concentrating on the present heavy industry base. But this apparently plausible argument still confuses the static and the dynamic pictures of a national economy, because it misses the important fact that advanced countries are not today standing still but are going through a perpetual industrial revolution and that in this revolutionary process it is very often certain light industries that are leading the way. For example, in the United States at this moment the growing point of the economy is undoubtedly the electronics industry which is so "light" that it consists of no fewer than 4,200 companies, employing 14 million workers. Although research in this field is dominated by two giants, General Electric and Westinghouse, for the most part capital needs are small and there are 500 electronics factories in Massachusetts alone, while in Los Angeles a new electronics plant arises every 15 days. From a turnover in 1946 of \$2,000 million, this industry has now reached a figure of \$11,500 million and ranks as the United States' fifth biggest industry; it is expected to double its turnover in ten years. Here we have a plain case of a major economy being "piloted" by an industry that is light in the classic sense—and incidentally an industry that is virtually unrepresented in India.

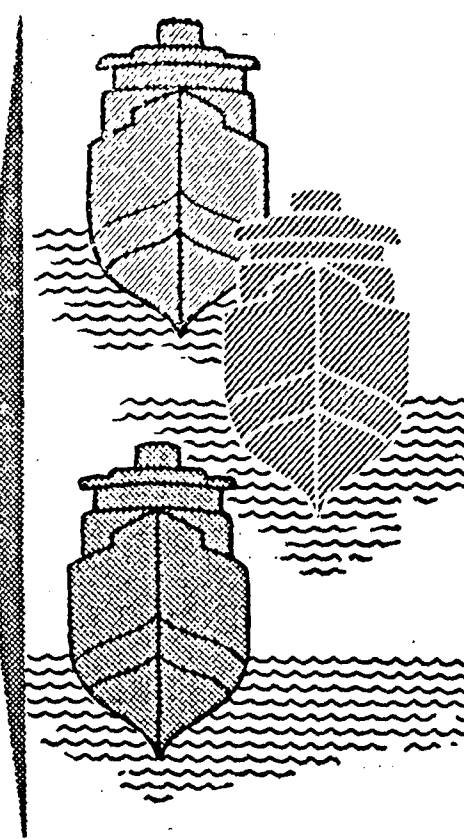
The moral here is that the industries that will be basic tomorrow often present themselves as light today. A nation whose plans run well into the age of atomic energy, of aluminium and of electronics (as our five year plans do), cannot afford to sacrifice too expensively on the altar of yesterday's heavy industries. Having outgrown one superstition, that India cannot undertake heavy industrialisation, we must beware of running into the opposite superstition, that the road to economic progress lies exclusively in the direction of heavy industry.

It emerges then that neither Communist experience nor orthodox economic science provide a sure guide to the dosage of heavy industry that the developing Indian economy needs. On the one hand, India will not be deterred from any particular industrial venture by the dogma that a backward economy "cannot do that sort of thing". On the other hand, it is no conclusive argument in favour of a particular heavy industry that India must have it because Britain and Germany have it. If this appears to reduce us to empiricism, that is not discouraging, because empiricism in this case means that the test whether this or the other heavy industry is desirable and possible in India is substantially the same as for any business undertaking: the economic viability of the concern, the presence of resources and of a market, and the feasibility of a certain quantum of slow-maturing investment judged in terms of the supply of food and other consumer goods and of foreign exchange.



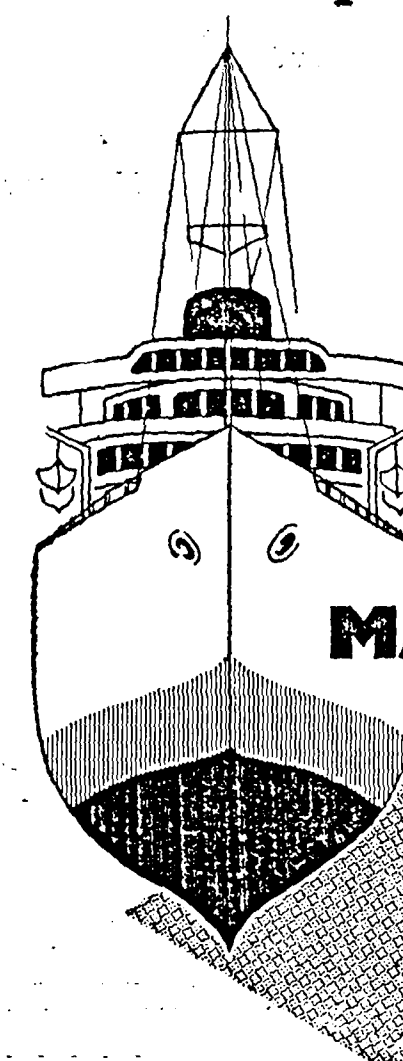
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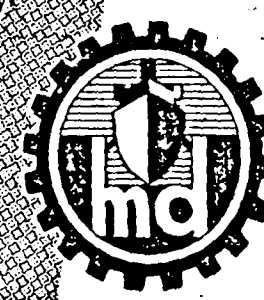
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PROGRAMME TO EXPAND CAPACITY FOR STEEL-MAKING

PROBLEMS THE INDUSTRY WILL HAVE TO FACE

• By A SPECIAL CORRESPONDENT •

AT the end of the second world war, the question of expanding India's steel output to promote industrialisation occupied the attention of both the Government and the steel industry. In 1945, the Government appointed a Steel Panel to make recommendations on the future development of the industry with the object of doubling production in a period of five to seven years. Mr. J. R. D. Tata, chairman of Tata Steel, also took the view that an immediate and large-scale expansion of the industry was necessary. The main tasks in the postwar years were, therefore, replacement and renewal of worn-out plant and machinery, and expansion. The heavy wear and tear of machinery during the war necessitated immediate replacements to enable efficient functioning. Expansion was necessary to meet not only the demands of the railways and the building industry which before the war accounted for nearly 65 percent of the total consumption, but also the demands arising from postwar construction and development programmes. In 1946, Tata Steel engaged foreign experts to draw up plans for the renewal and rehabilitation of plant, to expand production facilities to the maximum within the existing framework, and to diversify production.

The difficulties facing the industry, however, were many and serious. Some of these related to the procurement of plant and equipment, and of adequate supplies of essential raw materials, such as coal. The biggest problem was finance. In prewar years, the renewal and rehabilitation of plant and machinery could be carried out from the substantial reserves accumulated from surplus profits in addition to the normal provision for depreciation. But the high level of taxation in the postwar years prevented the accumulation of such reserves. Besides, the increase in the prices of capital equipment made the normal depreciation allowance very inadequate. The industry faced a number of difficulties in raising finance. Its lopsided capital structure prevented fresh capital from being attracted, and attempts to revise the capital structure did not meet with success.

Government Policy

These difficulties were aggravated by official policy. In 1947, the Government, after considering the Steel Panel's report, decided to take immediate steps to set up two major steel works, each of 500,000 ingot tons capacity. This announcement of State intrusion in the sphere of a basic industry was followed by the Government's Industrial Policy Statement of 1948. Although the policy, by deciding to let the steel industry alone for ten years set at rest certain doubts and apprehensions among producers and investors, it was hedged in with reservations and left a number of issues vague. The decision to reconsider the question of nationalisation after a period of ten years created anxiety and nervousness. As a result, it was extremely difficult to raise large sums of money for financing the ambitious expansion and rehabilitation schemes which were drawn up by the industry.

To help tide over the difficulties, producers asked for an increase of Rs. 100 in the controlled retention price of steel. The proposal was rejected by the Government although even with this increase, the price of a ton of Indian steel would have been about Rs. 400 less than that of imported steel. In 1951, in response to repeated requests from the industry to build a bigger depreciation fund, the Government, on the recommendation of the Tariff Board, accepted the proposal for setting aside a special allowance over and above the standard rates of depreciation. But the problem of adjusting the rates of depreciation for income-tax purposes to the inflated costs of machinery remained unsolved.

In spite of these difficulties which made it almost impossible to attract fresh capital, the steel industry in 1953 embarked upon its much-delayed expansion schemes. In that year, the Indian Iron and Steel Co. and the Steel Corporation of Bengal were amalgamated into a single integrated unit. Indian Iron planned to increase its capacity to 700,000 tons of finished steel, and 400,000 tons of pig iron a year. To help finance this expansion, the World Bank

advanced a loan of \$31 million, while the Government provided a special advance of Rs. 10 crores and a loan of Rs. 7.9 crores from the Equalisation Fund. In the same year, Tata Steel launched its modernisation and expansion scheme to meet the many wartime arrears in repairs and renewals, to diversify production facilities and to raise steel output to 931,000 tons a year by 1958. The programme was estimated to cost Rs. 25 crores, and the Government agreed to lend Rs. 10 crores interest-free from the Equalisation Fund.

Expansion under Second Plan

With the second five year plan, the steel industry entered a phase of more dynamic expansion. The decision to raise output from the current level of 1.8 million tons to 6 million ingot tons by 1960-61 is a bold attempt to hasten the tempo of industrialisation. As the *Manchester Guardian* pointed out editorially a year ago, this rate of expansion is faster than any which took place during the Industrial Revolution in Britain. The increase in production—of nearly four times in five years—is being brought about by the establishment of three State steel units, each with a capacity of a million tons, and by expansion in the private sector of the industry. Instead of a fourth steel plant, the Government allowed Indian Iron to increase its productive capacity to a million tons of steel a year. Simultaneously, Tata Steel was allowed to proceed with a two million-ton project to double its output.

In December 1955, Tata Steel entered into a \$130 million (Rs. 61 crores) agreement with Kaiser Engineers, a division of the Henry J. Kaiser Com-

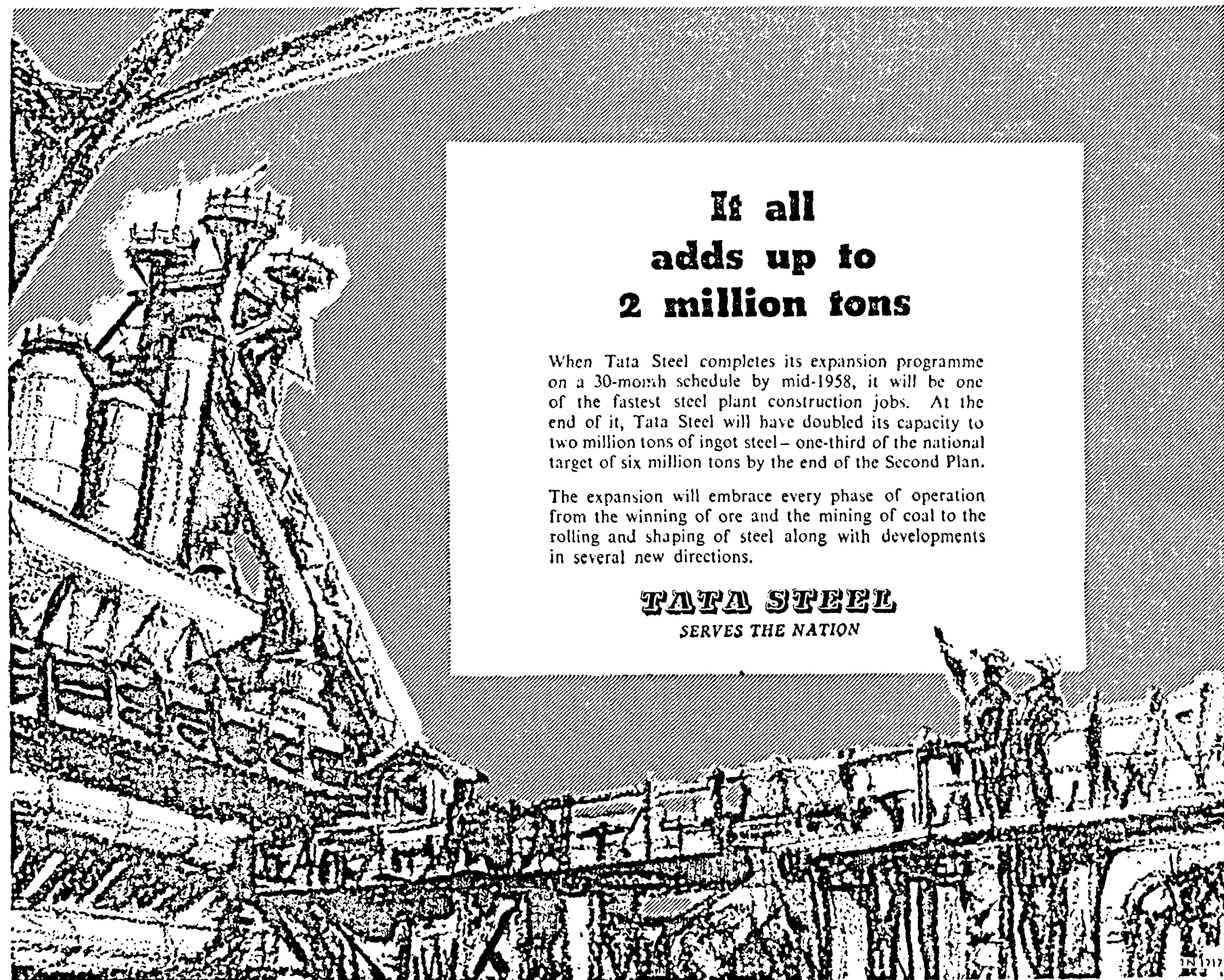
pany of the United States, to undertake the designing, procurement and construction of new facilities to raise output to two million tons. This project is scheduled for completion by 31st May, 1958—in exactly two and a half years from the date of the signing of the agreement. The project covers expansion or an improvement in the mining of ore and other raw materials, and embraces every aspect of the plant from coke ovens to rolling mills, including services such as electrical distribution, roads, sewers and transport. Extensive mechanisation of iron ore mining and loading and unloading of raw materials will help increase output and cut costs.

Principal Items

Among the principal items included in the project, mention should be made of the addition of a blast furnace with a 28-foot hearth and a capacity of 1,650 tons a day designed for top pressure operation; additional steel-making operations, and three new rolling mills—a 46-inch blooming mill, a medium and light structural mill and a sheet, bar and billet mill. A sintering plant with two sintering machines of 2,000 tons capacity a day is being erected. This will enable the use of iron ore fines so long thrown away and will help improve the efficiency of furnace operations. A notable feature is the contribution of Indian technical personnel and Indian industry to the project. Out of nearly 10,000 men engaged in it, all except 85 are Indian. As a top project executive pointed out, "nothing is being imported that is obtainable in India." Work is progressing according to schedule. At the end of March 1957, 93 percent of the procurement and



Teeming steel into ingot moulds



It all adds up to 2 million tons

When Tata Steel completes its expansion programme on a 30-month schedule by mid-1958, it will be one of the fastest steel plant construction jobs. At the end of it, Tata Steel will have doubled its capacity to two million tons of ingot steel—one-third of the national target of six million tons by the end of the Second Plan.

The expansion will embrace every phase of operation from the winning of ore and the mining of coal to the rolling and shaping of steel along with developments in several new directions.

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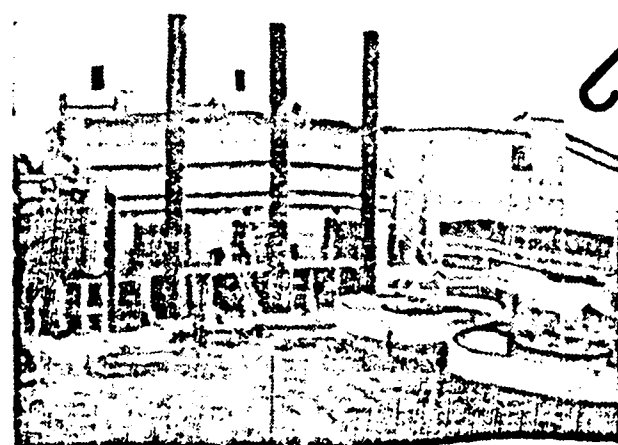
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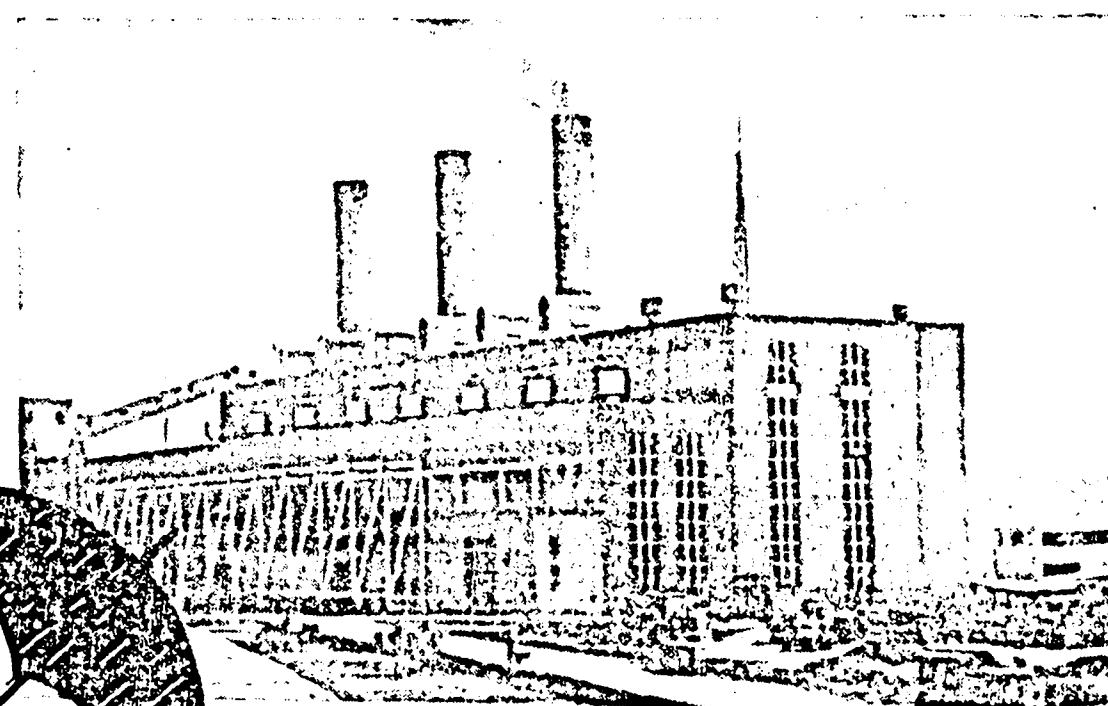
Nor is it the only way. At Sindri, floors in production bays and stores are acid and alkali proofed with Stp; at Bhakra-Nangal, Stp Water-proofing and Hotpour Expansion Jointing play their part.

This is on the project side. On an ever-increasing scale Shalimar Tar Products also protect the homes and industries of India.

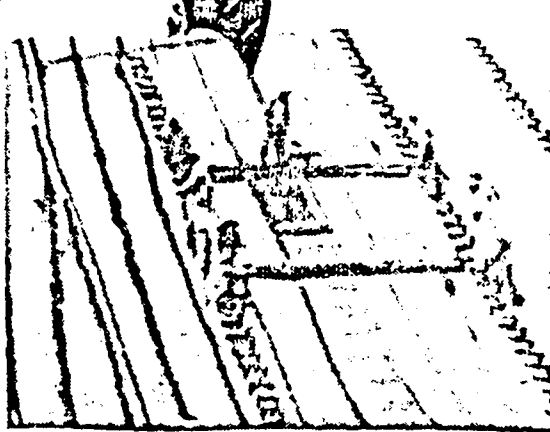
Over 12,000,000 sq. ft. of Shalimar Waterproofing Tarfelt were supplied in one year to protect the roofs of India.



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67.9 percent of the design work had been completed. Total project completion work was estimated at 46.2 percent.

State Plants

Following the decision to establish iron and steel plants in the public sector, the Ministry of Production conducted negotiations in 1953 with the German combine of Krupps and Demag to establish the first of the three State plants in Rourkela, Orissa. In June 1953, Hindusthan Steel Private Ltd. was formed with an authorised capital of Rs. 100 crores to serve as managing agents of the Rourkela steel plant. After Rourkela, the Government decided to put up two other steel plants, one in Bhilai in Madhya Pradesh with the technical and financial assistance of the Russian Government, and another in Durgapur in West Bengal with the help of a consortium of British engineering firms. On 31st March, 1957, the Government announced that the steel plants in Bhilai and Durgapur would also come under the control of Hindusthan Steel Private Ltd. Henceforward, policy questions relating to these two plants will be dealt with by Hindusthan Steel while day-to-day matters will be tackled by their respective local boards. It is hoped that this new arrangement will help the Ministry of Iron and Steel to handle more effectively the larger problems relating to the development of the industry.

The new steel projects will each produce steel and pig iron worth Rs. 40 crores a year. It has been assessed that apart from saving foreign exchange at the rate of Rs. 150 crores a year, the annual steel output will enable the country to finance two one-million-ton steel plants every five years. All the three State steel plants will have a capacity of a million ingot tons of steel a year, and 350,000 tons of foundry pig iron, with provision for further expansion. Care is being taken to plan and co-ordinate production as far as possible to meet demand more effectively. For instance, the Rourkela plant will concentrate on the manufacture of flat products, the Bhilai works will produce rails, beams, heavy, medium and light structurals, sleepers, bars and billets. The Durgapur plant will concentrate on the production of rolled products and railway materials.

Technological Advance

Technologically, these steel plants will incorporate many advances in plant construction and steel production techniques. In Rourkela, for instance, steel will be made by both the open hearth and the Linz-Donawitz (L-D) process—the latter for the first time in India. In the L-D process, steel is made by blowing oxygen instead of air through molten metal. This process, apart from reducing the cost of production, will allow the manufacture of fertilisers. Similarly, at all these plants, coke ovens are being equipped for the recovery of crude benzol. Its rectification into benzene, toluene, xylene, etcetera, is proposed at the Bhilai and Durgapur works. At these two plants, provision is also being made for the fixation of the by-product ammonia in the form of ammonium sulphate, and for the recovery of other coke oven by-products. In the blast furnaces, the use of high top pressure techniques will be adopted.

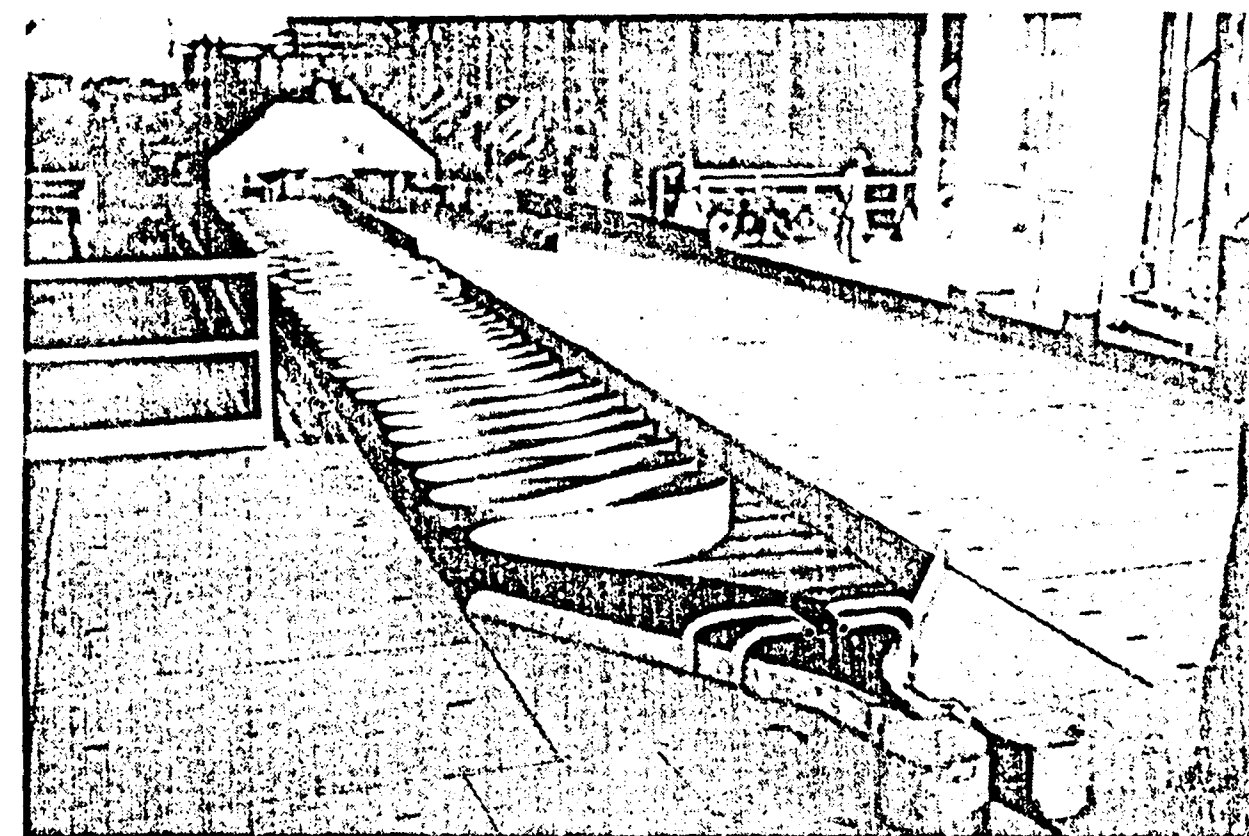
Rourkela: According to the present schedule, the first blast furnace in Rourkela will go into operation in 1958 with the others following soon afterwards. The slabbing mill, it is expected, will be commissioned in 1959, and the plate mill the following year. Good progress has been made in the work relating to a township for 100,000 people. The Government intends to develop the ore mine in Taldih, some 60 miles from Rourkela, to provide iron ore to the plant.

Bhilai: By March 1957, 16,000 tons of machinery, steel structurals, etcetera had arrived from Russia. The iron ore supplies for the Bhilai plant will be drawn from the rich deposits of iron ore in Dhalli-Rajhara in the Durg district of Madhya Pradesh, which were discovered by Tata geologists 50 years ago. The coal supplies for Bhilai will be drawn from the new mines which are being opened up in Korba. It is expected that the Korba mines will be able to supply coal by 1960 at the latest.

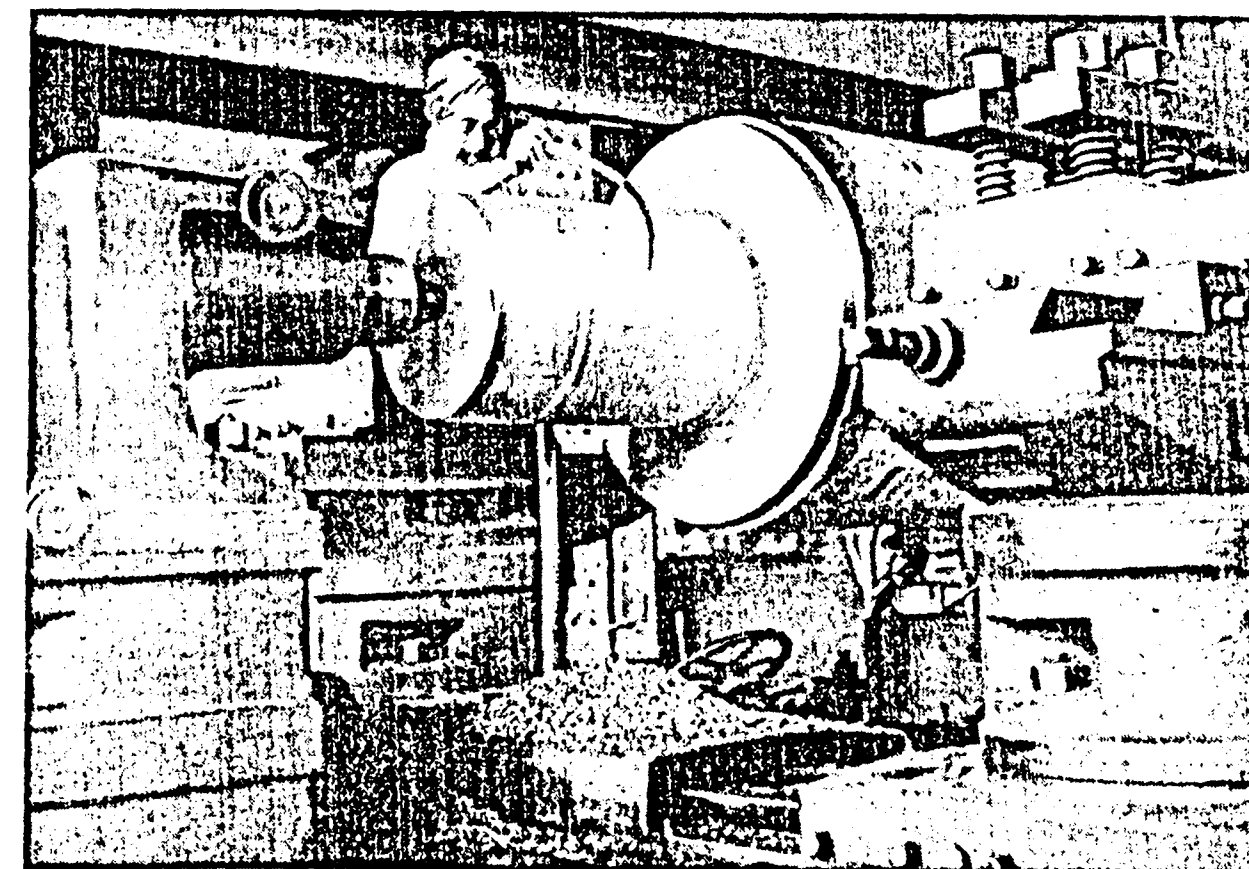
Durgapur: The third steel plant, located in Durgapur, will mainly manufacture rolled products and railway materials. The Durgapur plant will have a wheel, tyre and axle plant—the second of its kind in the country (the first one, established in 1941, is in the Tata works). This plant, equipped with a 6,000-ton forging press and a 200-ton dishing press, will help supply rolling stock equipment. The Damodar Valley Corporation proposes to set up a thermal station to supply power to Durgapur and to consume the by-products of the plant.

Capital Outlay

The total outlay for the steel expansion programme in both the State and the private sectors under the second five year plan is about Rs. 462



Finished skelp at the skelp mill



Roll turning at the machine shop and the measuring of the roll neck

crores, representing nearly 43 percent of the total investment for large-scale industries. The total output of saleable steel during the second plan period is estimated at around 11 million tons, against an estimated requirement of 17 million tons. The Planning Commission, in its *Programmes of Industrial Development, 1956-61*, has stated that production is expected to equal demand only in the last year of the plan. Thus, large quantities of steel will have to be imported in order that the progress of the various plan projects may not be hampered. In the current year, steel imports have so far been satisfactory. But there has since been a drastic cut in the foreign exchange allocations for them. The consequent uncertainty about imports is hindering the development of secondary steel-using industries. The production of steel at the end of the third plan is estimated at 15 million tons; a fourth State steel unit will be set up in Bokaro.

The Re-Rolling Industry

Side by side with the development in the basic sector of steel-making, a major expansion of steel-using industries is also under way. There are at present nearly 142 re-rollers in the country with a basic capacity, on a three-shift basis, of 700,000 tons. Unfortunately, the total supply of billets and semis available to re-rollers is limited to around 250,000 tons. The supply of scrap, another principal raw material, is also far short of requirements. In view of the existence of considerable surplus capacity among re-rollers, the Government does not permit the establishing of new units in the re-rolling industry. When the steel target is realised,

it is hoped that the supply of billets and semis will go up to 700,000 tons. This will enable all re-rollers to operate fully on a single-shift basis. The supply of scrap, it is expected, will also be stepped up. Simultaneously, it is expected that re-rollers will improve their equipment and operational efficiency.

Heavy Engineering

The second five year plan accords very high priority to the development of the heavy engineering industry to provide the basis for an accelerated tempo of industrialisation. Foundries for heavy castings are being established by T.E.L.C.O. and at the Chittaranjan locomotive works. They will help meet the requirements of heavy castings for the railways entirely from within the country. In order to make possible the manufacture of heavy industrial machinery in both the public and the private sectors, the National Industrial Development Corporation intends to establish a heavy steel foundry and forge shop. This shop will be able to supply castings required by the steel industry and other essential steel products.

Two foreign heavy engineering missions, one British and another Russian, were invited to report on the establishment of a heavy engineering industry. The British mission recommended the establishment of four regional units, while the Russian mission suggested the establishment of a single centralised unit. An expert committee under the chairmanship of Sir Jehangir Ghandy was appointed to examine these reports. The committee recommended to the Government that an integrated

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plant be set up which combined in itself the following six separate units; a foundry-forging shop; a heavy machine building unit; a heavy machine tool works; a heavy plates and vessels unit, a heavy structural shop and a unit for coalmining equipment. The whole project is expected to cost Rs. 65 to Rs. 75 crores during the second plan, of which the foreign exchange component to be available as aid from Russia and the U.K. is expected to be of the order of Rs. 40 crores.

Surplus Labour

Before proceeding to an examination of the problem relating to the expansion schemes now under way, reference should be made to the long-standing problem of surplus labour in the steel industry. A specific instance is the labour force in Tata Steel. At present, the company employs no less than 29,000 workers to produce a million tons of steel compared with the units in the State sector which will employ only about 7,100 to 9,000 men in producing an identical tonnage. In the Tata works, although expensive modern plants have been installed, there has over the years been a continuous increase in the labour cost a ton of steel. This cost today stands at Rs. 101 against Rs. 27 in 1939-40. The average earnings a worker in the same period have gone up from Rs. 784 to Rs. 2,392 a year. Simultaneously, the average output of finished steel a worker has decreased from 39.9 tons to 23.8 tons in the same period. Yet the company has not laid off a single worker.

In its *Programmes of Industrial Development, 1951-56*, the Planning Commission has admitted that surplus labour exists. The expansion activities will help solve, to a degree, the question of the surplus labour force and to raise the productivity of labour. The management of Tata Steel has given an unqualified assurance that not a single worker will be retrenched. This is based on an agreement with the Tata Workers Union that the surplus labour force will be transferred to the new jobs and vacancies created by implementing the expansion schemes. It has also been agreed that no worker will suffer any personal loss in earnings on account of such transfers.

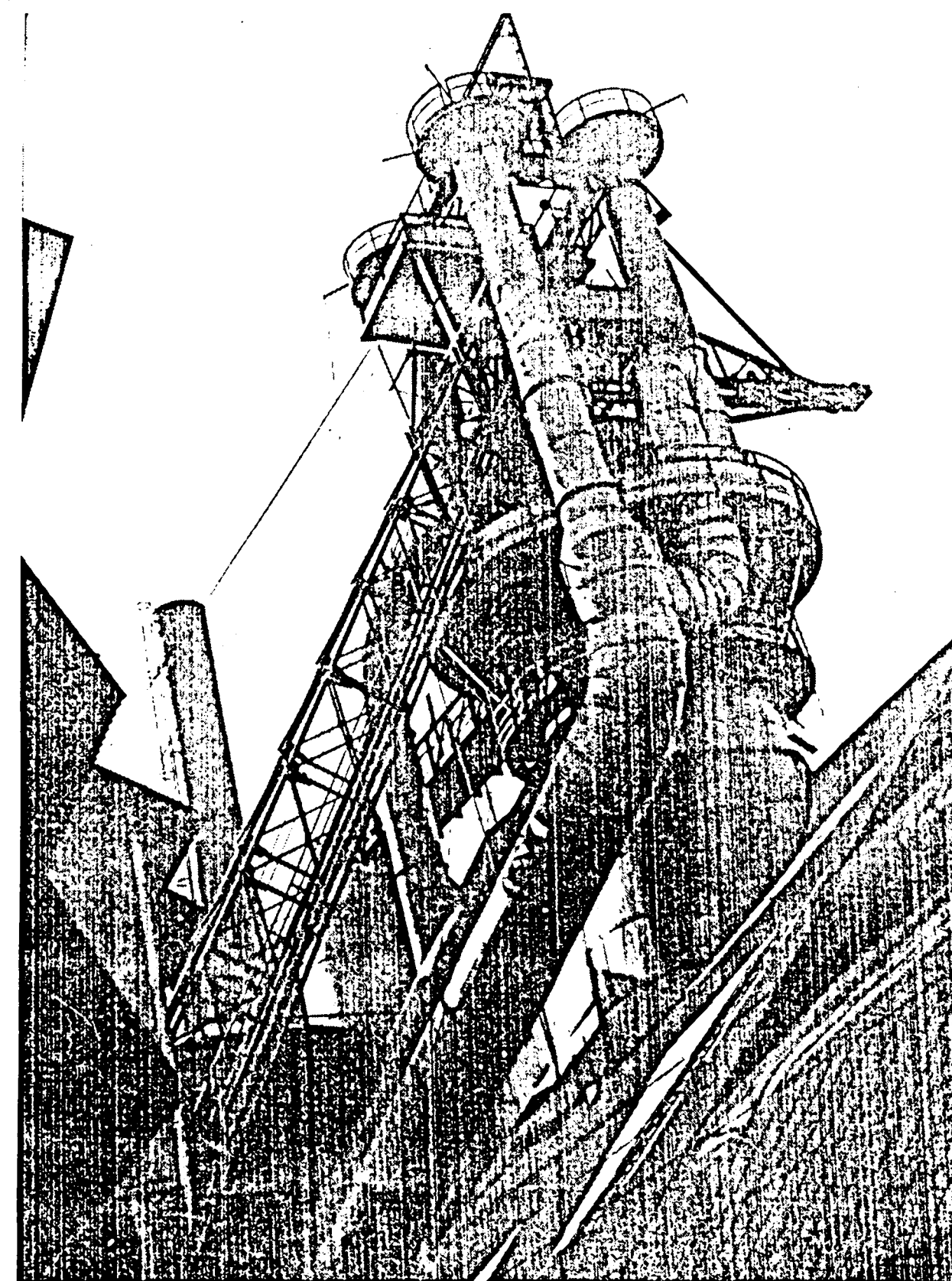
The Problems Ahead

The steel expansion plan will naturally give rise to problems relating to every aspect of the industry—the supply of raw materials, the availability of power, of transport and of technical and other personnel. It has been estimated that another 8 million tons of ore will have to be mined. In the public sector, plans are being made to develop the Barsua mines, in addition to Taldih, to supply iron ore to Rourkela. The Dhalli-Rajhara ore mines will be worked for supplying iron ore to Bhilai. In the private sector, Tata Steel is mechanising the Noamundi ore mines to raise more tonnage and is opening up a new mine nearby, in Joda, to cope with its doubled requirements of iron ore. India's iron ore reserves, calculated at 20,000 million tons, are potentially the richest in the world. Although virtually inexhaustible, it is nevertheless necessary to exploit them carefully. A significant step in this direction has been taken by the establishment of sintering both in the new State steel units and at the Tata steel works. Sintering will enable the use of iron ore fines hitherto thrown away and will also help improve the operational efficiency of the furnaces.

Another significant development in the raw material field is the attempt to start the indigenous manufacture of ferro-manganese—an important raw material used in the manufacture of steel in the open hearth furnace. India exports, on an average, about a million tons of manganese every year. It was felt that, in the long-term interests of the country, it would be necessary to stop the export of this vital raw material. The Government has issued licences for starting seven ferro-manganese plants. The first of these, having a capacity of 150 tons a day, went into production in April 1956. An important project for the production of ferro-manganese is the new plant Tata Steel is setting up in Joda, close to the Noamundi ore mines, and 94 miles from Jamshedpur. The Joda plant will have an initial capacity of 30,000 tons of ferro-manganese a year, going up to 100,000 tons by stages. It is expected that the plant might be able to export 10,000 tons of ferro-manganese annually, earning for India a minimum of Rs. 70 lakhs in foreign exchange.

Refractory Production

The present production of refractory bricks in India is estimated at 209,000 tons a year. This meets the current demand, except for basic bricks. The latter are not made in India, though Tatas produce a small quantity for their own use. The demand for refractories in the iron and steel industry alone is expected to go up to 405,000 tons a year. Besides, the construction of the new steel plants will call for 553,000 tons of bricks, in addition to



A close-up view of the blast furnace

recurring operational requirements. The Planning Commission has already approved schemes for establishing refractory works to produce 130,000 tons of refractories a year. The Tata-Didier project in Belpahar will have an initial capacity of 60,000 tons, with provision for doubling the output when necessary. This plant will produce all the three types of bricks needed by the steel industry, that is, 30,000 tons of fireclay bricks, 20,000 tons of silica bricks and 10,000 tons of basic bricks. The manufacture of basic bricks is particularly important because India still depends almost entirely on imports.

It has been assessed that an additional quantity of 10 million tons a year of coking coal will be needed by the iron and steel industry alone. In order to conserve coal, Tata Steel has set up coal washeries in the Jamadoba and West Bokaro coalfields. These plants have been operating successfully for years. The Government is now planning to set up washeries and blending plants at the coalfields for the beneficiation of inferior grades of coal. When the new steel plants go into operation, it is estimated that the requirements of raw coking coal will reach 50 million tons by the third five year plan. Washing and blending will enable a saving of at least 50 percent in the consumption of raw coking coal by enabling the use of inferior grades of coal for coking purposes.

Transport Problem

It has been estimated that construction activities under the second five year plan will increase the demand for freight transport from 120 million tons in 1955-56 to more than 180.8 million tons in 1960-61. The problem of handling the extra freight generated by the expansion in the steel industry will be great. Construction activities alone will require movement of about 1 or 1½ million tons of materials. When in full production, each of the new steel plants will require 12 trains of raw materials every day—five trains of iron ore, five of coal and two

of limestone—each train carrying a load of 12,000 tons. Two trains will be needed to move finished steel from each of the new plants. With the doubling of the output of Tata Steel, the raw material traffic will rise to about 21,000 tons a day and outgoing pig iron and finished steel will account for 5,400 tons a day. In preparation for the new responsibilities of additional freight traffic, the main line section, Monaharpur-Rourkela-Bilaspur-Bhilai-Durg, a distance of 307 miles is being doubled. A double line is also being laid in the section from Anara to Burnpur, while the section from Vizianagaram to Gopalapatnam is to be doubled. In addition, new lines totalling 232 miles are being constructed for bringing ore, limestone and washed coal to the steel plants.

Railway Electrification

Since even with the doubling of the principal sections it will not be possible to move under steam traction the entire traffic at the end of the second five year plan, a decision has been taken to electrify the Asansol-Sini-Tatanagar-Rourkela and Raj Kharaswan-Dangoapuri sections, over which the raw materials for the steel works will move. Pending electrification, which will take time, the railways have ordered, as a purely interim measure, 60 diesel engines to handle the extra traffic. With the help of these diesel engines, it will be possible to move heavy trains carrying 3,000 tons of coal and other raw materials to the steel plants. In addition to these measures, old railway tracks are being rehabilitated.

For handling the increased traffic, four new marshalling yards of the latest design are being constructed in Bhilai and Rourkela. A new one for the Tata steel works has already been constructed in Adityapur. The railways are making efforts to increase the supply of special type wagons. A new workshop, costing Rs. 2 crores, is being erected for the maintenance of wagons. The importance of the railways to the steel industry will

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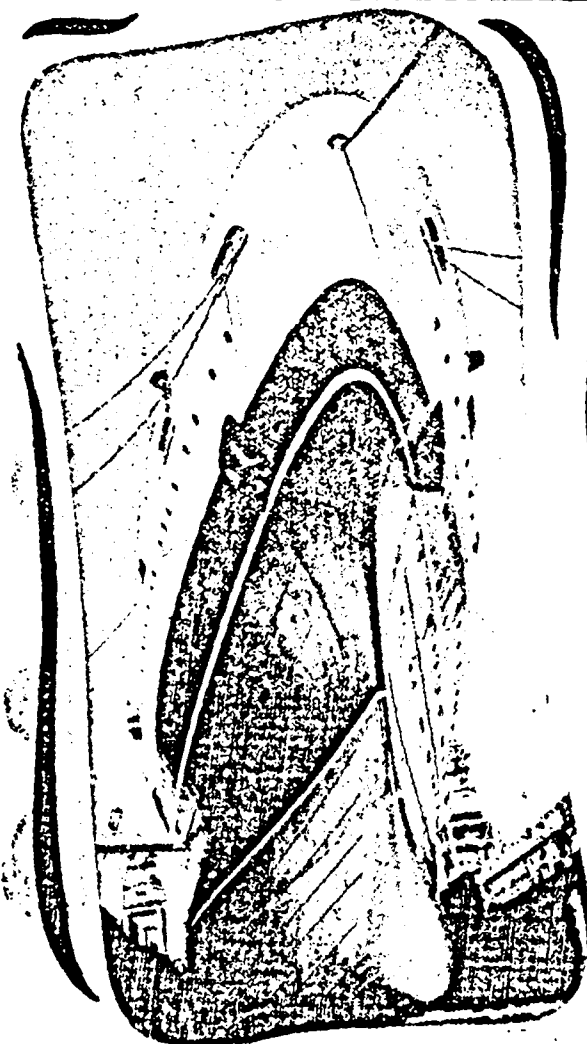
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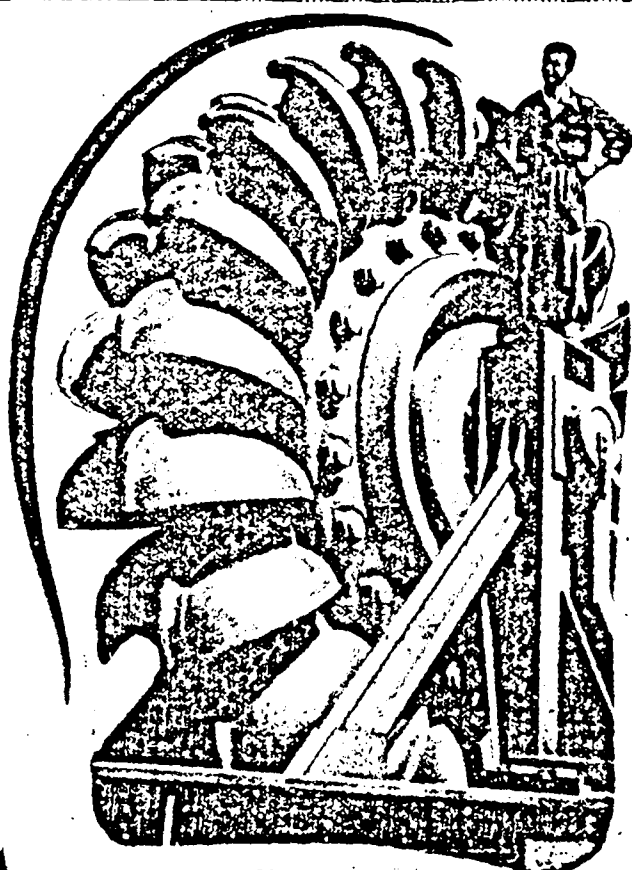
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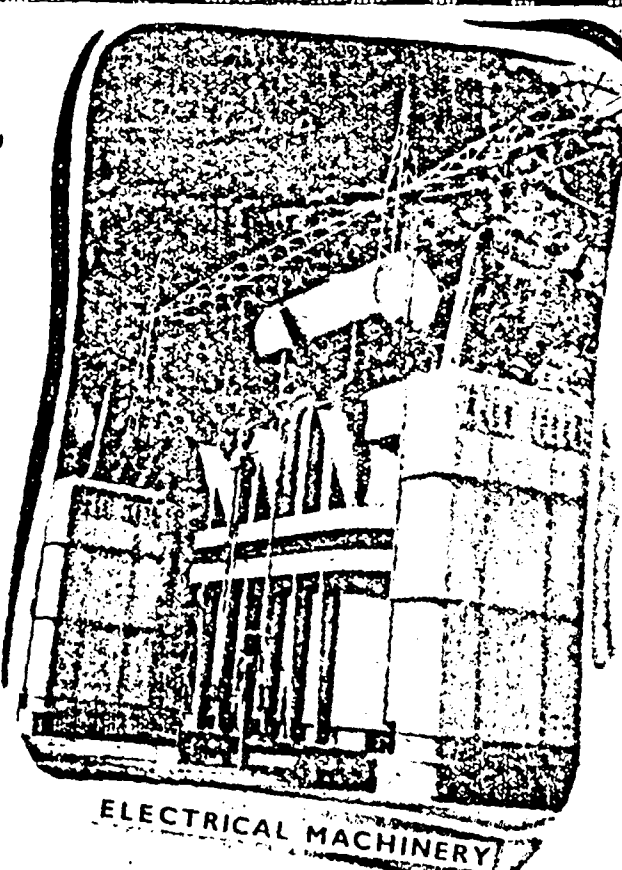
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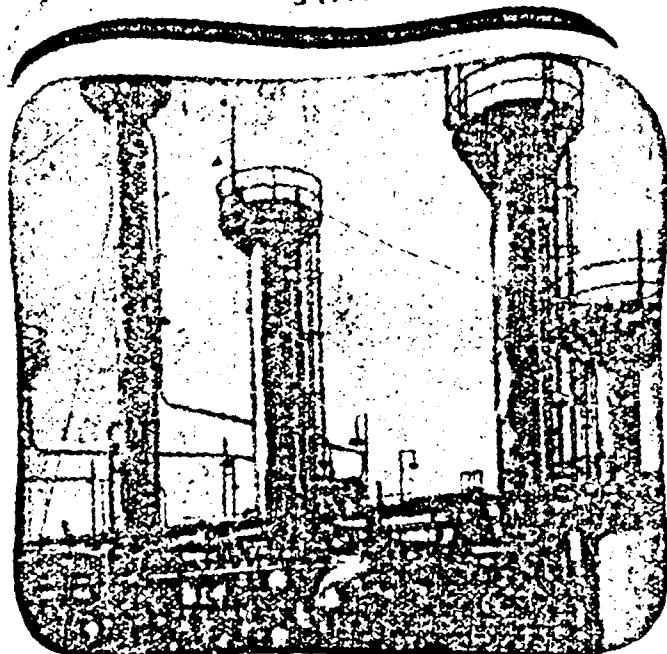
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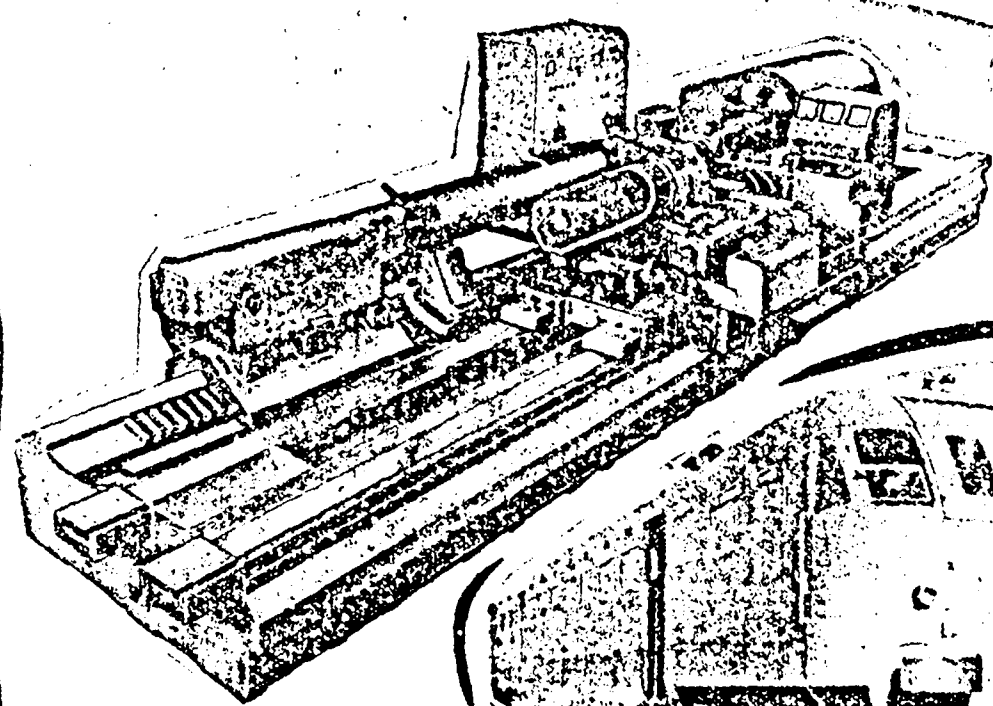
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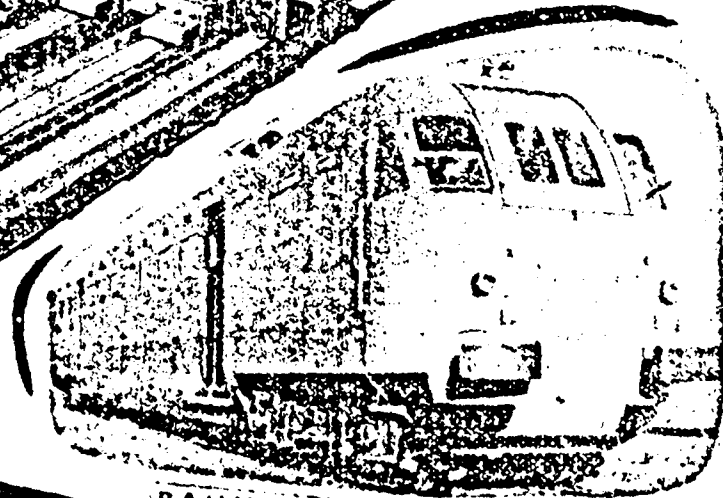
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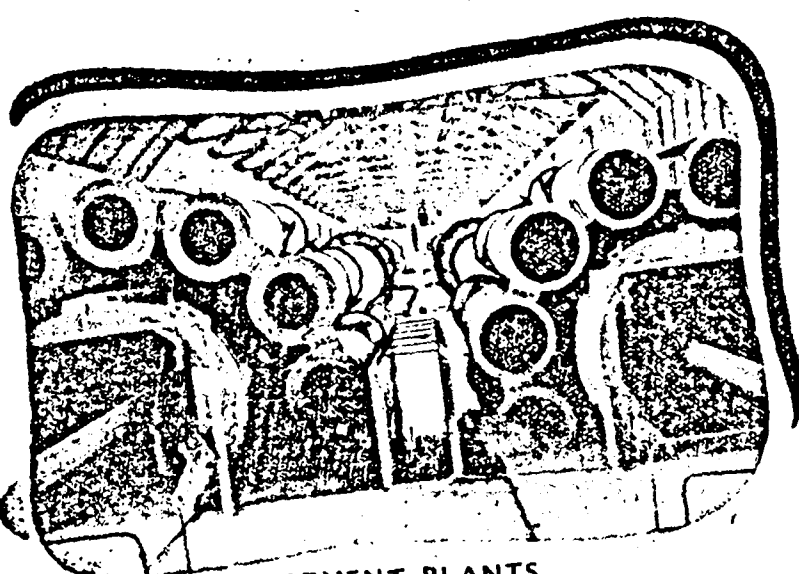
CHEMICAL PLANTS



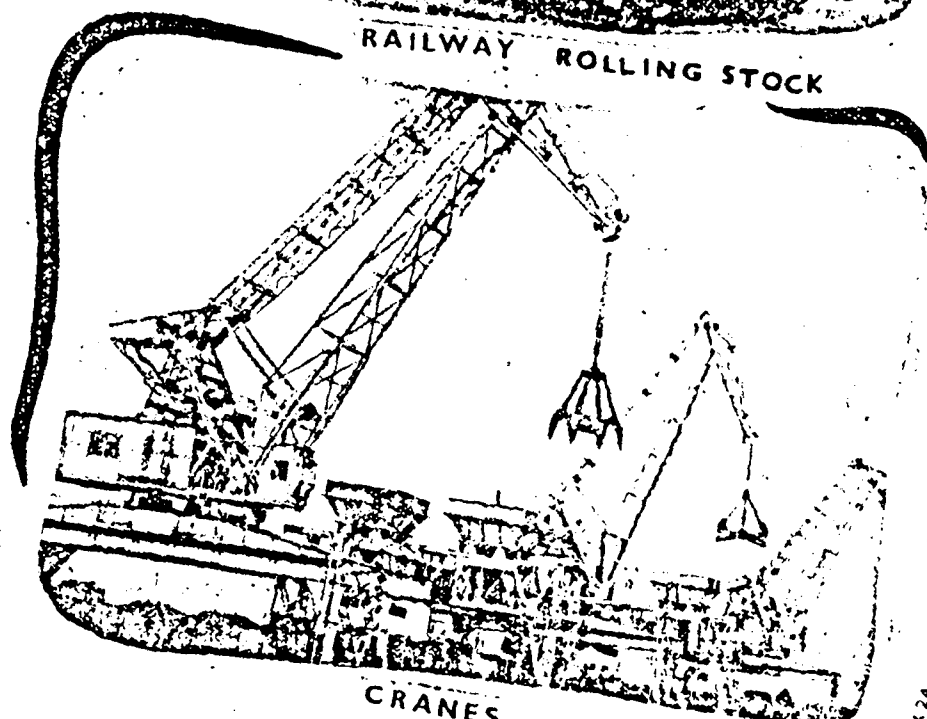
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CRANES

DELEGATE IN INDIA-144. GOLF LINKS-NEW DELHI-3

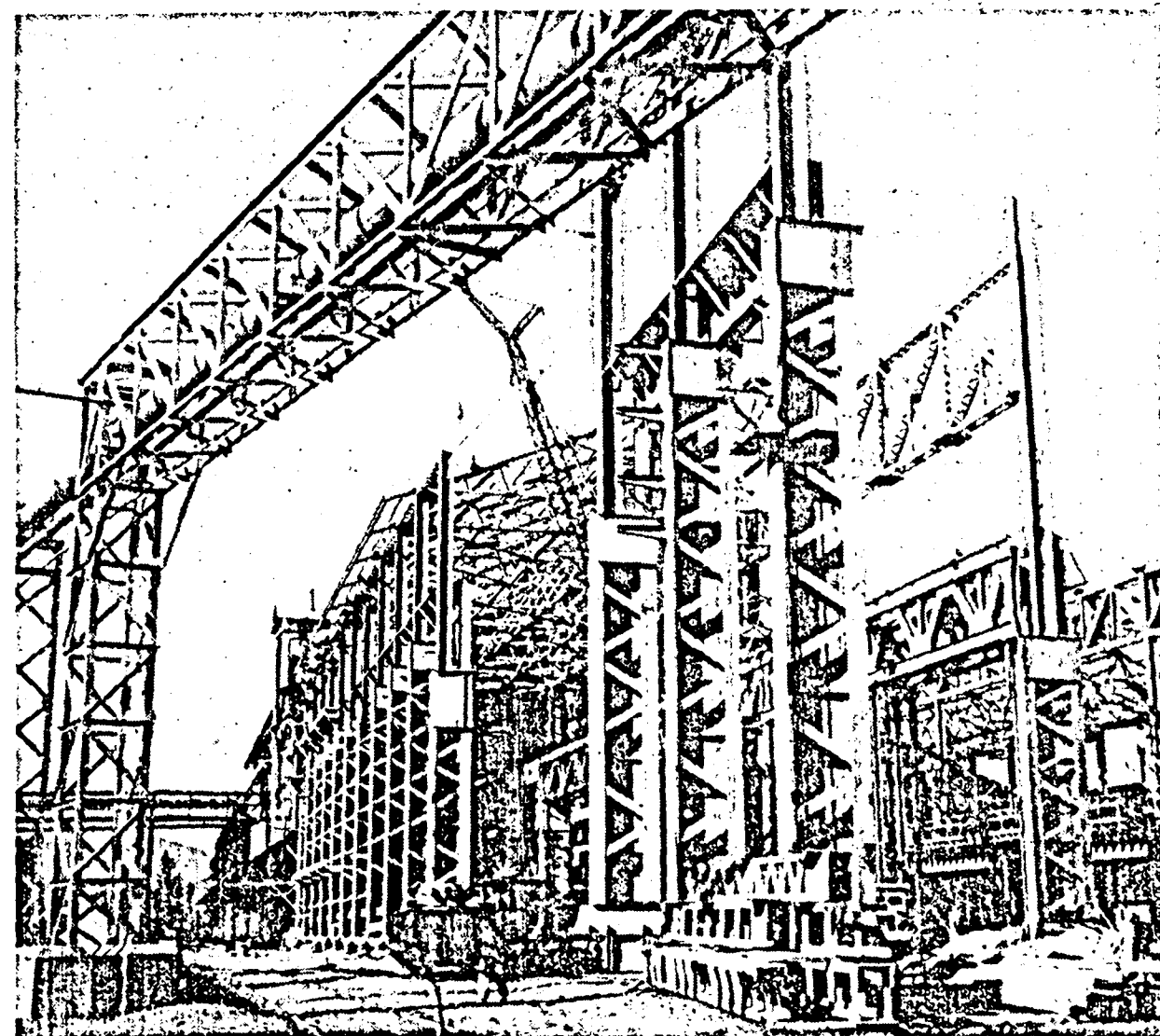
be evident from the fact that out of a total outlay of Rs. 330 crores for the construction of the Rourkela and the Bhilai plants, as much as Rs. 105 crores forms the share of the South Eastern Railway.

Technical Manpower

Finally, one comes to the very important question of technical and administrative personnel. The successful implementation of the steel expansion plans and other industrial programmes largely depends on them. The Engineering Personnel Committee, appointed by the Planning Commission, has gone into the question of technical manpower in detail. It has recommended the establishment of a total of 18 degree colleges and 52 diploma institutions in all the four regions at a cost of Rs. 16 crores. It has been assessed that the three State steel units alone will require roughly 2,100 men for supervisory and technical staff, 15,000 technicians below the category of foreman and an additional 15,000 to 20,000 semi-skilled personnel to work on the shop floor and for administrative and clerical duties. Similarly, an additional 30,000 trained and untrained workers will be needed at the end of the second plan as a result of the expansion on the railways. In the case of the State steel plants, the Government is making arrangements with its various foreign collaborators to train key personnel for the design, maintenance and operation of the plants.

The Committee came to the conclusion that in the case of the steel industry, there will still be a shortage of about 9,800 engineers by 1961, even if all its recommendations are implemented. Particular mention might be made of the metallurgists needed to man the Government's steel plants. The present outturn of metallurgists is around 80 a year, against a total requirement of about 480 by the end of 1961 for the Ministry of Iron and Steel alone. To overcome this difficulty, the Ministry proposes to start a scheme of one year's intensive training in metallurgy for the candidates chosen for recruitment.

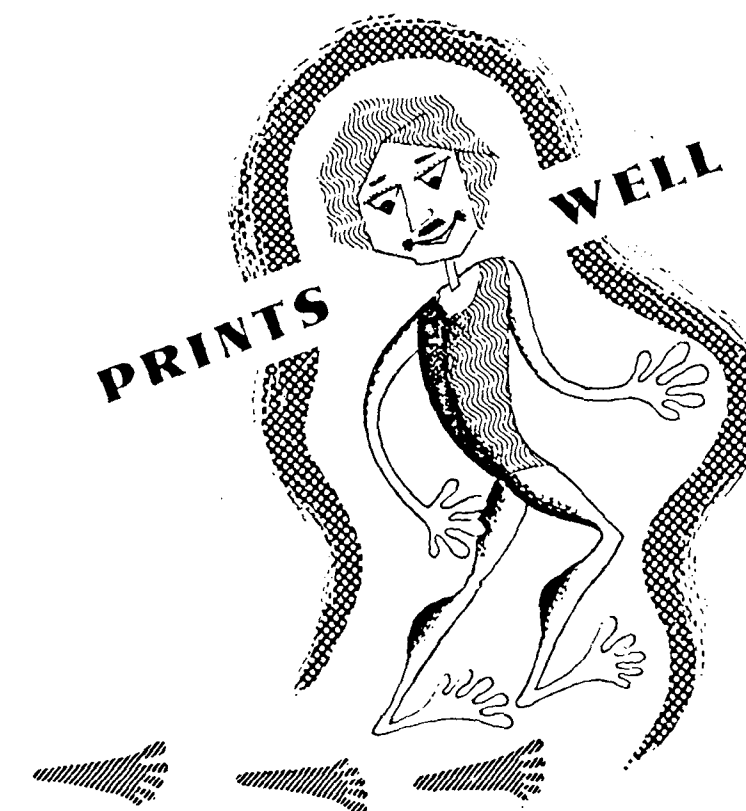
Till now, industries in the private sector had to be satisfied with the products of general engineering and general metallurgy. As a result, major industrial units, such as Tata Steel, had to run their own schemes for training technical personnel. Tata Steel provides intensive training to graduates in mechanical engineering, electrical engineering and metallurgy for a period of two years to make them suitable for jobs and conditions in the iron and steel industry. It is now helping provide



A view of the construction work under the two million ton expansion scheme

similar training to Rourkela personnel, from apprentices to the senior-most supervisors. Besides, Tata Steel provided a six-week orientation course for 400 young graduate engineers recruited for the State steel plants before their departure for training abroad. With the intensive development and expansion in the iron and steel and other heavy industries, the time has now come to think in terms of starting courses in specialised branches of engineering and metallurgy so that the minimum

period is wasted on their further training to make them suitable for specific jobs. Similarly, efforts should be made to train a large cadre of skilled workers for large-scale industries. The Government now has about 70 labour training courses, but the training given at these centres is of a very general nature. It will be necessary to impart such training as will make the trainees ready for work on the shop floor. Unless these changes are made, the pace of industrialisation will suffer.



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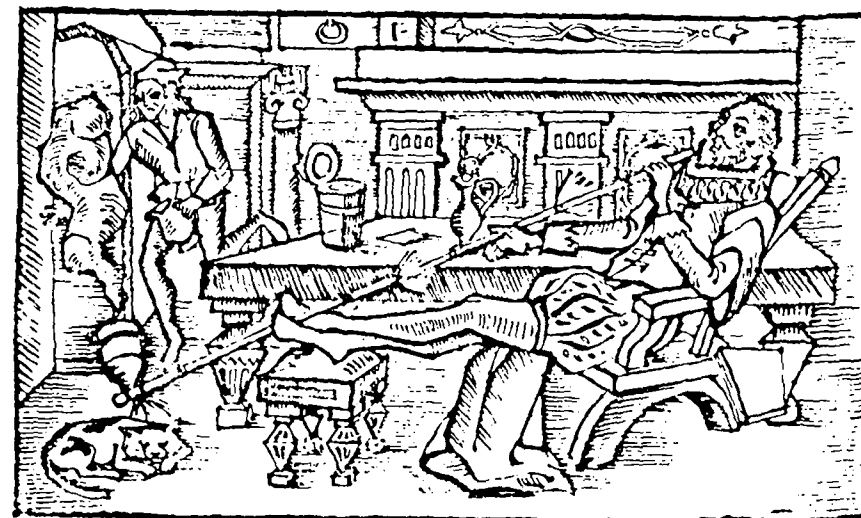
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STEADY RISE IN CEMENT NEEDS LIKELY RAW MATERIAL AND TRANSPORT PROBLEMS

• By P. K. MISTRY •

Director, Cement Agencies (Private) Ltd., Managing Agents of the
Associated Cement Companies Ltd.

A LONG with steel, cement is the most important building material of modern times. The consumption of cement has, therefore, come to be regarded as a reasonably reliable index of the economic development of a country. In India, there is an acute shortage of cement in spite of the giant strides taken by the industry to increase its production during recent years. While this is a sure and welcome indication of the social and economic progress of the country, there is still an enormous leeway to make up. The annual per capita consumption of cement in Sweden is about 740 lbs—the highest in the world. Belgium records 716 lbs, the United States 516 lbs, Denmark 416 lbs, the U.K. 411 lbs and Japan 90 lbs. The figure for India still stands at the deplorable level of 27 lbs.

The Planning Commission has therefore accorded a high priority in the second five year plan to the expansion of the cement industry, which is given pride of place next only to steel. Thus, out of the capital outlay of Rs. 1,094 crores on industrial development—both in the private and public sectors—the share of the cement industry is put at approximately Rs. 81.5 crores, or 7.4 percent of the total. With this outlay, the planners envisage an annual production capacity of 15 million tons of cement, while a target of 25 to 30 million tons is being talked about for the third plan.

Exhilarating Times

In these exhilarating times, when all discretion and caution have been thrown to the winds in order to "live dangerously", economically speaking, we hardly pause to question the realism of these targets. This is the more so because, in the recent past, calculations and estimates have often become obsolete overnight. It now seems strange to recall that only about seven years ago, when India was producing barely 2 million tons, cement manufacturers and the Government were seriously debating taking steps to counteract the effects of likely overproduction in some parts of the country! Undoubtedly, the second plan opens a vast field for constructional engineering in multipurpose projects, large-scale industrialisation, development of transport, provision of housing, etcetera. The potential future demand for cement would, therefore, appear to be practically insatiable. Nevertheless, we would do well to ask ourselves whether there will be a glut of cement when the large and urgent demands for dams, irrigation and other Government projects are satisfied or are slowed down. There has also to be taken into account the major problem of transport.

Industry in Retrospect

At the turn of the century, the cement industry in India had yet to be born. It was started in a modest way in 1904 with the establishment of a small factory in Madras, but the enterprise failed. Nearly a decade later, another attempt was made with the establishment of a factory in Porbandar, Saurashtra, followed by two other factories, in Katni, Madhya Pradesh, and in Lakheri, Rajasthan. War conditions gave an impetus to the industry, and by 1918 these three units were firmly established with a total annual cement production exceeding 85,000 tons, though the country's needs were still largely met by imported cement. Between 1919 and 1924 seven more factories were installed. Unfortunately, the industry developed in an unplanned manner. This, and the prejudice with which the indigenous product was still regarded, created serious difficulties for Indian manufacturers. Soon, all the producing units were competing in a reluctant market, and in the middle 'twenties the industry faced a near collapse. Three factories closed down, and the Indian investor lost more than Rs. 2.5 crores.

The producers then got together and established the Indian Cement Manufacturers Association in 1925, the Concrete Association of India two years later and the Cement Marketing Co. of India Ltd. in 1930—the last-named to co-ordinate the distribution and sales of member companies. These steps had a stabilising effect on the industry. There were two factors which sustained the cement industry in those difficult times. Firstly, the determination of the promoters to see that the industry did not fail, and secondly, the faith and

confidence of the shareholders in the future of their companies. These investors knew that they would not see any returns for many years. They also knew that there was the risk of total loss of their investments. But this is a calculated risk that free enterprise must and does take.

In 1936, an entirely new and significant chapter opened in the history of the industry when ten out of the 11 units then existing agreed to amalgamate to form the Associated Cement Companies Ltd. This momentous step was largely the result of the efforts of a great industrialist, the late Mr. F. E. Dinshaw who, unfortunately, did not live to see the fruits of his scheme which had as its primary object the furtherance of the industry in the best interests of the consumer. Since the "merger", the industry has never looked back. By 1947, there were 23 factories operating, with a total capacity of 2.6 million tons against 500,000 tons in 1923. On partition, five factories went to Pakistan, leaving 18 in India. In 1950-51, the capacity of 22 operating units had risen to 3.3 million tons, when the first five year plan called for an expansion to 5.31 million tons. In spite of several handicaps, the industry responded manfully. By 1955-56, installed capacity had reached 4.93 million tons, by extensions to some of the existing factories and by the establishment of six new ones. Among these, special mention must be made of A.C.C.'s new factory in Sindri which uses, as a raw material, the calcium carbonate sludge which is a waste product of the Sindri fertiliser plant. This is the second cement factory of its kind in the world, and its establishment, which was fraught with technical difficulties, is a triumph for the bold approach and expert competence of Indian enterprise.

Rising Production

The tremendous advance made by the industry during the ten years since independence can be gauged from the following figures of annual cement production:

Year	Production (in million tons)
1947	1.44
1948	1.55
1949	2.10
1950	2.61
1951	3.19
1952	3.53
1953	3.78
1954	4.39
1955	4.41
1956	4.92

There are today 11 different companies manufacturing cement, operating a total of 28 factories. The A.C.C. is the largest, with the Dalmia group coming next, followed by nine other one-unit companies. All but two factories (the U.P. Government's factory in Mirzapur and the Mysore Government's factory in Bhadravati) are in the private sector. The total manufacturing capacity of the country at present is 5.2 million tons. Along with the need to increase production to meet the growing needs, the cement industry has another fundamental responsibility—to ensure the quality of its product. This it has also discharged with signal success. Indian Portland cement is as good a cement as any in the world. Its quality not only conforms to but exceeds, by generous margins, the rigid specification laid down by the Indian Standards Institution.

Significant Achievements

The cement industry has three other significant achievements to its credit. Firstly, it has provided excellent amenities for its employees, by way of hospitals, schools, clubs and swimming pools, canteens, etcetera. A large number of employees are adequately and comfortably housed, a facility which is very unusual even in Europe and America. In the quality and the extent of employee amenities, the main units of the industry have certainly set a standard worthy of emulation. Secondly, the industry in its chief component, the A.C.C., has reason to be proud of its record in developing the fabrication of cement-making machinery. Until shortly before the outbreak of the second world war, there was little which was not imported. The pioneering work

of the A.C.C. has today made that company self-sufficient in the matter of rotary kilns, clinker coolers, hammer-crushers, grinding mills, elevators, conveyors, slurry pumps, dust collectors, etcetera. Considering the high costs of imported machinery, a great deal of precious foreign exchange is thus saved. The industry is alive to the necessity of increasing the scope and tempo of such machinery manufacture, and it should not be long before the country's entire requirements of cement-making machinery—other than heavy electrical equipment—are manufactured at home. Thirdly, the efficient running of the industry has made it possible for the price of cement to remain unchanged since 1948, during which period the prices of all other building materials have increased substantially. This is an extraordinary achievement in a period of rising costs. The rigid check on cement prices is reflected in the modest dividends declared, e.g. the A.C.C., in the 20 years of its existence, has paid an average dividend of 5.65 percent on invested capital.

State Trading

Against the background of the achievements of the cement industry, there was no reason to anticipate that cement would be taken over by that favoured enfant terrible of the Government of India, the State Trading Corporation. The reason given was that as cement had to be imported to meet the current shortage, it was necessary to equalise the selling prices of indigenous and foreign cement by fixing a higher selling price for indigenous cement to subsidise an equivalent price for cement imported at a considerably higher cost. The industry proposed various alternatives to State trading which would have served the purpose of scaling indigenous cement at a price just high enough to subsidise the sale of imported cement at the same equalised price. But the Government proceeded to carry out its intention without offering any convincing reason, and issued a notification requiring all cement manufacturers to sell their entire production to the State Trading Corporation with effect from 1st July, 1956. The industry's basic objection to State trading in cement cannot be better stated than in the following extract from an article by Mr. N. Dandekar, in the A.C.C.'s House Organ:

"The mere fact that State trading can resolve a given problem in terms of agreed objectives is not enough to justify its adoption, if other solutions of equal, superior, or even (let me say) of slightly inferior validity, but not involving State interference, are available. The objection to State trading in cement becomes, in these circumstances, fundamental. Moreover, it lops off an essential function, namely, the sales function, from a basic productive industry laboriously built up over the years by free enterprise, thereby causing grave, albeit unintended, injury to it in a vital spot. State trading in cement also runs counter to the declared policies of the Government itself as enunciated in the Industrial Policy Resolution early this year, in which an admirable balance was struck between State enterprise and free enterprise. The continual maintenance of such a balance is of the very essence of a socialist pattern of society, if it is to be built on the foundations of a democratic Constitution. State trading in cement has gravely disturbed that balance."

Cost of Expansion

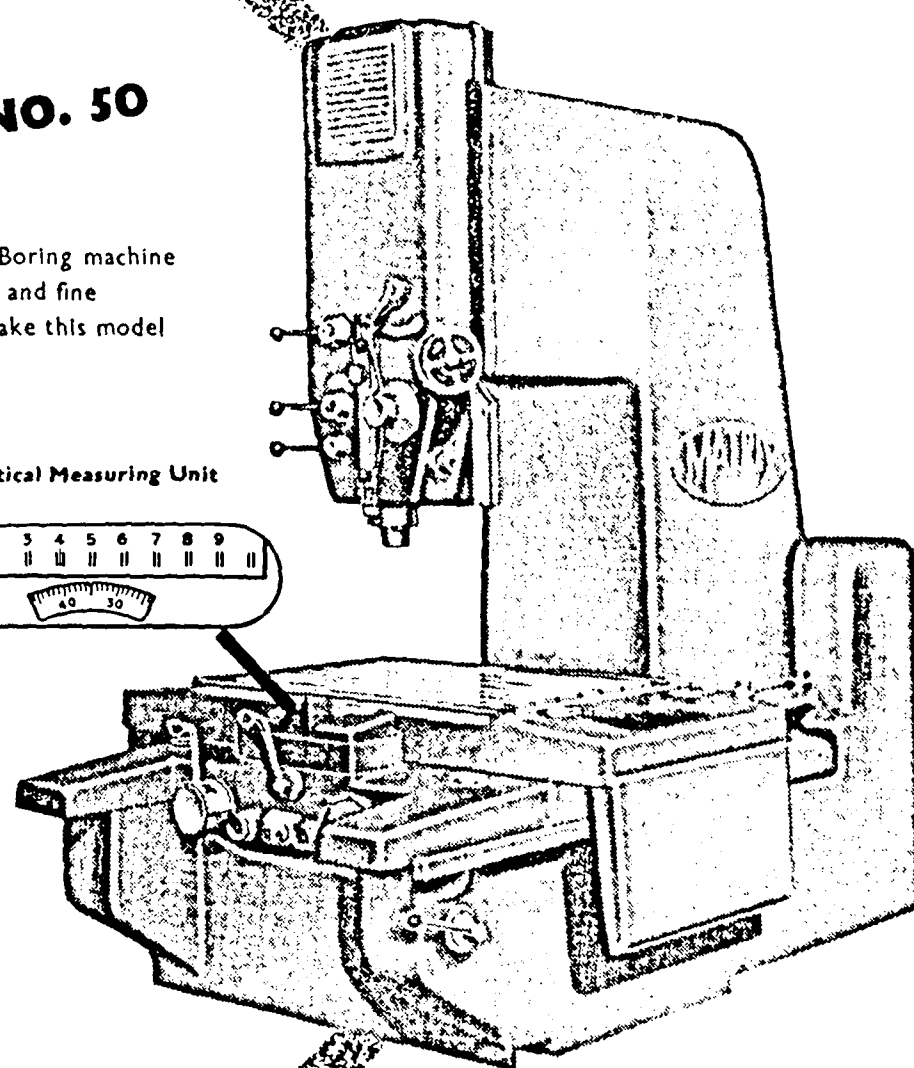
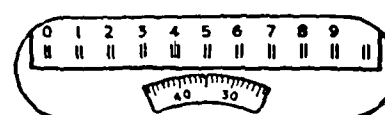
In the Government's Industrial Policy Resolution of April 1956, the cement industry is listed in Schedule "C", i.e., its expansion falls into the sphere of the private sector. The cost of installing new factories, which was about Rs. 40 to Rs. 45 a ton of manufacturing capacity in 1938, is now nearly Rs. 150 a ton, and is still rising. The cost of extending the existing works naturally being lower, the increase in annual productive capacity from 5 million tons to 15 million tons will actually require an investment of Rs. 125 to Rs. 150 crores, against the Planning Commission's original estimate of Rs. 81.5 crores mentioned earlier. In the face of new taxation policies, this is a very high expectation for capital formation in the private sector. Caution is also necessary against a too rapid development of the industry

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Raw Materials

Nature has not blessed this country with anything like inexhaustible supplies of quality limestone evenly distributed over its vast areas. Really good deposits of limestone are to be found in only a few regions, viz., Saurashtra, Madhya Pradesh, Rajasthan and the Deccan. But even these deposits are not nearly as massive or as easy to exploit as the deposits in the United States, England, Japan and many other countries. And coal, which may be considered another important raw material in the manufacture of cement, is also concentrated in the eastern and central regions of the country. This entails long and expensive transport of coal from the coalfields to most of the cement factories. To a lesser extent, the same is true of the transport of cement from the factories, located atop limestone deposits, to consuming centres, although the industry has generally followed the policy of dispersing cement factories as far apart as permitted by the occurrence of limestone deposits. The question is sometimes asked: "Why, in the interests of dispersal, should not some new factories be located on coal deposits, to which limestone could be transported?" The answer is simple. To manufacture one ton of cement, we require about 1 1/3 tons of limestone as against a little over 1/3 ton of coal.

If the industry is to fulfil its production targets, new factories will have to be concentrated in the areas abounding in massive limestone reserves. This will further accentuate the strain that the expansion of the cement industry will place on our already overburdened transport system which may well become even more of a bottleneck. However, the Government is fully alive to the problem, and much has been done, as a first step, to rationalise wagon movements.

One manner of dispersal—but at a price—is to locate factories on deposits which, though quantitatively satisfactory are qualitatively deficient, by resorting to beneficiation of limestone by flotation or other processes, thereby making it suitable for the manufacture of cement. Besides increasing manufacturing costs substantially, such beneficiation processes require special know-how,

and are not so likely to be resorted to for establishing new factories as for prolonging the life of factories which have exhausted their high quality limestone reserves and must needs fall back on lower grades or close down. The A.C.C. is today the only manufacturer in the country which is already operating beneficiation processes—in its Khalari and Sevalia works.

In order to boost output and meet the existing unsatisfied demand, a likely development is the manufacture of what are known as "blended cements". This type of cement is usually produced by intergrinding quantities of burnt clay or pozzolanas, blast-furnace slag, etcetera, along with controlled quantities of Portland cement clinker. Some of these blended cements have qualities which are very desirable from the standpoint of the constructional engineer. But blended cements will have to be made according to strict specifications; otherwise there will be a grave danger of the country being flooded with adulterated cements. In the use of blended cements constructional engineers will also have to improve the technique of concrete mixes.

Labour Productivity and Skilled Personnel

The comparative productivity of Indian labour is known to be low. In the cement industry, the differential is staggering. The man-hours required for every ton of cement manufactured in India are 15 to 20 times the man-hours consumed in Europe or the United States. Therefore, though Indian labour is paid less, the labour component in the cost of manufacture is higher in India than in western countries. Large-scale mechanisation alone can bring down this cost and save the present wastage of human energy.

In the present period of rapid industrialisation in a fast-expanding economy, a serious shortage of skilled personnel faces all industries and Government projects. This is particularly true of the cement industry because there are certain special techniques, e.g. kiln burning and tube mill grinding, which can only be acquired by training in a cement factory itself. The industry will, therefore, have to depend largely on its own resources to meet its growing need for skilled hands.

In recent years, there has been a steady rise in the cost of coal, rail freight, cesses, royalties,

etcetera, over none of which has the industry any control. There has also been the inevitable rise in wages, which is to be welcomed if the expansion of the economy is not to remain something hollow and meaningless for the working man. As mentioned earlier, the cement industry has absorbed these high cost factors and managed to maintain the same price level since 1948. This the industry has been able to do only by continually increasing its efficiency. But there is a limit beyond which increases in costs cannot be absorbed by any industry, however efficient. Under a directive of the Government of India, the Tariff Commission is, therefore, now engaged in examining the question of revising the price payable to cement producers. The price structure of cement is presently as follows:

Price of bulk (unpacked) cement paid to the manufacturers	A ton	
	Rs. 54.50	
Packing Charges	Rs. 13.44	
Marketing Expenses	Rs. 1.50	Rs. 69.44
Average Freight (estimated)		Rs. 14.00
Excise Duty	Rs. 20.00	
Profit to the State Trading Corp., on indigenous cement	Rs. 14.06	Rs. 34.06
Total		Rs. 117.50

In addition, the consumer has to pay sales tax and general tax amounting to approximately Rs. 7 a ton. In as much as the increase of excise duty from Rs. 5 to Rs. 20 a ton, effected by the recent Budget, has added to the price of cement over and above whatever rise the Tariff Commission may deem it necessary to recommend, it may well have a deterrent effect on future demand.

This, in short, is an account of the Indian cement industry, an industry which is an excellent example of free enterprise—a well-balanced industry, regulated by and, in its turn, regulating the interests of consumers, workers and investors. The many problems of the future present a challenge which the industry, given a little encouragement, will endeavour to meet with determination and confidence.



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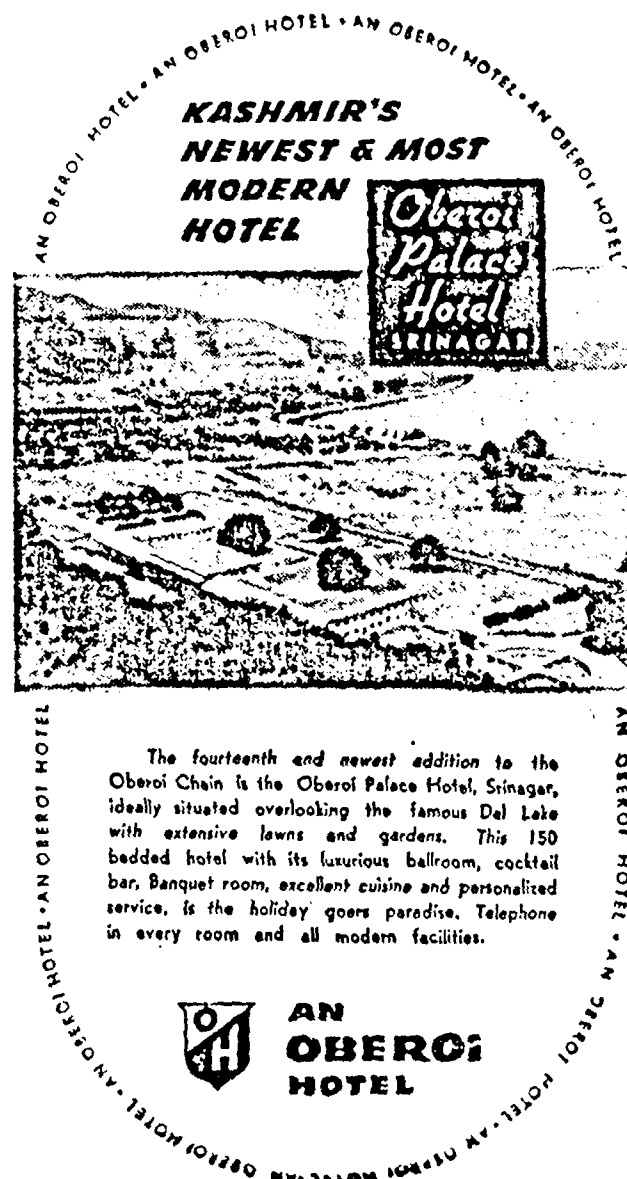
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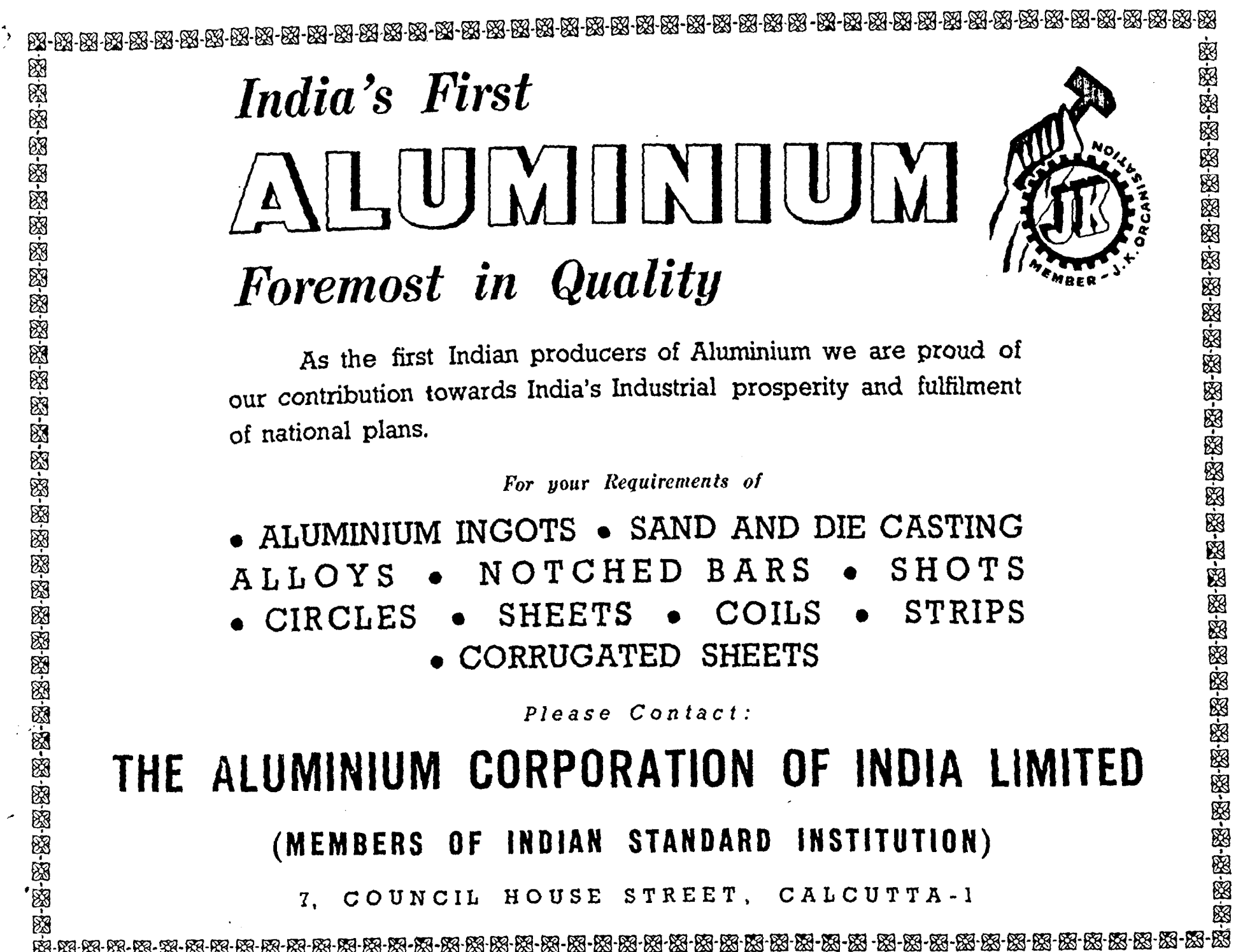
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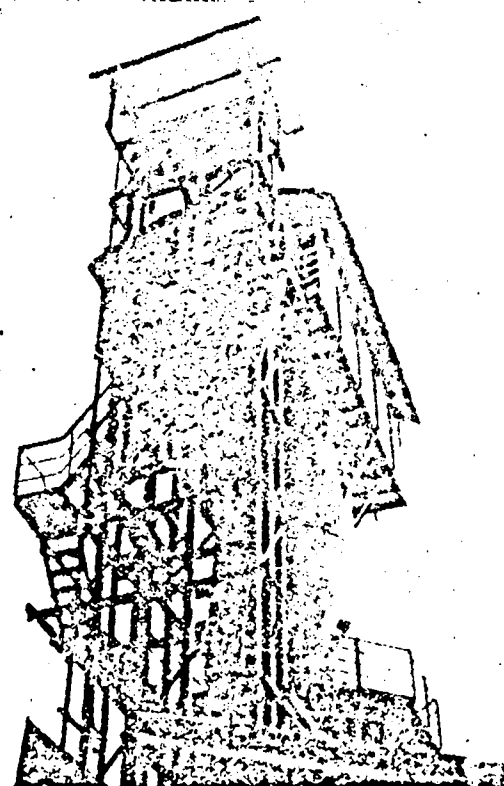
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EXPANSION OF THE ALUMINIUM INDUSTRY

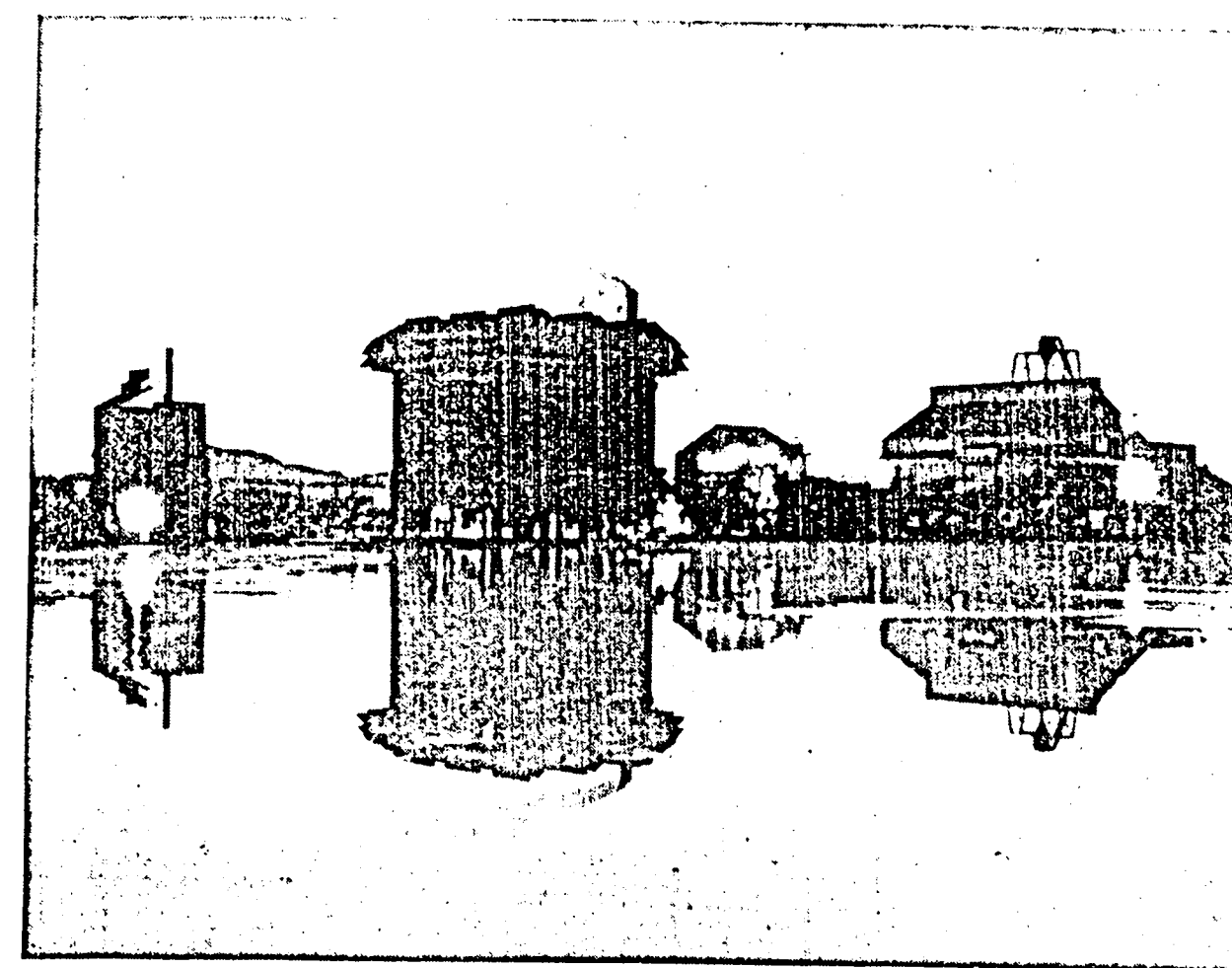
LARGE CAPITAL INVESTMENT NECESSARY

• By MAHESH CHANDRA •

It is axiomatic that industrial development in India should have two objectives: first, to secure self-sufficiency in essential commodities, and second, that these commodities should be produced at a sufficiently low cost, without which a rise in the standard of living will not be possible. India's present production capacity of primary aluminium is 7,200 tons a year, compared with an estimated aluminium consumption of 27,000 tons in 1955 and estimated demand of 35,000 tons by 1958. Part of the gap between production and demand will be filled when metal from the Indian Aluminium Company's new 10,000-ton capacity smelter in Hirakud, Orissa, is available towards the beginning of 1959. Various proposals are being considered for reducing the remaining inadequacy of production, and to achieve the target of 30,000 tons capacity in the second five year plan. More production will help the country attain self-sufficiency in aluminium, but unless production costs are also lower, it will defeat the goal of raising the standard of living of the people. The problems of expansion of the industry may be described briefly with this in view.

Dominating Feature

The dominating feature in the economics of the aluminium industry is the large investment required in fixed capital assets and the heavy charges that are involved in the form of depreciation and the cost of obtaining money. The magnitude of these charges can be gauged from the fact that whereas in the steel industry the capital cost is approximately Rs. 1,000 a ton of annual capacity, in the aluminium industry it represents about Rs. 10,000 a ton of capacity. Thus for an integrated aluminium smelter of 10,000 tons capacity, the capital cost would be of the order of Rs. 10 crores; depreciation at an average of 8 percent of Rs. 10 crores would amount to Rs. 800 a ton and the cost of obtaining money at 8 percent—which is the average for commercial concerns—on Rs. 10 crores would amount to another Rs. 800 a ton, making total capital charges of about Rs. 1,600 a ton of metal produced. In recognition of the overwhelming importance of capital charges, present-day expansion in the major aluminium producing countries of the world is taking place in units where the economies of large-scale production can be achieved. This tendency towards large production units is illustrated by the fact that Russia produced over 200,000 tons of aluminium in 1952 with only four works, while north America, at the



A general view of an alumina works in Muri, Bihar

end of the same year, had a production capacity of 1.7 million tons with 20 works, i.e., an average of 85,000 tons a plant.

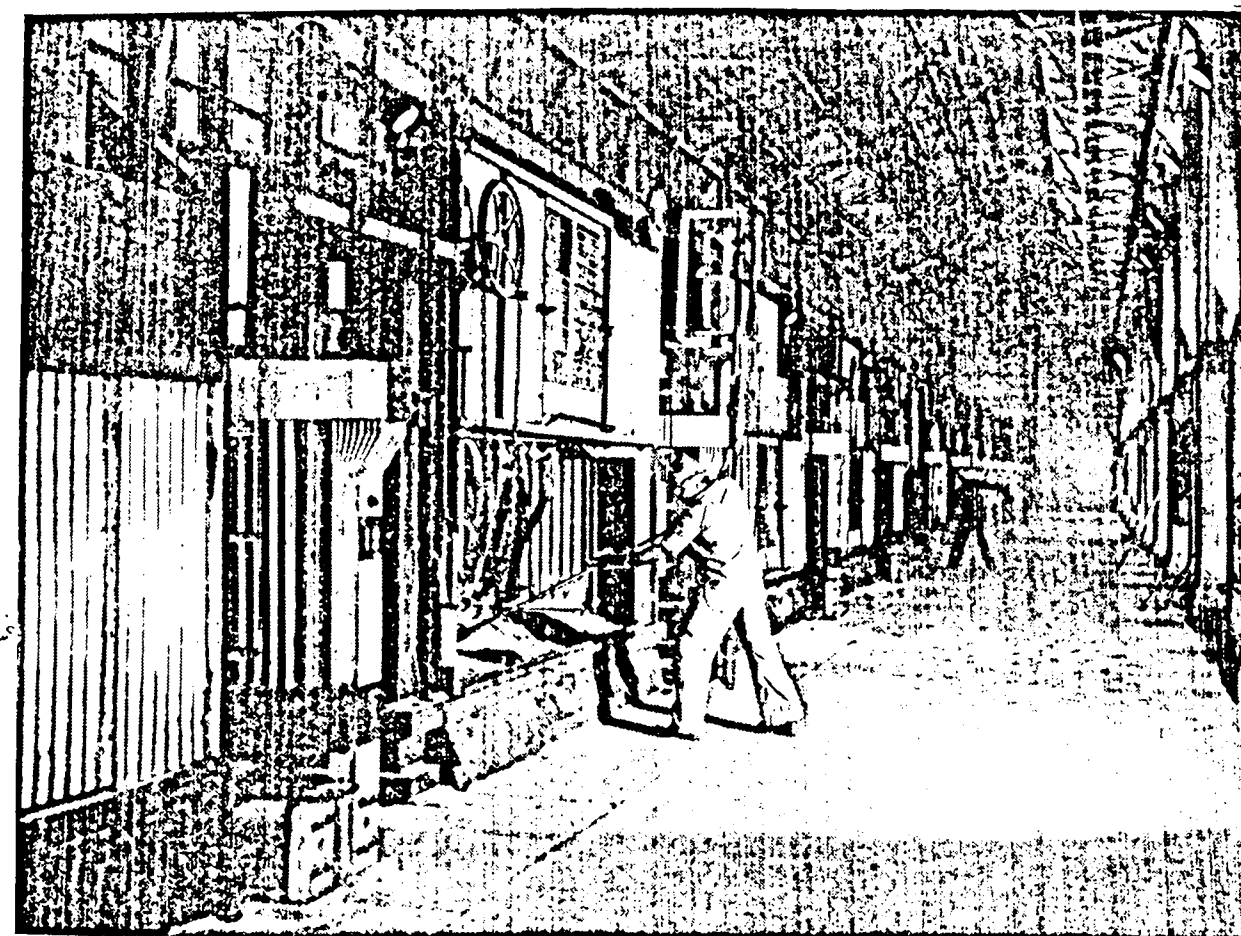
The expansion of an existing unit is generally cheaper in terms of capital cost than the erection of an entirely separate unit to achieve the same increase in production capacity. Compared with an initial capital cost of about Rs. 10 crores for integrated facilities to produce 10,000 tons of aluminium a year, expansion of the facilities at the same location to 20,000 tons of annual capacity would cost only an additional Rs. 5 crores. Thus, for a further increase of 10,000 tons in aluminium

production capacity in the country, the capital charges in the expansion of an existing unit would amount to Rs. 800 a ton, while the charges would be twice as much at any new location.

Electric Power

An aluminium smelter of 10,000 tons annual capacity requires about 25,000 kW of electric power for operation. The importance of an uninterrupted supply of power—available in large blocks—for the efficient and economic operation of an electro-metallurgical process, such as is employed for the production of aluminium, cannot be over-emphasised. For minimum power costs and to avoid power interruptions, it is necessary to locate aluminium smelters as close as possible to sources of cheap hydro-electric power. For this reason, the proposals being advanced for the expansion of the aluminium industry appear to centre on the utilisation of the power which is expected to become available from the Hirakud, Mettur and Rihand hydro-electric projects. In the relatively advanced industrial countries, the availability of electric power and proximity to centres of aluminium consumption have enabled the development of an aluminium smelting industry, even though bauxite or alumina has to be obtained from distant sources. The presence of "metal grade" bauxite, i.e., bauxite suitable for aluminium extraction near sources of electric power within the same country, is an advantage.

"Metal grade" bauxite should have, as a rule, a minimum of 45 percent available alumina (aluminium oxide) content, and should also be low in "reactive" silica content. The lower the available alumina content, the larger the quantity of bauxite that will need to be mined and the larger the processing plants that will be required for the desired quantity of alumina. The higher the "reactive" silica content, the larger the loss of alumina and consumption of soda ash during the process of eliminating the silica impurities. Production costs are also affected by the extent of "overburden" of humus sand, clay, or hard laterite covering the layers of bauxite, which requires to be stripped before the bauxite can be mined. A 10,000-ton aluminium smelter should have access to reserves of at least two million tons of metal grade bauxite, to enable it to operate for 40 years. India's estimated reserves of 25 million tons of "metal grade" bauxite are reported to be distri-



A pot line at an Aluminium reduction works in Alupuram, near Alwaye, Kerala.

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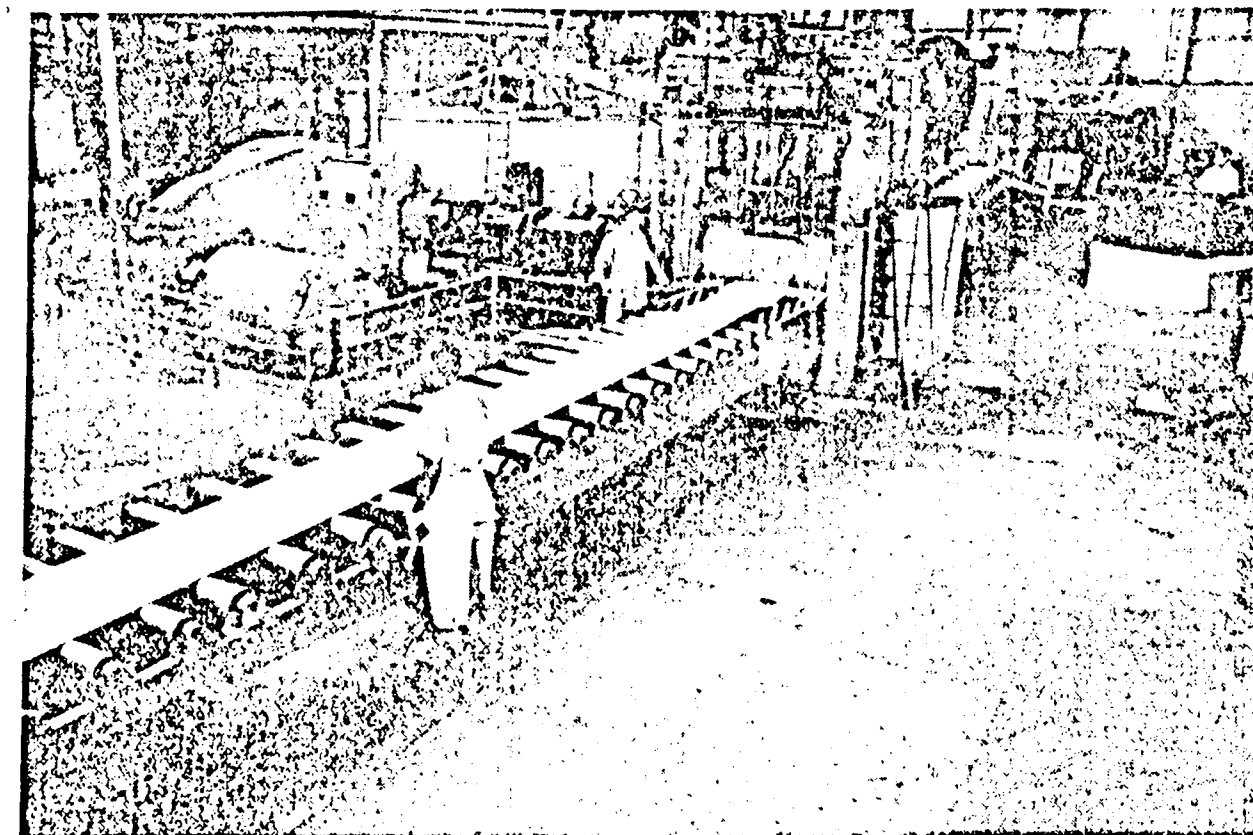
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The hot mill fitted with a reversible drive in an aluminium rolling mill in Belur, near Calcutta

buted as follows: Bihar 9 million tons; Madhya Pradesh 9 million tons; Bombay 3 million tons; Madras 2 million tons; Kashmir 2 million tons. Present information indicates that bauxites in Bombay are scattered over a wide area, and are also not of uniform quality. The quality of the Kashmir bauxites and their relative inaccessibility makes their exploitation difficult. Bauxites in Madras are reported to contain a relatively large proportion of "reactive" silica, but are otherwise suitable and are found in the form of surface deposits, thus requiring very little stripping of "overburden". Bihar and Madhya Pradesh contain the largest and most concentrated deposits of bauxite, but almost two tons of "overburden" require to be removed for every ton of bauxite mined

in the case of the deposits being exploited at present.

Plant Design

The production of aluminium is carried out in two main stages. The first stage involves the processing of bauxite in an "alumina plant" to extract alumina or aluminium oxide and to separate it from the impurities. The second stage accomplishes the separation of aluminium from aluminium oxide by electrolysis, in what is known as a "reduction plant" or smelter. Every alumina plant has to be designed according to the quality and type of the bauxite it is called upon to treat, and it might take considerable time before bauxite deposits are surveyed and the proper and most efficient design for a plant for extracting alumina from a

particular type of bauxite has been determined. The designing of a reduction plant poses no comparable problems, but work is being carried on to improve designs according to experience.

Alumina Works

In India, we have alumina works designed to use bauxite from the Ranchi (Bihar) deposits, but if it were decided to exploit bauxites of different quality, the designing of the plant would take time and would need to be entrusted to persons with recognised experience in this field. In an aluminium reduction plant, the importance of trained personnel is paramount. Whereas the operations at an alumina plant can be controlled to a considerable extent by the application of scientific principles and by standardisation of practices, the tending of "pots" or electrolytic cells in a reduction plant is still largely an art in which the long experience of skilled personnel plays a decisive part. When pots become "sick" or "dirty", the terms themselves indicate the nature of the "know-how" required to bring them back to normal, and if pot "failures" occur, it can cause severe disturbance to operations and result in increased costs. Whether it is in the lining of pots, or in the pouring of metal to get the right composition of alloys and properties, considerable experience and skill is required. There is already a nucleus of experienced and trained personnel in the two aluminium companies operating in India; but for the substantial expansion of the industry, a commensurately large number of trained personnel will be required. For the training of Indian personnel, and to maintain the level of technological advance in the industry, it will be necessary to maintain connections with other aluminium producing countries which are devoting large resources to research and development in the industry.

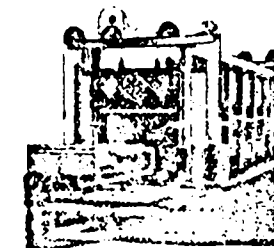
There is considerable scope for the expansion of the aluminium industry in this country; but there is need for careful investigation and consideration of the various factors involved, before decisions are taken as to how the expansion could best be achieved. The principal factors to which importance should be attached are the availability of hydro-electric power in quantity, regularity and at a cost conducive to economic smelting operations, the accessibility of adequate reserves of suitable quality bauxite, the availability of plant design, operating technique and personnel training facilities, and last but not least, the speed with which various alternative schemes for expansion can be brought to fruition.



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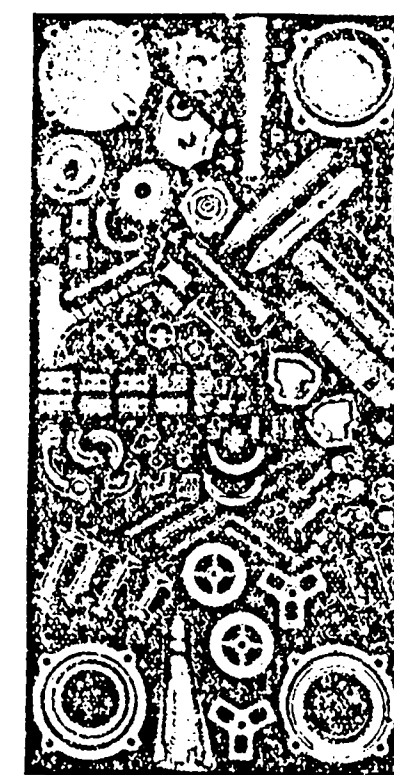
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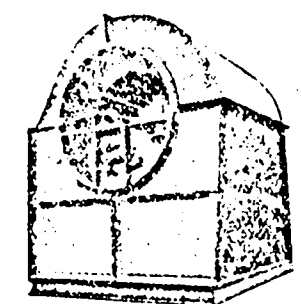
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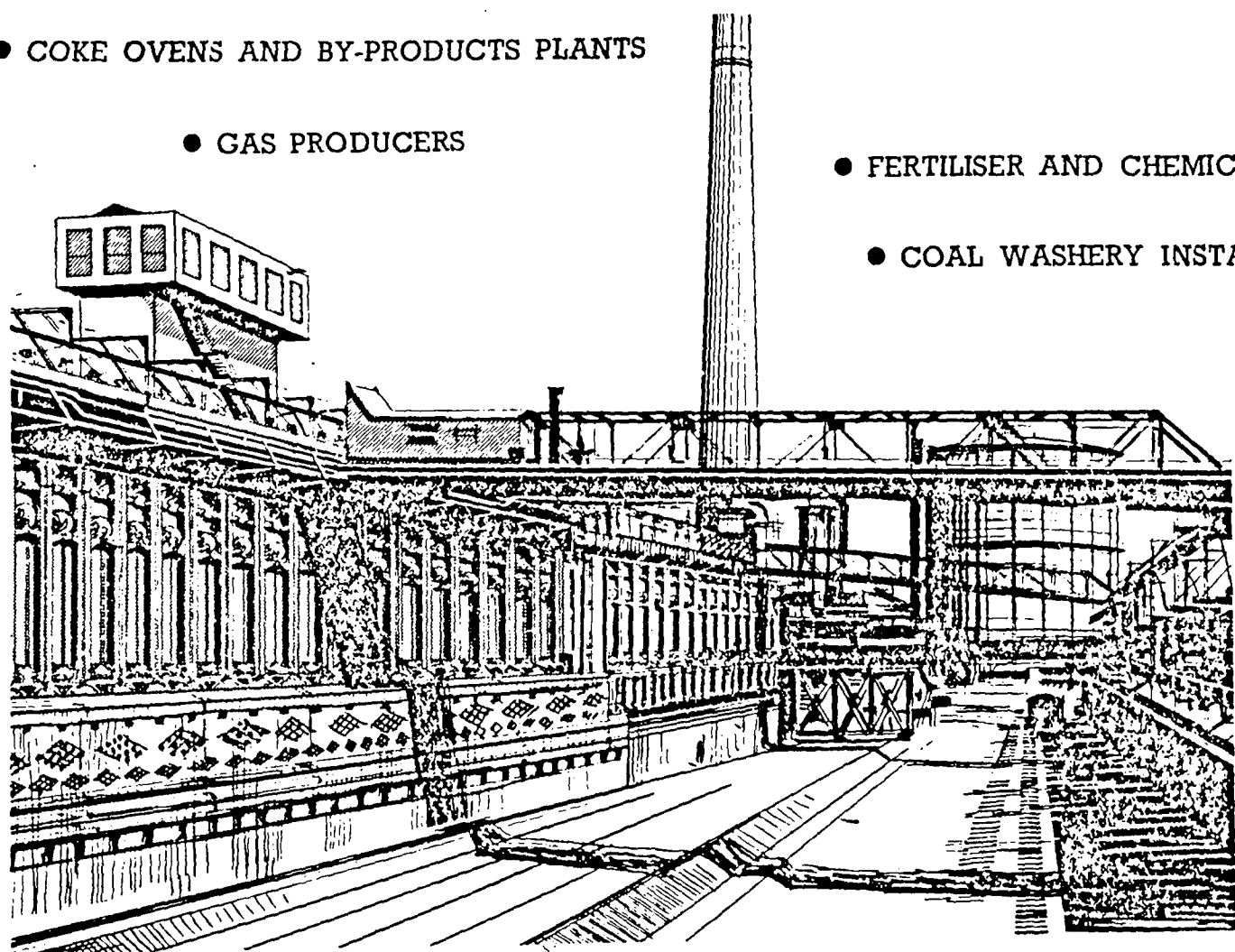
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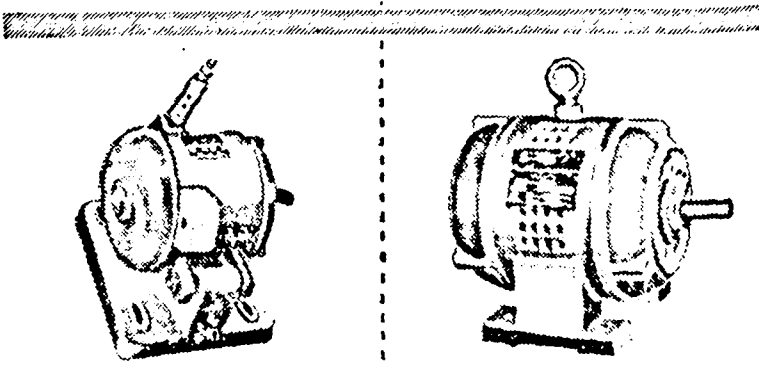
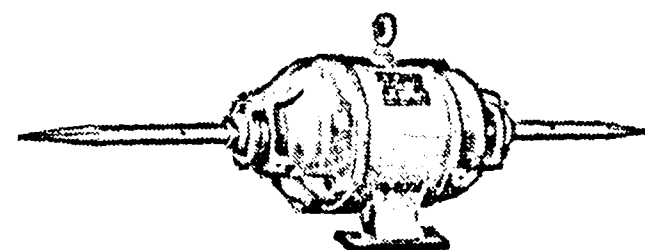
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BASIC PROBLEMS OF COPPER MINING

IMPORTANCE OF THE SEARCH FOR NEW DEPOSITS

● By A CORRESPONDENT ●

INDIA is not so fortunate as to have abundant deposits of copper. The only known workable deposits are in the Singhbhum copper belt in Bihar. That is why only one unit has been manufacturing this metal so far. At present, the annual production is about 7,200 tons while demand is estimated at over 30,000 tons. With electrification plans and the rapid development of industries, it is expected that the demand for copper will steadily increase. It is estimated that utensils and hollow ware will need an annual supply of 8,000 tons; electrical cables and wires about 12,000 to 15,000 tons; and defence, railways and other miscellaneous establishments about 5,000 to 7,000 tons. Because production has fallen far short of demand, imports have amounted to 5,798 tons in 1951-52, 20,590 tons in 1952-53, 8,532 tons in 1953-54, 26,979 tons in 1954-55 and 18,122 tons in 1955-56.

The main problem in increasing copper production is to find new deposits. The Government has said that if sufficient reserves are available, it will consider setting up a plant with a capacity of 10,000 tons a year. The most promising site so far is the Khetri mines in Rajasthan. The Ministry of Natural Resources and Scientific Research has undertaken a systematic examination of areas such as Dariba in Alwar, the Hazaribagh district of Bihar, the Garhwal district of U.P., Sikkim, Ananthapur and Nellore districts. The discovery of fresh deposits in these areas might go a long way towards justifying the establishment of an additional plant. But until prospecting operations are completed and sufficient reserves of ore, which can be commercially exploited on a large scale, are found, it will be difficult to undertake planning for the establishment of new units. Furthermore, it is because there are few new proved deposits of copper ore that the planners have been unable to fix any target of production.

Production Statistics

Manufacturers have appreciated their responsibility in increasing production to meet the rising demand for copper. The total output of the Indian Copper Corporation Ltd. was 7,083 tons in 1951, but fell to 6,079 tons in 1952 and to 4,920 tons in 1953 (because of a three months' strike). It rose to 7,161 tons in 1954, 7,281 tons in 1955 and 7,628 tons in 1956. The Corporation, which is the only substantial producer, has launched an extensive programme of prospecting. Its chairman has said: "This expansion programme is aimed at increasing considerably the present output of the mines, and while no immediate results can be anticipated, it is hoped, provided the results of the present exploration are satisfactory, that by the end of the present plan your company will have substantially contributed towards making India less dependent on imports of this important metal."

The Bronze Age

Copper is one of the most essential metals used by man, dating to probably before the Bronze Age. Ample evidence still remains in many countries of the world that the mining and smelting of the ore was extensively carried out in those days. The ancients who carried out the operation of exploring the copper lodes were undoubtedly skilled in their craft. Judging by present-day standards, they appeared profitably to mine and smelt a lower grade of copper ore than is possible today, although this must have fitted in with the conditions existing then. Throughout the world, copper occurs principally in the form of sulphides, carbonates and oxides and in certain areas as "native" copper. But the metal is mostly smelted from sulphide ores. The origin of almost all known copper deposits is closely connected with igneous rocks having—according to geologists—invariably been deposited in situ by uprising solutions penetrating the earth's crust. These chemical solutions have in their travels collected other metals and it is not uncommon to find gold, silver

and other rare metals associated with copper ores.

Prospecting for copper is little different from prospecting for other minerals, and entails careful research. But, unlike a large number of minerals, once a copper deposit has been located, to prove its commercial value requires large financial commitments which are highly speculative. This is true of practically all the deposits in India, which occur in veins formed along fissures or shear zones where drilling, the normal method used for proving minerals underground, is of little use.

Areas of Deposits

Copper deposits in India occur in widely separated districts including the Andaman Islands, Assam, Bengal, Bihar, Bombay, Madhya Pradesh, Hyderabad, Kashmir, Madras, Mysore, Punjab, Rajputana and Uttar Pradesh, with neighbouring areas in Bhutan, Nepal and Sikkim. The majority of these areas are merely of mineral interest, the more likely ones being as follows:

Assam: Copper was at one time mined in the south-east corner of Manipur district.

West Bengal: Copper minerals disseminated in slates and schists have been mined by primitive methods in and around the foothills of the Himalayas at such places as Komai on the left bank of the Mo Chu and in Pastok in the Darjeeling area; in Mangphu on the left bank of the Tista, together with other areas around Kalimpong. Other small deposits are to be found in the Bankura district.

Bihar: With the exception of the Singhbhum belt, which will be described later, copper deposits occur in the Giridih sub-division of Hazaribagh district, in the Santal Parganas district in Bharrukhi and Budhbandh and in the Manbhum district in Punda and Kalyanpur.

Central India: Old copper workings may be seen in Indore State and deposits of copper minerals occur in Jubbulpore district in Sleemanabad, Nirvar and Narsinghpur.

Kashmir and Jammu: There are a large number of occurrences of copper minerals in Kashmir and Jammu, the more important being in Shrimahal near Hapatnar in the Kashmir Valley, and Gainti in the Riiasi district but little prospecting has been done because of inadequate transport facilities.

Madras and Mysore: Old copper workings on an extensive scale are to be seen in Nellore, Bellary, Cuddapah, Kurnool, Trichinopoly and Biligiri.

Sikkim: There are a large number of known deposits of copper minerals in Sikkim and the existence of lodes of possible value proved, but the main obstacle to a successful exploration is the inaccessibility of the deposits and the lack of adequate communications. The more important occurrences are in Bhotang, Dikchu, Rhotak, Sirbong, Rachikhani and Pakyong.

Exploration of Lodes

Over the last century the exploration of copper lodes in India has for all practical purposes been confined to the Singhbhum belt in Bihar. This copper belt exists on the south side of the Subarnarekha river, starting at a point approximately 15 miles south of Ghatsila on the Eastern Railway (135 miles from Calcutta) and extending in a north-west direction to Kharswan in the Saraikala district of Bihar. Although the general direction of the belt is north-west by south-east, the deposits are not usually in line or continuous, making mining operations and location difficult. The deposits in the Mosaboni mines occur in a narrow thrust zone in soda granite, somewhat chloritised, itself is in granitic schist, somewhat chloritised. The width of the lode varies from a few inches up to sometimes 25 feet, but the average is approximately 5 feet. The mineralisation consists of

chalcopryite, pyrite with some quartz, a little pyrrhotite and occasional apatite. There are two parallel lodes or ore bodies which dip at approximately 30 degrees from the horizontal.

There is ample evidence that large movements of the earth's crust have taken place in the Singhbhum belt, producing what are geologically known as "overthrusts", forming "shears" in the rock structures which made it possible at some places for copper-bearing solutions emanating from great depths to make their way upwards in these pervious sheets to the earth's surface depositing, chiefly by the replacement of other minerals, the copper on the way up. The existence of the Singhbhum copper belt has been known for many years and a number of mines were started towards the end of the last century and the beginning of this. Little success attended these efforts and the only mine to produce copper before closing down was the Raka mine and this only to the extent of a few hundred tons. It extended to a depth of 800 feet from the surface and it gave some limited information as to the behaviour of the copper lodes at moderate depths in this area.

Birth of Indian Copper

In 1920, a company took an option on an area known as Mosaboni in the Singhbhum copper belt. This company exercised its option in 1924 and after reconstruction the Indian Copper Corporation was formed, which commenced exploration of the copper lodes in the area. Development continued and in 1927 a concentration plant and smelter were erected, resulting in the actual production of copper being achieved in 1928. The mining and refining of copper ore continues and since the commencement of operations in 1929 to the end of 1954 a total of 8,210,457 short tons have been treated, giving a production of 149,742 long tons of refined copper. The average grade of the ore treated throughout these years was 2.183 percent copper. Within the Mosaboni area, the Corporation has operated three mines known as Mosaboni, Badia and Dhubani, although the latter has in recent months become exhausted and has closed down. The Mosaboni and Badia mines on the same line of lode adjoin one another and underground workings extend a horizontal distance of approximately 2½ miles, where it is possible to walk from one end to the other without the necessity of coming to the surface. The workings of these two mines up to the end of 1954 extended to a vertical depth of over 2,200 feet from the surface and development, although restricted latterly, is proceeding to greater depths. The method of working employed is similar to that practised by other large modern metalliferous mining projects, where somewhat similar conditions are found, throughout the world. The Corporation's production is fire-refined copper with a purity of 99.35 percent copper, the remainder being impurities, of which nickel forms the greater part.

Manufacturing Process

The major portion of the copper production is utilised by the Corporation for the manufacture of hot rolled and cold rolled yellow metal sheets for the utensil industry. In the foundry, copper and zinc are melted together in low frequency induction furnaces and the brass thus produced is cast into blooms in water cooled moulds. The blooms, after scraping, are sent to the rolling mill, where, after being heated, they are broken down in the "roughing" mill into "plates". These in turn are reheated and given an intermediate rolling in the first "finishing" mill, and after further re-heating, the hot rolled production is finished in the second "finishing" mill to the requisite gauge. The same mill also provides blanks for the Corporation's four-high cold rolling mill, which produces lightweight sheet to a closer tolerance in gauge and better surface than the hot rolled product. After annealing, the sheets are sheared to size, that is, four feet square, pickled and sent to the store.

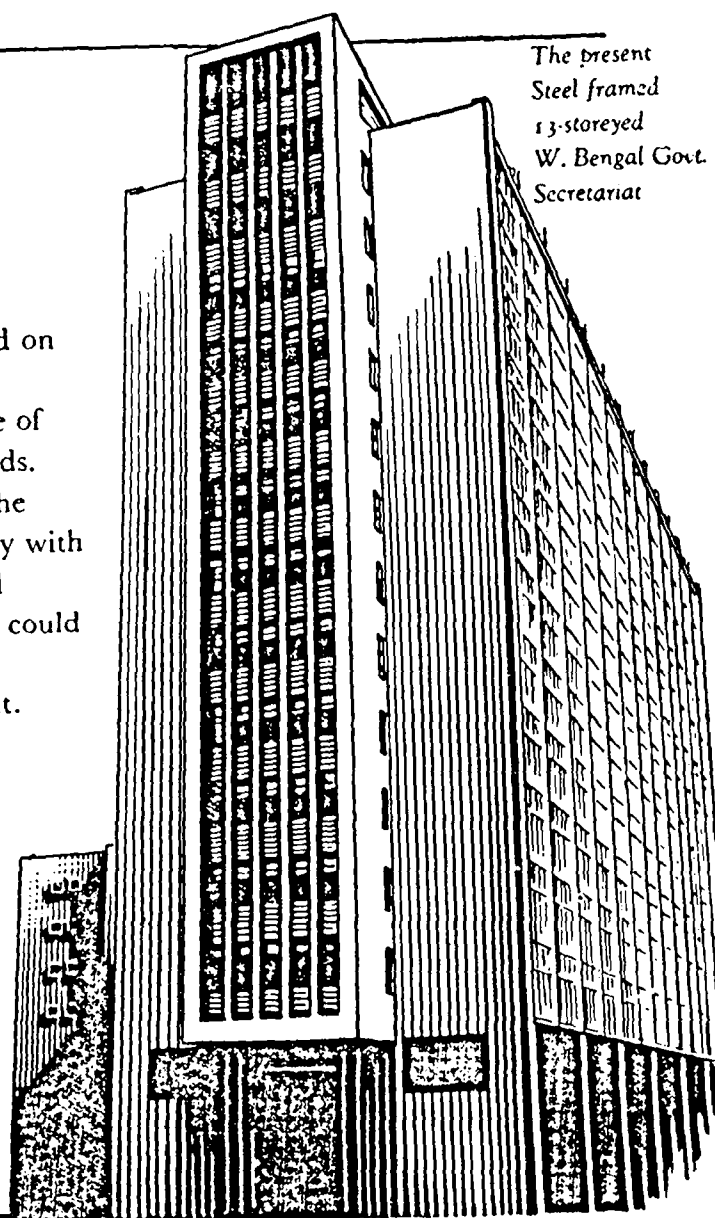
"Where now the city stands,
there was once naught but the city's site." OVID

Calcutta

On August 24 1690, when Job Charnock stood on the banks of the Hooghly, he saw before him a depressing landscape of mud hovels, swamps, and paddy fields. On that very site has risen in the course of the years a pulsating city with heavy industry, modern transport and busy docks—a metropolis which could have made little progress but for STEEL—thousands of tons of it.



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where they are inspected, classified and packed for distribution to customers through the metal markets of Calcutta, Bombay and Madras. The hot rolled product is used predominantly in the cottage industry, where the hand-made utensils are produced by hammering, while the light-weight cold rolled sheet is consumed by the utensil factories employing modern presses.

At present, the electrical industries are the major consumers of copper, although their demand for high conductivity electrolytic copper has still to be met from imports. The reason is that copper produced in India is of the fire-refined variety and does not conform to the specifications laid down for high conductivity copper. The indigenous production of copper is mainly used in the manufacture of brass for the utensil industry and other copper base alloys. There is a great necessity, therefore, for the installation of a copper refinery to manufacture high conductivity copper for the electrical industries. The Indian Copper Corporation is thinking on these lines, and has prepared a scheme for the installation of an electrolytic copper refinery. Electrolytic copper refineries are working successfully in such countries as Germany and Italy which have no adequate supplies of indigenous copper. India also does not have adequate supplies, but some think that it will not be difficult to establish a refinery with Government support. The questions of basing the refinery on indigenous copper, and of size and location, will have to be adequately considered before a concrete decision is reached.

Trend of Prices

After remaining at a high level for a considerable time, world copper prices have eased in recent months. But India will still have to spend a considerable amount of foreign exchange to meet her requirements through imports. Prices of electrolytic copper were firm throughout last year on account of the tight supply position in the U.K. and the United States. Labour strikes in some Chilean copper mines and bulk purchases by Western Germany contributed to the firm tendency. Later, France followed Western Germany and purchased large quantities of the metal. Russia took more copper wire from Britain, while a prolonged strike in an American refinery led to a substantial loss of production. Last year, the demand for copper in India was good and prices increased. On the other hand, the demand for brass sheets remained steady, with a less spectacular rise in prices. There is little chance that world demand for copper will decline in the foreseeable future. Although the U.S. Government is reported to be thinking of replacing copper transmission lines by aluminium cables, it is unlikely that world demand as a whole will fall. In her own interests, therefore, India should increase her output; otherwise, the need to import huge quantities each year will mean spending much foreign exchange.

THE PROSPECTS FOR PETROLEUM REFINING

STEPS TOWARDS SELF-SUFFICIENCY

• By J. CHARANJIVA •

TO the oil industry of today goes the credit for the adventure of opening up many of the waste places of the earth. Under deserts, prairies, marshes and seas, there may be oil—oil for lamps, for cooking stoves, for industry, for farming, for the world on wheels, the ships and aircraft of all nations. The oil industry must go out and find new sources of supply to meet an ever-expanding demand. It must drill waste land to dredge the dark and sticky but valuable liquid the earth holds. But this treasure has to be located first. More than a million wells have been drilled for oil during the last 90 years, but only a minute percentage of these exploratory drillings have struck oil. The search for oil is still an adventure—a probe into the unknown.

The petroleum industry is older than many people think. Most histories of the oil industry start from the year 1859, when Colonel Edwin Drake dug the first successful commercial well in the United States. But oil was in fact found and used in various forms in many parts of the world centuries before his birth. Petroleum, largely in the form of seepage oil, was known and used for many centuries in Mesopotamia, Egypt, Persia, China and elsewhere for heating, lighting, road-making and building. Mesopotamia was an important producer and was made the centre of the bitumen industry by Sumerians, Assyrians and Babylonians. In Egypt, small quantities were used for mummification. In the Far East, too, knowledge of the sources of bitumen existed and the seapages of Sumatra produced the first Sumatran crude, which was imported into Holland as early as 1632.

The "golden ages" of the past, though they still attract us despite the passage of time, were not golden ages for all. A golden age for the many depends on finding mechanical means to do the work which was done manually in societies of the past. Machinery requires fuel, and not until the fuel resources to run machinery were discovered did the common man benefit in terms of a saving in toil and sweat. It was coal which made possible the nineteenth century conquest of nature, known as the Industrial Revolution. It produced a network of railways, shipping lines, canals, bridges and many manufacturing processes. The twentieth century has carried the work of the industrial revolution much further but with a new source of power, i.e. oil. It has, among other things, transformed the older means of transport by giving us the automobile and aeroplane. The twentieth century may well be described as the Oil Age. With the growth of the world's population and the expansion of industry, oil is increasingly in demand as a source of energy for heat, light and power. This is shown by the fact that, as against a production of 100 million tons in 1920, world production of oil in 1955 totalled some 800 million tons.

Different Properties

Crude petroleum consists essentially of compounds of hydrogen and carbon known as hydrocarbons, which exist in a great variety of forms depending on the numbers of carbon and hydrogen atoms in each molecule and the way in which the atoms are linked together. They may exist in solid, liquid or gaseous form, and often all three states are found together, but in different proportions in different localities. Crude oils from different sources vary widely in their composition and have widely different properties. In a very broad classification, they may be divided into three main groups:

1. **Paraffin Base Crudes**, which are characterised by a high proportion of paraffin hydrocarbons, including paraffin wax. Pennsylvanian crude is of this type.
2. **Asphaltic Base Crudes**, which contain little or no paraffin wax, but usually asphaltic matter, often in quite large proportions. An example of this type of crude is Venezuelan crude.
3. **Mixed Base Crudes** contain both paraffin wax and asphaltic material in quantity and have some of the properties of both the above. Crudes from the Middle East fall largely into this class though they tend towards class (1).

The function of the refinery is to split up the crude oil into products with commercial value, such as motor spirit, kerosene, lubricating oils, diesel oils, furnace oil and bitumen. This is done by distillation, whereby the crude oil is separated into groups or "fractions" which consist of products differing from one another in boiling range. The crude oil is heated and passed through tall, vertical, cylindrical metal towers known as fractionating columns—a structure often 100 feet high in which unevaporised liquid flows down and out of the bottom as residue while vapours rise up the column. Inside, the tower is divided up into compartments by a series of trays (trays filled with bubble caps) placed one above the other. In these trays are holes through which the vapours from each floor can travel to the one above. The temperature in the towers being controlled—it gets cooler towards the top—the vapours get condensed with liquids at different temperatures. Those with high boiling points get condensed at the bottom floors (trays) and those with lower boiling points get condensed at the tower's top. Distillation in essence separates out the molecules of the crude by size and weight. It can be compared to taking a heap of stones of various sizes and running them over a series of sieves to sift them.

Thermal Cracking

Refining, however, is much more complex than the name implies. The natural yield by volume of products by a simple distillation process like the one described above is unlikely alone to match the demand from the market, so means have to be employed for altering the oil fractions to change the yield and composition. Such processes are also capable of improving the quality and performance of the products, and include thermal cracking (using heat and pressure), or catalytic cracking (using chemical catalysts, usually silica alumina) producing yields of high

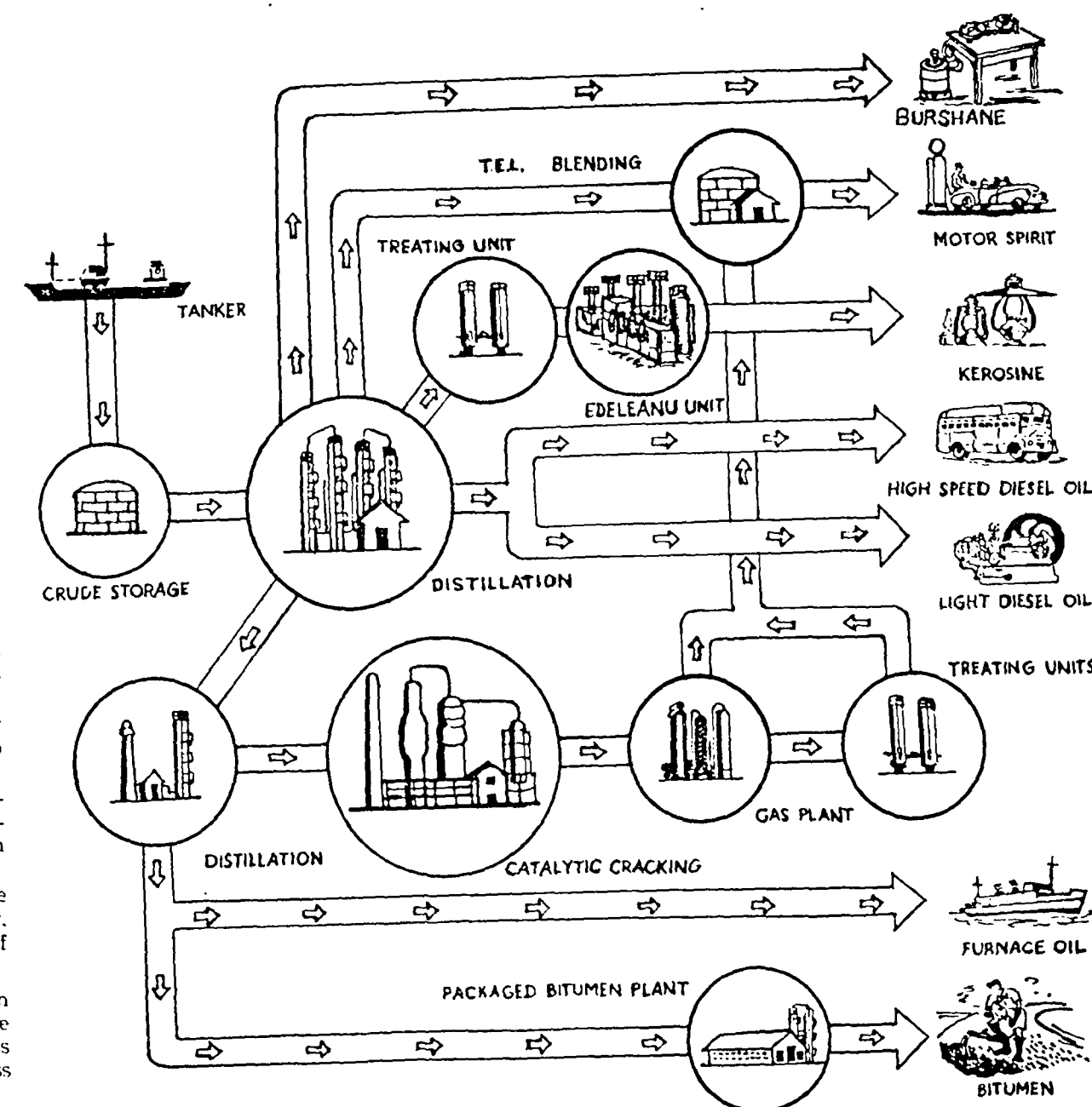
octane gasoline or combinations and variations, e.g., catalytic reforming, polymerisation, etcetera. If distillation can be compared to sieving out stones of various sizes according to the purposes for which they will be used, "cracking" can be compared to breaking up some of the larger stones (e.g. fuel oils) to get more of the lighter ones (the lighter products, e.g. gasoline). Thus, in the course of its journey, the crude oil has been cooked, squeezed, vaporised, cooled, heated again and mixed with various chemicals.

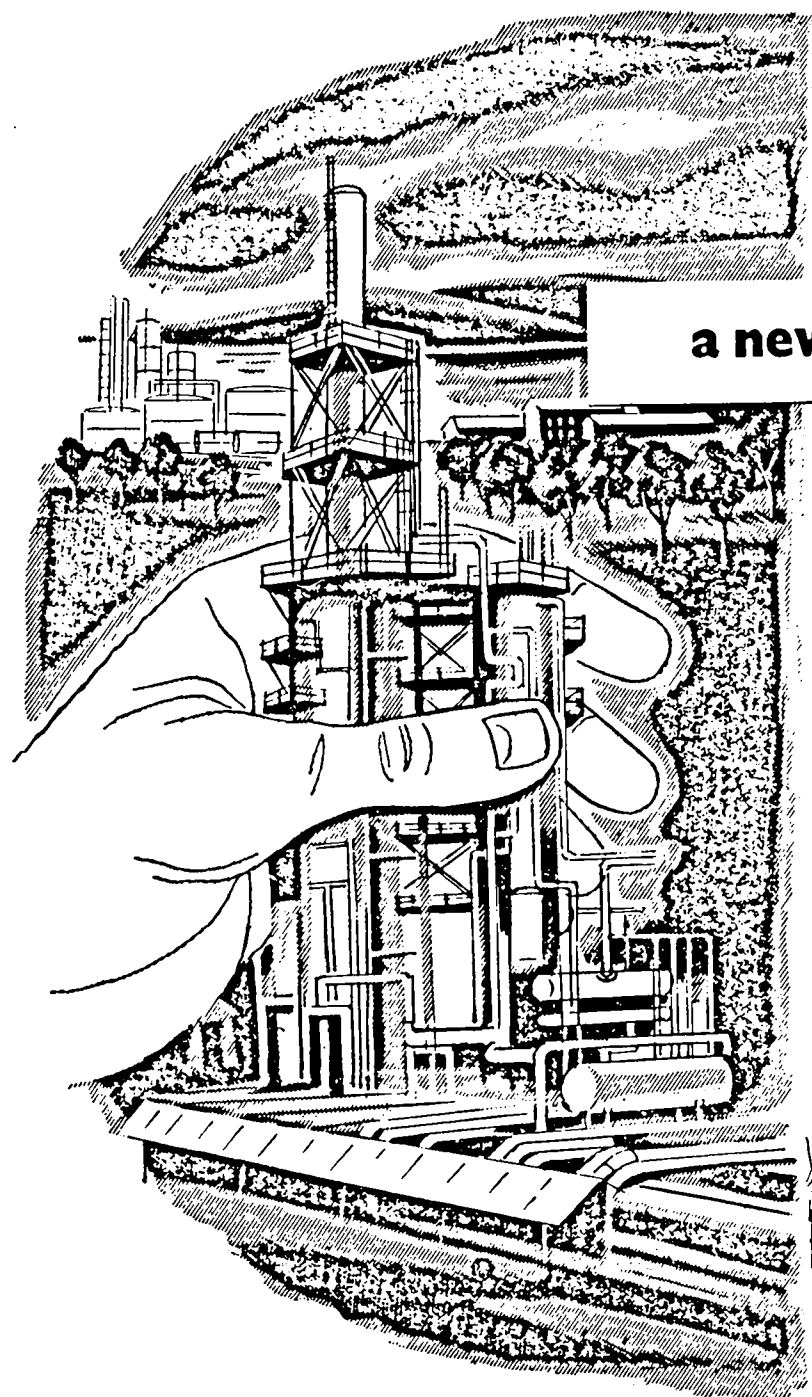
Crude Evaluation

Before schemes for processing crude oil in the refinery can be evolved and processing equipment designed, data has to be collected on the yields and properties of the products which can be obtained from the crude oil. Such an analytical investigation, which is called "crude evaluation", enables the usefulness of a particular crude to be assessed for the manufacture of the required products. A crude evaluation consists, in the first place, of an analysis of the crude oil itself, followed by an accurate laboratory distillation under specific conditions whereby the crude is split into its narrow fractions. These fractions will naturally depend upon the types of crude. A series of further laboratory tests will decide what further processing will be necessary. It should be realised, however, that although the processing possibilities depend to a large extent on the nature of the crude itself, they are also closely connected with market demands and refinery economics. While the proportion of the different products may be varied to a certain extent, there is a limit to the variation and usually a minimum amount of each product must be made.

At the end of the second world war, over four-fifths of the total refining capacity was in the West and nearly three-quarters in the United States. But, since then, new construction in the

A REFINERY FLOW CHART

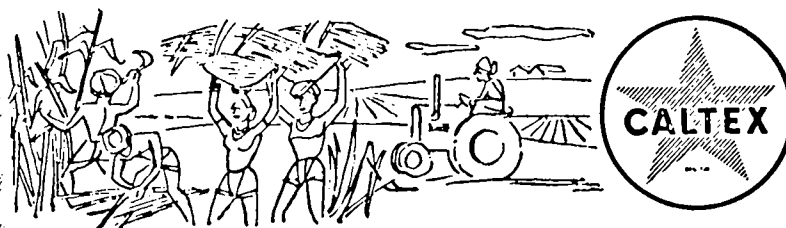




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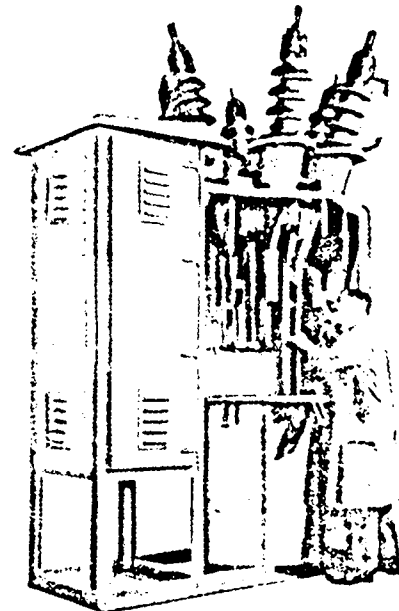
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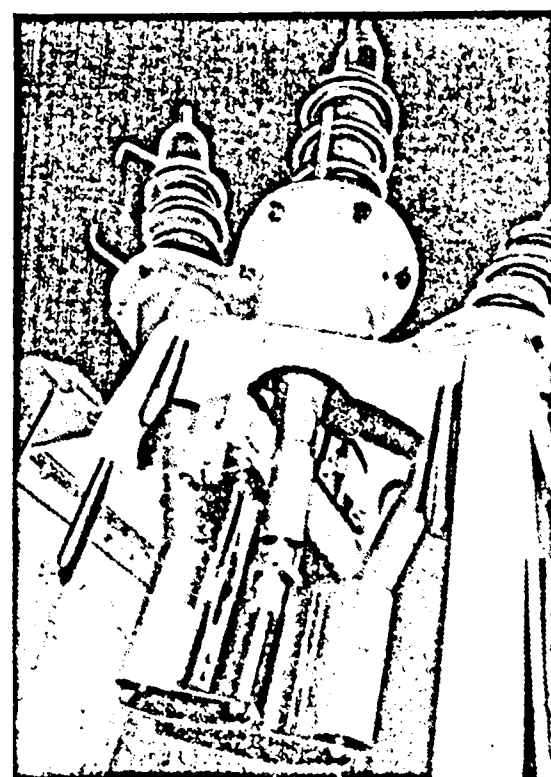
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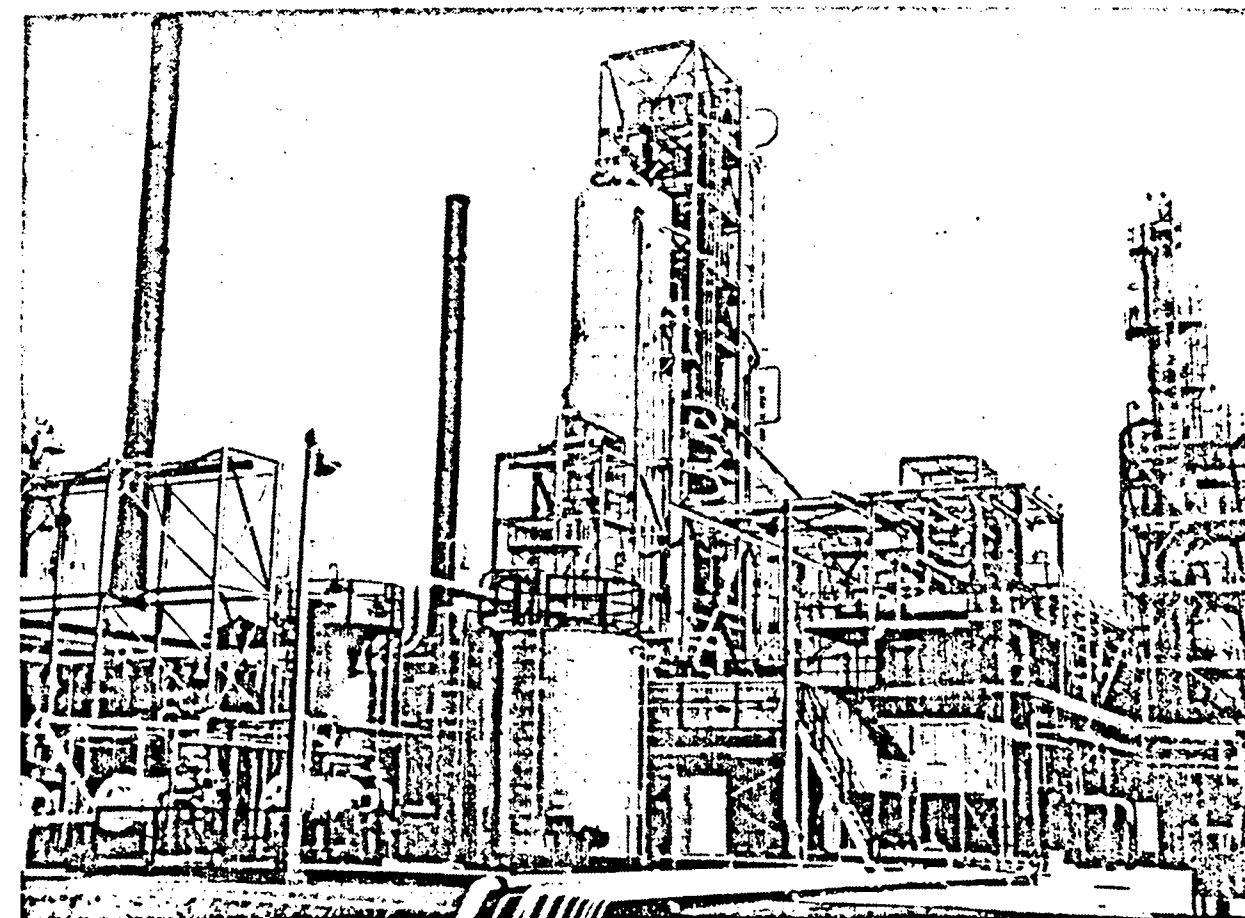
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Eastern Hemisphere has altered the balance. Before the war hardly any country apart from the United States had a consumption large enough or sufficiently well balanced to enable even a small refinery to be built which exactly matched the local market. A single large refinery supplied a number of small and widely separated markets, surpluses in one area being balanced against deficits in another. Transport costs were also thus reduced because oil used as fuel or lost in the refining process did not have to be carried. Before the war, it was the general practice to site refineries near oilfields, the finished products being shipped to consuming areas. Since the war, because of the appreciable growth in the demand, and also because of changes in the pattern of product demand, many consuming markets or a group of neighbouring markets have become big enough to justify a fair-sized and economic refinery. So much of the postwar expansion has been on these lines.

Digboi Refinery

The year 1899 saw the beginning of oil refining in India when the Assam Oil Company, a subsidiary of the Burmah Oil Company, built a refinery in Digboi to process Assam crude. The search for oil in Assam, however, goes back much further. Early pioneers made the first attempt to drill for oil in 1866, when two wells were sunk without success only seven years after Colonel Drake's first commercial well in the United States in 1859. The first well in Digboi was drilled in 1869, since when more and more wells have been drilled—including many unsuccessful ones—to replace the old. Digboi grew from a wayside station into a busy oil town with derricks towering above the tree tops heralding the birth of a new industry in India. The present production from this refinery, which was recently enlarged and modernised, meets about 8 percent of India's steadily increasing requirements of petroleum products. Although the Digboi refinery may be small by world standards (its capacity is approximately 400,000 tons a year), it produces a wide range of petroleum products. In 1947, the Government of India invited the oil companies to examine the possibility of building refineries in India itself. In 1948, a technical party representing five major oil companies came to India to survey the possibilities and suitable locations for the refineries. After a three-month stay, a comprehensive report was submitted to the Government recommending Bombay and Visakhapatnam as the most suitable places for refineries. Following on these discussions, Standard Vacuum and Burmah-Shell indicated their willingness to provide a modern oil refinery each in Trombay near Bombay. Caltex followed suit a little later by offering to construct a refinery in Visakhapatnam on the east coast. The Stanvac Refinery came on stream in the third quarter of 1954, the Burmah-Shell Refineries Ltd. early in 1955 and the Caltex refinery is expected to do so in the second quarter of 1957. The Burmah-Shell refinery is the largest, with a capacity of 2 million tons a year; the capacity of the Stanvac and Caltex refineries is 1.2 million tons and 673,000 tons of crude a year, respectively. The total production from these three new refineries, as also from the Digboi refinery, amounting to over 4 million tons a year is expected to account for a large percentage of India's growing needs, which are at present between 4 and 5 million tons a year of the various petroleum products.



The crude distillation unit at a refinery in Trombay

The construction cost of the Burmah-Shell refinery has come to about Rs. 30 crores to Rs. 31 crores, and that of all the three new refineries (i.e. Burmah-Shell, Stanvac and Caltex) put together to over Rs. 60 crores, a big sum. Most of this represents foreign capital provided by the oil companies concerned. This is an indication of the economic stability of India. Though heavy capital investment is required in retailing oil products to the consumer, this is only a small proportion of the total amount of capital required for exploration, production, refining and ocean transportation. It is estimated that, on an average, the cost for every additional ton of oil required in excess of existing demand calls for an investment of the equivalent of £40 or Rs. 535 a ton, and this cost is rising. In approximate terms, about half this sum of money is required to finance the exploration and production of the oil, and the other half is split between the requirements of refineries, tankers, research and marketing facilities. In general, supplies of oil products have been maintained well ahead of demand in spite of the loss of the Abadan refinery in the past and the closure of the Suez Canal, which had caused a sudden increase in the requirements for tanker capacity due to the increased mileage round the Cape to meet world demand, which keeps growing.

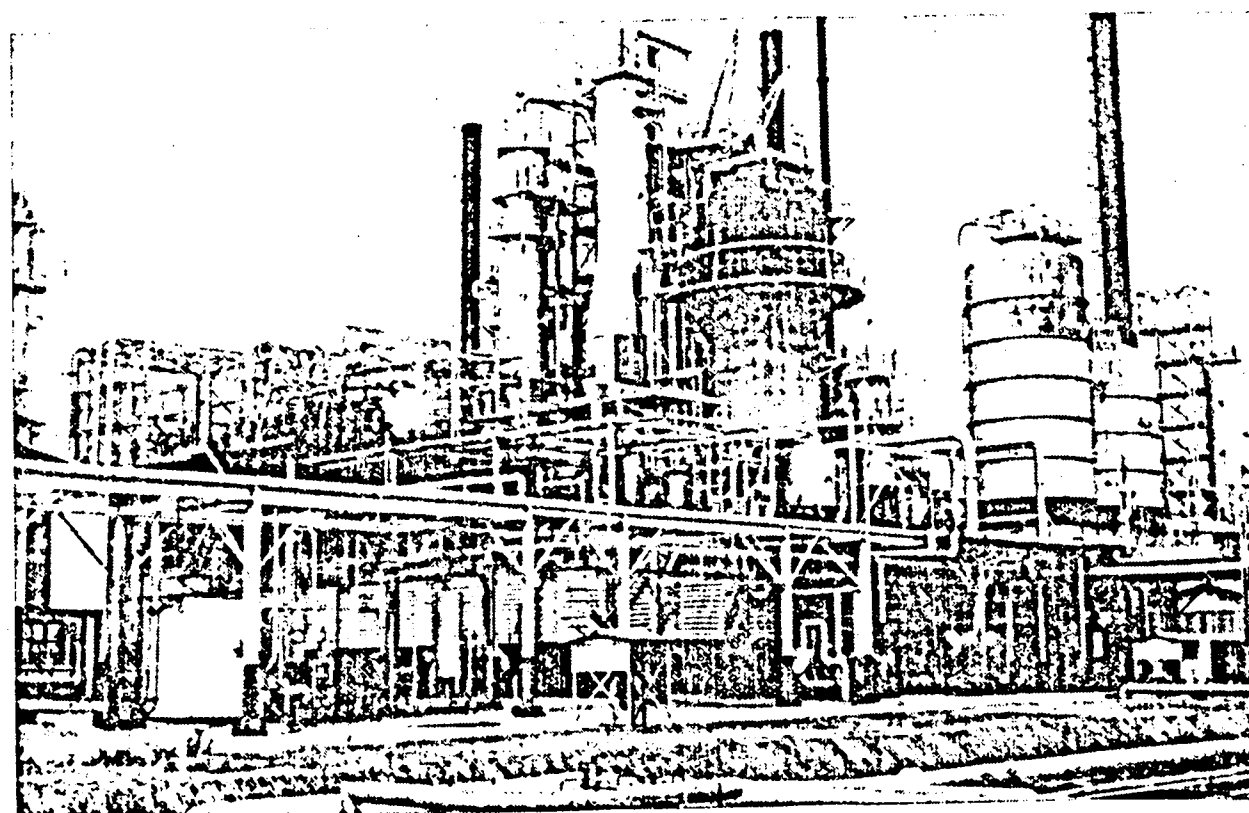
Oil Prospecting

The efforts of the Assam Oil Company to find another oilfield in Assam date from 1911 and in spite of the financial failure in Badarpur field and lack of success at other places, including Masimpur in the Surma Valley where prospecting for 20 years produced no oil, the search for oil, which

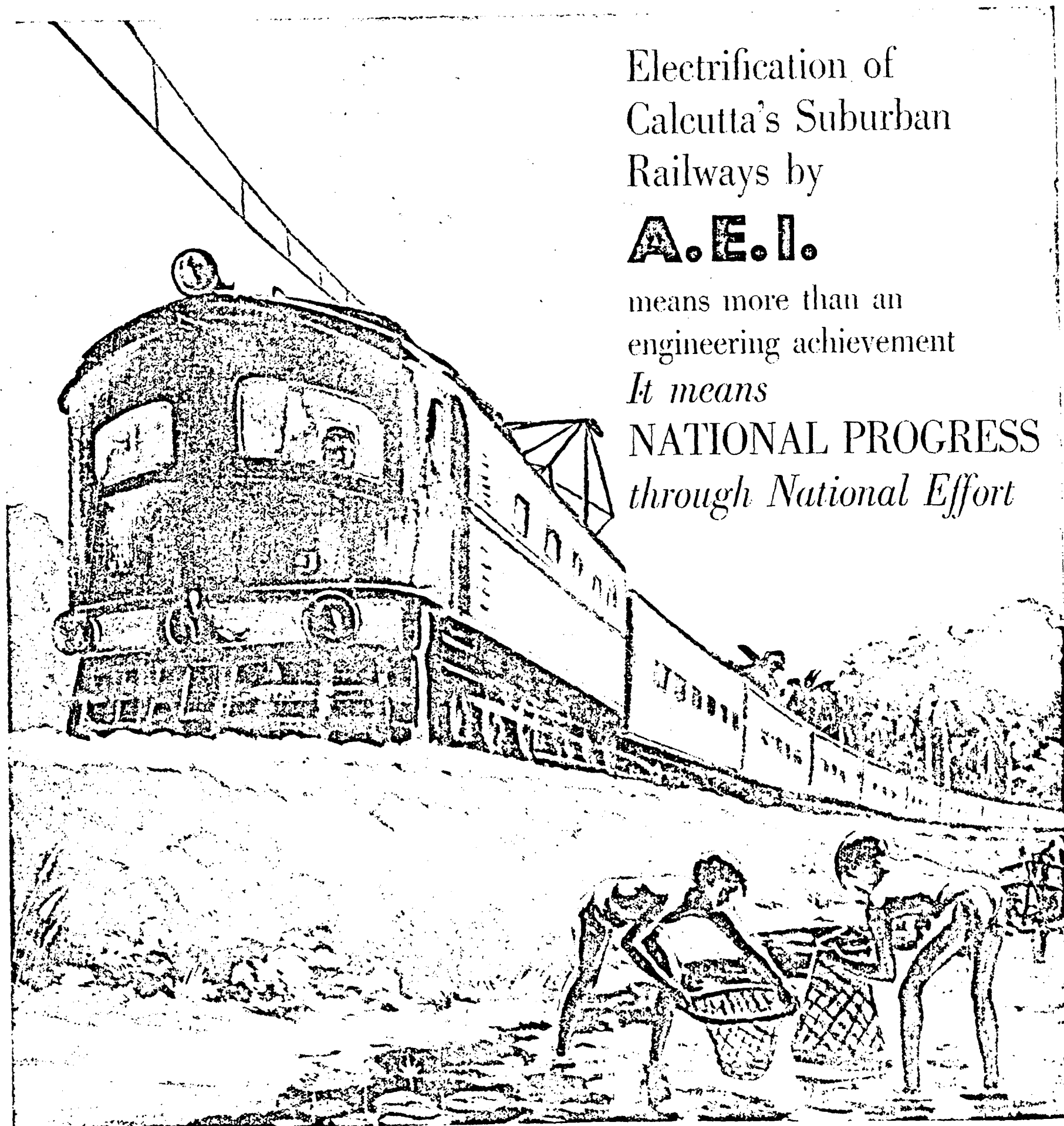
is a wasting asset and must be replenished, continued. It is perhaps worth recording that a total of well over 200 deep and shallow holes, including a very large number of test wells, all unproductive and therefore unremunerative, were drilled by the Assam Oil Company before discovering oil in Nahorkatiya in 1953 at a depth of 11,715 feet. Since then, an extensive programme of exploratory development drilling has been carried out in the Nahorkatiya-Hugrijan area, where over 23 wells have so far been drilled. Oil has also been found in Moran, 25 miles further west from Nahorkatiya at a depth of 13,739 feet, which is the deepest well so far in south-east Asia. Though it is too soon to make a forecast of prospects in Moran, the likely yield from Nahorkatiya is estimated at 2.5 million tons a year for a period of some 15 to 20 years. This find after years of continued effort is indeed a great achievement on the part of the Assam Oil Company and a great asset to India. The Government of India has taken keen interest in developing oil resources. It has set up an Oil and Natural Gas Commission to undertake the exploration, exploitation and refining of mineral oil. The Government, with the technical aid received from the Canadians and Russians, has surveyed certain other areas, such as Jaisalmer, Punjab, and the Ganges valley in U.P. and Bihar. The Government has also signed an agreement with the Standard Vacuum Oil Co. Ltd. for joint exploration in the West Bengal basin.

Vasist Committee

Negotiations have been going on between the Government of India and the Assam Oil Company for some time on the formation of a rupee company covering the production and refining of crude from Nahorkatiya. The Government appointed a committee, which included Indian and foreign experts, under the chairmanship of Mr. S. S. Vasist in September 1956 to examine the location of a refinery for oil from Assam. The Committee has submitted its report. The new refinery will require a large investment and present transport problems of considerable magnitude. When the new eastern refinery comes on stream, India will have taken another step towards self-sufficiency in petroleum products, and will save foreign exchange. The existing refineries and the proposed new one will be able to meet total internal needs of petrol and fuel oil, besides a large proportion of other petroleum needs which are growing fast. But some products like kerosene will still have to be imported in part as India is the second largest consumer of kerosene in the world and it is not possible to extract more than a certain proportion of kerosene from a barrel of crude. Meanwhile, the need for petroleum will continue to grow with the increase in population, expanding industry and the striving towards a higher standard of living. Oil is energy for India. Oil means more food, more comfort, better health and greater convenience. Trombay has been transformed during the last three or four years. What was once waste land and open fields (a portion even being below sea level) is now an oasis from where power, symbolised by oil, electricity and nuclear energy, flows.



A general view of the catalytic cracking unit



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THE OUTLOOK FOR THE CHEMICAL INDUSTRY

ENSURING GREATER COMPETITIVE EFFICIENCY

• By A SPECIAL CORRESPONDENT •

CHEMICAL manufacture is not of recent origin in India. Many chemicals, such as saltpetre, nitre, alum and lime, were manufactured in ancient times, but the operations were conducted in a very crude manner and on a very modest scale. The first world war gave an impetus to the manufacture of a number of chemicals in India, and a small chemical industry began to take shape. During the inter-war period, although expansion was of an unplanned and more opportunistic type, the industry practically tripled in size. The second world war gave a further stimulus to its growth which continued into the postwar period and survived the upheaval of independence and partition. With the Government of India's concept of a planned expansion of the economy and the implementation of the first five year plan, the growth of the chemical industry changed radically to meet the new conditions. This plan, with its emphasis on agriculture, naturally focussed attention on the production of chemical fertilisers. At the same time, the Industries (Development and Regulation) Act, 1951, sought to control the expansion in other directions to meet the overall requirements of the plan. Now that the second five year plan is under way, it is stimulating to stop and consider the shape the chemical industry is taking, and some of the problems that must inevitably arise.

Raw Materials

In spite of the great diversity of its products, the major raw materials of the chemical industry are few: coal, salt, limestone, sulphur, phosphate, oil and agricultural products such as molasses, glycerine and cellulose. Compared with the U.S.A., Britain and Germany, India is not well-endowed with mineral raw materials, and although geological exploration continues, it is rather unlikely that there are many pleasant surprises in store. There are, however, adequate supplies of cheap coal and coke. Although the total reserves are high, those of good coking coal are a source of anxiety, and some economy may be needed in future to conserve them by using lower-grade coals for steam raising. One of the difficulties in the way of making carbide in the country has been the obtaining of supplies of coke of sufficiently low phosphorus content, but with the installation of more washeries and coal grading plants this difficulty is likely to disappear in the not too distant future.

Although the sea offers an inexhaustible supply of salt, and long stretches of the coastline have a suitable climate for its manufacture, solar salt is by world standards an expensive raw material for the chemical industry. Following the encouraging report by the Salt Experts Committee in 1950, the Government has been successful in stimulating the production of large quantities of good quality salt. The country is now making all it needs and there has been in the last two or three years a small quantity left over for export. The absence of good deposits of mineral salt has, however, imposed a peculiar handicap on the chemical industry in the past, and will continue to do so for some time yet because of the higher cost of solar salt. Manufacture on a larger scale, the use of more mechanisation and better technical control of operations must contribute to a decrease in its production cost in the future. Thus the influence of the high cost of this basic raw material may confidently be expected to diminish.

Dependence on Sulphur

Like many other countries, India depends almost entirely upon imported sulphur, chiefly for the manufacture of sulphuric acid, and this dependence is certain to continue. Opinion about world reserves changes from time to time, but whatever they may be, it is beyond dispute that they are being used up at a large and ever-increasing rate. Recovery of this vital raw material and winning it from alternative sources, such as gypsum and pyrites, will become increasingly attractive as time goes on. The Government has very recently announced its intention of setting up in the public sector a plant to make sulphuric acid from pyrites. It hopes to encourage the private sector to do the same. Hydrochloric acid can replace sulphuric acid in some of its uses, thereby not only saving

foreign exchange but also helping the alkali industry to dispose of some of its chlorine.

There are massive deposits of limestone in the country, and many of them are worked to provide lime for making steel and cement. The chemical industry requires lime of high quality, particularly for making carbide and bleaching powder, and it has found it difficult in the past to obtain the requisite quality. A recent survey by the National Chemical Laboratory indicates that good quality stone exists in a number of localities. With suitable selection and beneficiation, the supply may be expected to improve.

The Assam Oilfield

The discovery of a large oilfield in upper Assam is of tremendous importance to the chemical industry. A great deal will depend on the results of the prospecting for oil now in progress and on the location of the fourth and any subsequent refineries. Oil has been the mainspring of the major developments in chemical technology during the last 20 years. Cheap and abundant, it has enabled the growth in the western world of a heavy organics industry to meet a demand which has now far outstripped the supplies that could be made from organic by-products from agriculture.

At present, one of the most important assets of the Indian chemical industry is the substantial quantity of alcohol available from molasses. Industries based on it are already growing up. Two plants to make polythene are being built and plans are being made for the manufacture of polystyrene and butadiene. In other countries, oil has proved to be the cheaper starting material for these processes once the scale of operations has reached a certain size. This pattern may not be followed in India if alcohol stays cheap and free from any restrictive duty. Other agricultural products which are proving of immediate value are glycerine and cellulose which will be used for making explosives at the factory now being built in Bihar.

The new technologies today are in inorganic fields, in the non-ferrous metallurgy of titanium, the rare earths, radioactive elements and silicon. The pace of development is very fast. Titanium has progressed from a few laboratory specimens to hundreds of tons a year of an engineering metal, within a space of ten years—barely a fifth of the time it took aluminium to make the same progress. The time is not far distant perhaps when India will require these industries, and when she does, there will be ample raw materials to hand.

Forecasting Demand

It is a symptom of the complex and far-reaching nature of the chemical industry that a considerable part of its technical effort has to be employed in choosing the right course of action. A plan for manufacture requires the best forecast of demand that can be made. Under- and over-estimation alike have their unfortunate consequences. On the one hand, under-estimation can lead to the building of a number of small plants one after the other, each of which is less efficient in terms of capital and employment than would be one or two units of large capacity. On the other, over-estimation can lead to waste of resources in the installation of capacity which would not be required for some time.

The technique of market forecasting as a specialised skill has improved greatly during the last 20 years. Like many other activities in the industry today, it calls for team-work and the pooling of technical and commercial experience. It requires a wide knowledge of the chemical market, of the end-uses of a product and of the usefulness and limitations of modern statistical techniques. Although in the short term, it is frequently possible to get a good idea of the market demand by studying the requirements of the individual customers and industries, it is necessary in most cases to look ahead five, ten or even 15 years if capital is to be invested with the maximum effect.

The likely market so far ahead can only be estimated by a study of growth patterns. Experience in all long-established industries, such as oil and explosives for example, has shown that the upward trend over a period of 30 or 40 years can

be represented by a smooth curve. In the nature of things, there are short-term fluctuations and although major economic disturbances of wars and trade depressions cause a departure from the smooth trend, the demand quickly returns, once normal conditions are restored, to what would be expected if the development of the economy had been steady.

Examples from other Countries

A good guide to the future market is often given by the history of the same commodity in another country. It often helps, for example, when predicting for the U.K. the likely offtake of a new chemical or the increase of an old one in a new application, to study its history in the U.S.A., taking into account the differences in potential demand arising from the smaller population and the different industrial structure. This line of approach is particularly fruitful when the economies of the two countries under comparison are similar in nature and at about the same stage of development. Unfortunately, a comparative study cannot always be relied upon when estimating the Indian market because of the difficulty of making a good general comparison with any one country. None of the more developed countries have raw material resources, geographical difficulties, density of population and lack of balanced demand, all akin to those of India. Table I shows, for example, the ratio between per capita consumption in India and the U.S.A. for various items. Compared with heavy chemicals, the relative consumption of dyestuffs and plastics in India is very high.

Long-term predictions can also be made with confidence if something is known about the rate of growth of the population and the major industries such as agriculture, textiles and steel, whose long-term trends can usually be determined with sufficient accuracy for the purpose in hand. By using appropriate factors, it is possible to estimate the likely demand for chemicals many years ahead. A good example is a country's requirements of dyestuffs. From the trends of the population, the textile consumption a head and the weight of dyestuffs a ton of raw fibre, it is possible to arrive at an estimate of the market ten years ahead that is much more trustworthy than any other.

Dyestuffs Consumption

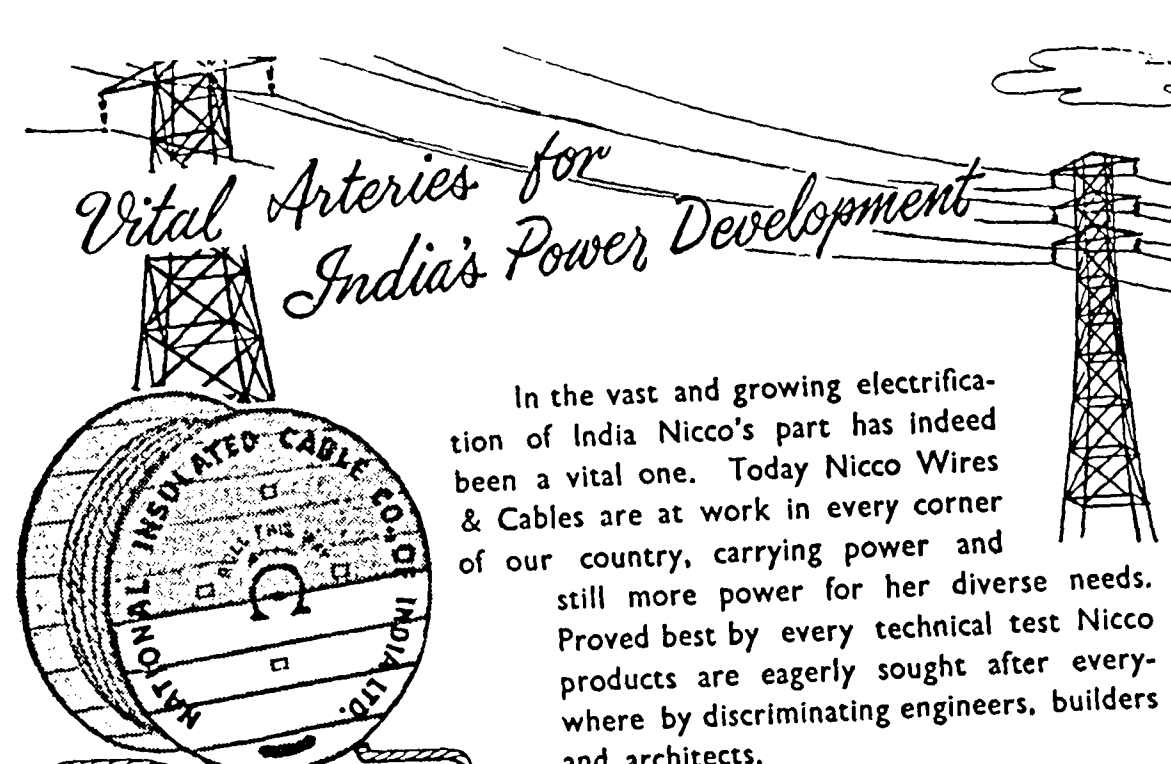
For India, the dyestuffs consumption in 1955 estimated in this way is surprisingly large, in fact almost twice as big as had previously been thought. The development of the Indian economy during the next ten years is likely to lead also to a very large increase in offtake of those chemicals which go into the making and maintenance of capital goods. The rate of growth of demand of such chemicals will be related to that of steel. It is planned to increase the output of steel during the second five year plan from 1.3 million tons to about 4½ million tons, a factor of over three times, and an even larger expansion of the paints industry will be required if the demand for paint is to be met; not only is it needed for new steel, it is also needed to maintain existing structures and capital equipment in good condition.

TABLE I
PER CAPITA CONSUMPTION (LBS.) OF SOME IMPORTANT CHEMICALS

	1955		Ratio
	India	U.S.A.	
Sulphuric Acid	1.0	214.0	1 : 214
Soda Ash	0.46	66.0	1 : 143
Chlorine	0.075	46.0	1 : 613
Plastics	0.40	23.0	1 : 58
Dyes	0.07	1.02	1 : 15

The problem of finding a suitable site for a particular manufacture is very often a critical one. Two or three raw materials may be required, each in large tonnages, and yet there may be no place where they are found near together. The cost of transporting lime, coal and salt to make soda ash, for example, can have a decisive effect on its cost

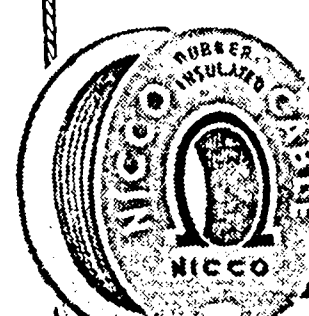
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of manufacture, and ideally they should occur in proximity to one another. Equally important is the siting of a plant within easy reach of the market it is to serve. India is not particularly fortunate in the disposition of a number of important minerals in relation to one another and to the markets for the products they might make. For this reason the choice of sites will often require particularly careful consideration. Some compromise will generally have to be made. If the raw material cost is a large part of the value of the finished product, as is generally the case in the heavy chemical industry, and especially if a great loss of weight occurs in processing, the source of raw materials will have a compelling attraction. On the other hand, where processing costs are high in relation to the cost of raw materials employed, it will generally be found better to locate the industry near the market.

The availability of water and power are also important. The industry as a whole is a great user of water, but because of violent and unreliable seasonal contrasts there are large tracts of the country where perennial water supplies are difficult and expensive to obtain. The river valley schemes, such as the Damodar project, with their dual purpose of hydro-electric power generation and irrigation, are likely to provide suitable sites. There is, however, the further problem of effluent disposal in the organic chemical industry parti-

cularly where much of the water that goes into processes comes out again contaminated with noxious effluent which has to be disposed of without contaminating domestic and agricultural water supplies. This can often be the major factor determining the location of a plant, making the only practical site one on or near the sea coast.

It is now well appreciated that the modern chemical industry, with its complex processes and equipment, is a very heavy user of capital. A modern high-pressure organics plant, for instance, can reach capital requirements of Rs. 10,000 to Rs. 15,000 a ton/year of product, a figure which is among the highest for any industry outside nuclear power. Since India is as yet producing very little chemical plant, the rapid expansion of the chemical industry in the country cannot avoid heavy commitments in foreign exchange and a serious drain on the very limited resources that are available. This must inevitably lead to the rejection of some schemes of expansion purely on grounds of inadequate finance. How is a selection to be made? For the board of any chemical company, considerable weight would be placed on the expected profitability of the new enterprise, and this is the generally accepted yardstick for the selection of an undertaking by the private sector. The ratio of fixed capital to turnover is another useful one and is found to be reasonably constant within the various sections of the industry. Table No. II shows

the average values for a number of sections of the chemical industry in the U.S.A.

TABLE II

U.S.A. 1954: CAPITAL VALUE/ANNUAL TURNOVER

Heavy inorganics	...	2.06
Synthetic fibres	...	1.79
Chemicals, general	...	1.25
Explosives	...	1.20
Pharmaceuticals	...	0.53

It is interesting to note from the table the relative importance that would be placed on the pharmaceutical section of the chemical industry if selection were made on the basis of capital/turnover ratio alone. It should however be remembered that the ratio completely ignores the need for special overhead expenditure such as research and development which might be required in support of such projects. On the other hand, it is interesting to see that the Government of India is taking notice of the savings in foreign exchange which will accrue from the investment in new projects. Although the resources of foreign currency are limited, it may be dangerous to trust this criterion too far. In spite of its attractiveness in the present circumstances, it is necessary to take a wide view in order to secure balanced technological development of the industry.

Apart from the capital considerations, in any decision to invest in a new project much attention

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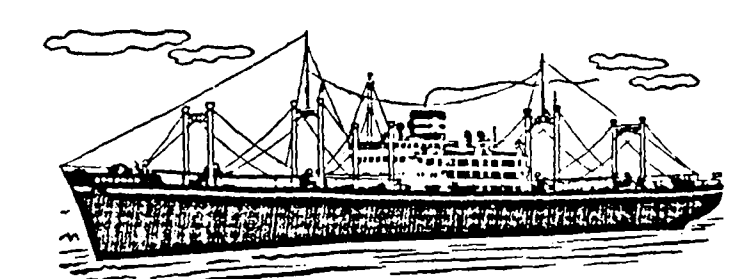
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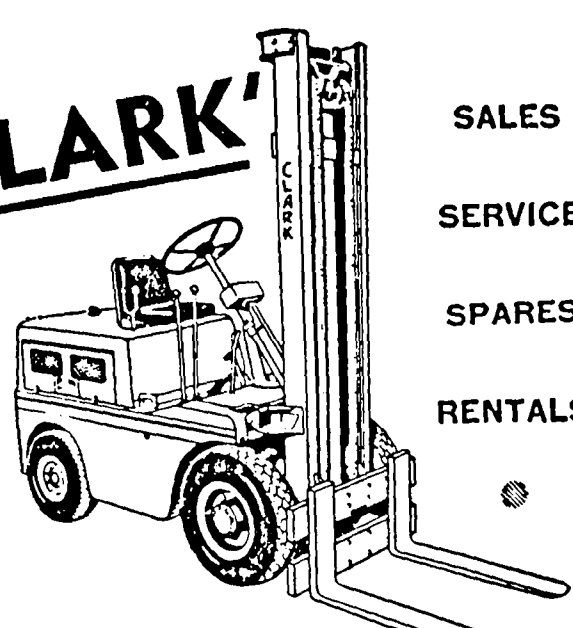
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has to be paid to the availability of technical information on the process or, as this is called in the industry, "know-how". In most cases, "know-how" will have to be obtained from abroad against payment, with some measure of foreign capital participation. There is a feeling in some quarters that it is almost immoral to be asked to be paid for technical knowledge, and this completely ignores realities. India is not alone in having to seek "know-how" from abroad. Indeed, even in the U.S.A. considerable sums are spent on acquiring foreign patent rights and buying new processes.

This situation is undoubtedly advantageous for India, as the need for a chemical industry anywhere to be up-to-date in techniques has resulted in a flourishing international trade in technical knowledge sufficiently competitive to keep the price paid within reasonable limits. It would be inadvisable for India to depart seriously from the generally accepted values for technical knowledge. For the immediate future, India will have to import processes and "know-how", but the time may not be very far distant when developments in these very processes made by Indian technologists could have a ready sale overseas.

The tendency in the western countries has been towards the amalgamation of chemical interests. It arose almost inevitably from the dependence of the parts of the industry on one another and from the rôle the whole industry plays as a service to the other parts of the economy. Whatever fears of monopoly practice this tendency arouses, the fact remains that it is unavoidable and indeed desirable in order that the industry shall perform its service to the community at the lowest cost. Although there is little scope in heavy chemicals for firms with small resources, they have their part to play in processing into a suitable form for the consumer market or ultimate user many of the products of the heavy industry such as dyes, pharmaceuticals and insecticides. As long as there is a general spirit of competition in the industry and an expanding market, there is little danger that restrictive practices contrary to the public interest will occur, and legal safeguards against them are only needed as a last resort.

Future Development

The future development of the heavy chemical industry could be affected greatly by the decision of the State to own progressively most of its important sections—the manufacture of basic and intermediate products required in the manufacture of dyestuffs, drugs and plastics; fertilisers; synthetic rubber; and the carbonisation of coal. The State is required by the Constitution to direct its policy towards securing that the operation of the economic system does not result in the concentration of the means of production to the common detriment. The process of amalgamation can go too far in the State's as well as in private hands. The element of competition, economic and technical, must remain if the industry is to develop on sound lines.

The Government is right to start industries which it considers essential if capital is required on a scale the private sector cannot in the present circumstances raise, but it should not close the door to a later entry in the same field by the private sector if a sound proposition is made. The policy implied of having the heavy chemical industry controlled by the State and the rest largely in the hands of the private sector could lead to an inefficient industry. It is desirable that there should be the possibility of competition throughout all sections and that private and State-owned enterprises should be able to co-exist.

THE GROWING POPULARITY OF CHEMICAL FERTILISERS

INCREASES IN PRODUCTION CAPACITY PROPOSED

• By S. M. WASI •

CHEMICAL fertilisers have become an increasingly important factor in modern agriculture. They are indispensable for the maintenance of soil fertility, while farm productivity and income both clearly depend on fertiliser use. Many other factors contribute to increased crop yields, such as irrigation, better drainage, better seeds, insect control and mechanisation, but the use of chemical fertilisers is probably the most important single factor in raising yields an acre. The second five year plan has, therefore, placed great emphasis on the extensive use of fertilisers. In fact, the plan envisages an increase in food production, through the use of fertilisers and manures, of about 2.5 million tons, that is, a little over 20 percent of the overall increase in the current food production potential. The attainment of this target is linked to a large extent with a commensurate expansion in fertiliser production capacity. This means that large quantities of fertilisers will continue to be required to support high yields an acre if the expanding population is to have adequate food. As farmers become more and more fertiliser-minded, they will continue to use them more and more to maintain the productivity of their farms, and especially to compensate for their investment in the land.

It was during the war years that the acute food shortage focussed attention on the ways and means of increasing food resources. The fertiliser industry at that time was in its infancy. In 1938, a small beginning was made with the establishment of a plant in Belagula in Mysore with a rated capacity of 6,600 tons of ammonium sulphate a year. Another source of supply of ammonium sulphate at the time was as a by-product from the coke oven plants and this did not exceed 25,000 tons a year. Total imports of various types of fertilisers amounted to 99,452 tons in 1938-39. In other words, fertiliser requirements were being met mostly by imports. Subsequently, in 1947, a larger plant with a rated capacity of 150 tons of ammonium sulphate and 100 tons of superphosphate a day was commissioned in Alwaye (Trevancore-Cochin). While the Mysore plant makes synthetic ammonia by neutralisation of sulphuric acid, the Alwaye plant burns firewood, obtained from the nearby forests, in a battery of gas generators to make producer gas for use in ammonia production. The plant was designed to make half the ammonium sulphate by utilising sulphuric acid and the other half by using gypsum from Trichinopoly. It is proposed to expand this plant to double its present capacity as far as nitrogenous fertilisers are concerned. It involves increasing the production of ammonia from 40 to 80 tons

a day and the utilisation of the additional ammonia for the production of more ammonium sulphate and for new products like ammonium phosphate.

Birth of Sindri

The postwar years saw big developments in the fertiliser industry with the establishment of a giant State fertiliser factory in Sindri. The Bengal famine of 1943 and general food shortage forcibly brought home the grim fact that the precarious position of food production must be remedied as early as possible. It was felt that unless India developed intensive methods of cultivation and increased the yield an acre, there would not be enough food for the increasing population. After independence, the Government implemented the plan for setting up this giant fertiliser factory in Sindri with a total investment of Rs. 23 crores. After four years of hard work, the factory went into production in October 1951, a significant landmark in the history of the Indian fertiliser industry. Of the nitrogenous fertilisers at present used in India, ammonium sulphate is the most popular. It has proved its value as the most useful manure for almost all farm crops. It has certain advantages over other forms of fertiliser. It has an excellent preserving value and in regions of heavy rainfall this form of fertiliser is more resistant to leaching. It is rich in nitrogen, the nitrogen content being about 21 percent, against 0.5 percent in farmyard manure and 5 to 7 percent in oilcakes.

Ammonium sulphate is usually manufactured by fixing nitrogen and hydrogen as ammonia and producing the sulphate by the inter-action of ammonia with gypsum or sulphuric acid. The nitrogen gas is extracted from the air and the hydrogen gas from water. At Sindri, nitrogen and hydrogen are produced by the action of steam and air on a hot bed of coke. Sindri's rated capacity is 960 tons of ammonium sulphate a day or 350,000 tons a year, but allowing for shut-downs for maintenance, etcetera, the rated production capacity is about 320,000 to 330,000 tons a year. By its steady progress, Sindri has more or less stabilised its production at its rated capacity. It has exceeded its production targets for both 1955 and 1956. The actual production was 321,353 tons during 1955 against the target of 320,000 tons, and 331,725 tons in 1956 against the target of 330,000 tons. So far, it has produced 1,490,526 tons of fertiliser, representing a saving of about Rs. 52 crores in foreign exchange.

Use of Fertilisers

The rôle of fertilisers in an agricultural economy is important. Plants, like human beings, need food. The three important plant foods are nitro-

gen, phosphorus and potash. Nitrogen produces rapid growth and increases the yield of leaf, fruit or seed. Phosphorus stimulates early root formation and growth, and hastens maturity and seed formation. Potash imparts vigour and disease-resistance to the plants. Nitrogen and phosphorus are needed most by the Indian soils. Nitrogen is generally supplied by ammonium sulphate and phosphorus by super-phosphate. Ammonium sulphate, as already stated, contains about 21 percent of nitrogen, and superphosphate 16 to 18 percent of water-soluble phosphoric acid. Among other nitrogenous fertilisers are urea and ammonium sulphate-nitrate whose utility is now being demonstrated in various fields of experiments throughout the country and which are going to be produced for the first time in India at the Sindri fertiliser factory as a result of the implementation of its expansion scheme. Indian farmers already know a good deal about the use of ammonium sulphate and its usefulness. The average response to 20 lbs of nitrogen applied in the form of ammonium sulphate yields 280 lbs of paddy and 230 lbs of wheat an acre. The average response to 20 lbs of phosphate applied is 140 lbs of paddy and 99 lbs of wheat an acre.

The application of ammonium sulphate to the soil supplies the growing crops with a very valuable food material. Paddy usually requires a dose of 100 to 200 lbs an acre, half at the final puddling of the soil and the other half a month after transplanting. But in the case of paddy sown by broadcasting, two-thirds of the prescribed quantity may be applied before sowing and the remainder after the first weeding. A similar dose of 100 to 200 lbs an acre is recommended for irrigated wheat and 75 to 100 lbs in unirrigated conditions. For irrigated maize, 100 to 200 lbs of sulphate will be sufficient, one half to be applied at the time of sowing and the other half about four weeks later. Among cash crops, sugarcane needs about 500 lbs of sulphate for thin varieties in the north and 1,500 to 2,000 lbs for medium and thick varieties in the south. Cotton requires 100 to 150 lbs for a rain-fed crop and 200 to 300 lbs for irrigated crop, while tobacco needs 200 to 250 lbs and jute 150 to 200 lbs. The requirements of potato and sweet potato an acre are usually 500 lbs, while kharif vegetables need 150 to 200 lbs.

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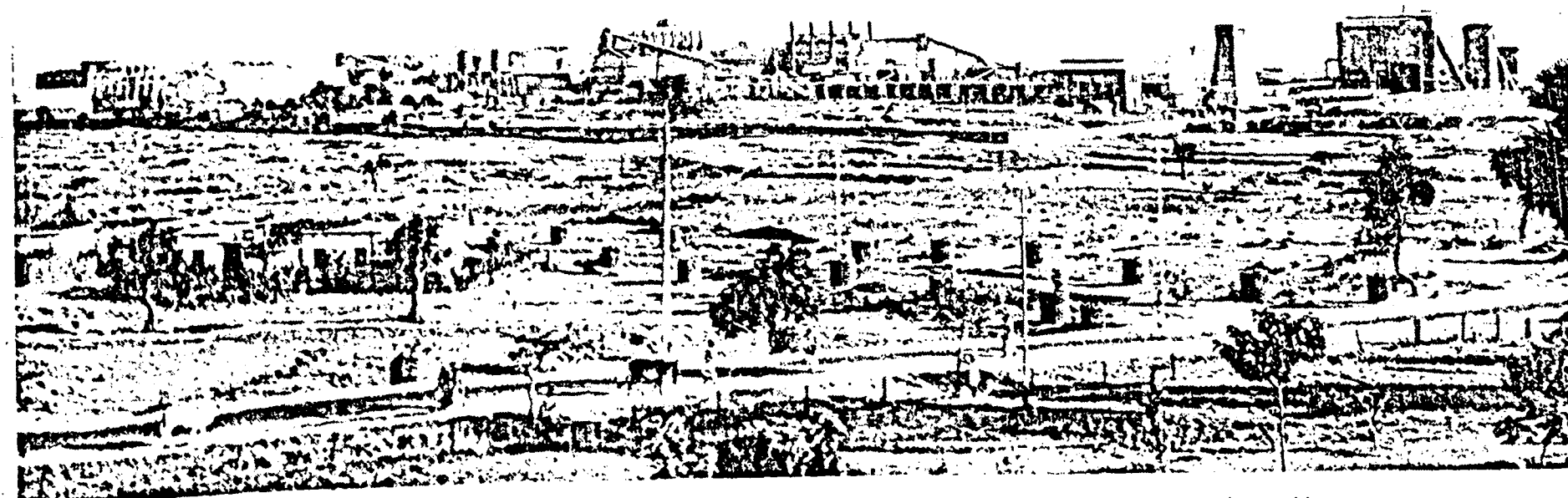
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successfully used in the United States, Japan and Italy, particularly in the cultivation of rice. It is claimed that one maund of urea usually helps to produce an increase of 6 maunds of paddy or 5 maunds of wheat. Agricultural experts recommend that to obtain good results, 50 to 100 lbs of urea an acre may be used for wheat and paddy.

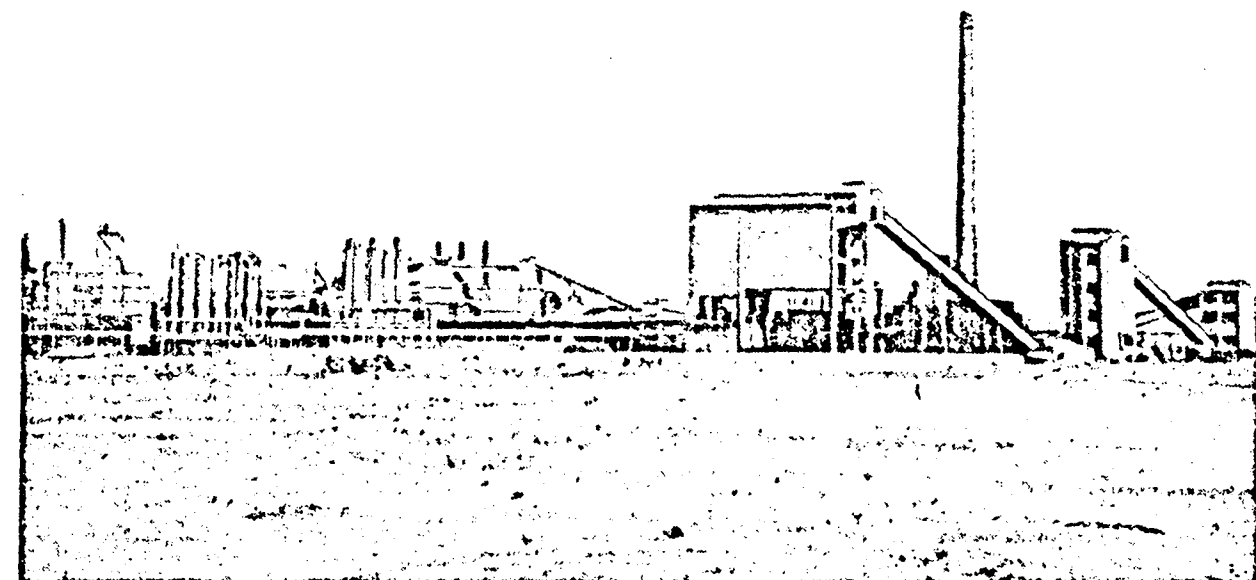
Ammonium sulphate-nitrate or double salt is another nitrogenous fertiliser suitable for a variety of soils and crops. It contains 26 percent of nitrogen, and is a double-salt of ammonium sulphate and ammonium nitrate. It is claimed that one maund of ammonium sulphate-nitrate should produce an increase of 3½ maunds of paddy or about 3 maunds of wheat. Agricultural experts recommend the usual rates ranging between 80 and 160 lbs of this fertiliser for food-grain crops.

Phosphate Rock

There are 14 manufacturing firms which produce super-phosphate in India. The installed capacity is for the production of approximately 210,000 tons a year against the actual production of 105,000 tons, according to the latest figures available. Super-phosphate is made by treating ground phosphate rock with sulphuric acid. By this process most of the phosphoric acid of the rock phosphate is rendered soluble in water, and it therefore becomes available to plants. Most of the phosphate rock is imported. Sulphur is also imported for the production of sulphuric acid used in the manufacture of super-phosphate. Super-phosphate is manufactured in two grades known as single, double or triple superphosphate. The single super-phosphate contains 16 to 20 percent phosphoric acid, while the double or triple grade contains 45 to 50 percent. At present, only single super-phosphate is available in the market. For cereal crops, an application of 100 to 200 lbs of super-phosphate an acre, along with an adequate quantity of nitrogen, is generally recommended. For vegetables, sugarcane, tobacco and similar other crops, a heavier application of 500 to 800 lbs of the fertiliser is needed. Leguminous crops benefit by the application of 400 to 500 lbs of the fertiliser an acre.

Bone-meal is another phosphatic fertiliser. It contains a small quantity of nitrogen also. It is obtained in two forms: (a) raw bone-meal and (b) steamed bone-meal. Ordinary or raw bone-meal contains 3 to 4 percent nitrogen and 20 to 25 percent phosphoric acid, while steamed bone-meal contains 1 to 2 percent nitrogen and 25 to 30 percent phosphoric acid. A bone digester has been devised by the National Physical Laboratory which cooks the bone for the manufacture of steamed bone-meal. The State Governments have been asked to set up similar bone-digestors at various rural centres for increasing the production of this useful fertiliser.

As for the third plant food, potash, very little use has been made in India so far of this fertiliser.



The coke oven plant

Most soils here contain sufficient amounts of potash. There are, however, some soils which are found to give increased yields when potassic fertilisers are applied. Sandy soils are known to respond to the application of potassic fertilisers. There are certain crops like tobacco, potato, cotton, fruit trees, tomato, etcetera, to which potassic fertilisers can be applied in order to improve the quality and appearance of their products. There are two potassic fertilisers in common use: (a) muriate of potash (potassium chloride) and (b) sulphate of potash (potassium sulphate). The former contains 50 to 60 percent potash, while the latter has 48 to 52 percent potash. Small quantities of potash salts have been produced in India.

Mixed fertiliser is a mixture of two or more of the essential plant nutrients, namely, nitrogen, phosphorus and potash, each in a specified and guaranteed percentage. To meet the varying demands of different crops, application of a suitable mixed fertiliser is essential. The choice of the mixture should normally depend upon the nature of the crop and the time of application of the fertiliser. About 40 manufacturers make mixed fertilisers. Most of the producers of superphosphate are included in this group. The production of mixed fertilisers in 1954 was about 200,000 tons. Fertiliser mixtures are generally composed of ammonium sulphate, superphosphate, bone-meal, oil-cake and muriate of potash. The proportion in which these fertilisers are mixed varies, depending upon the type of the soil and the crop to which they are applied. The most important ingredient of these mixtures is ammonium sulphate.

Organic Manures

Agricultural experts recommend that chemical fertilisers should be applied along with what are called bulky organic manures in order to maintain

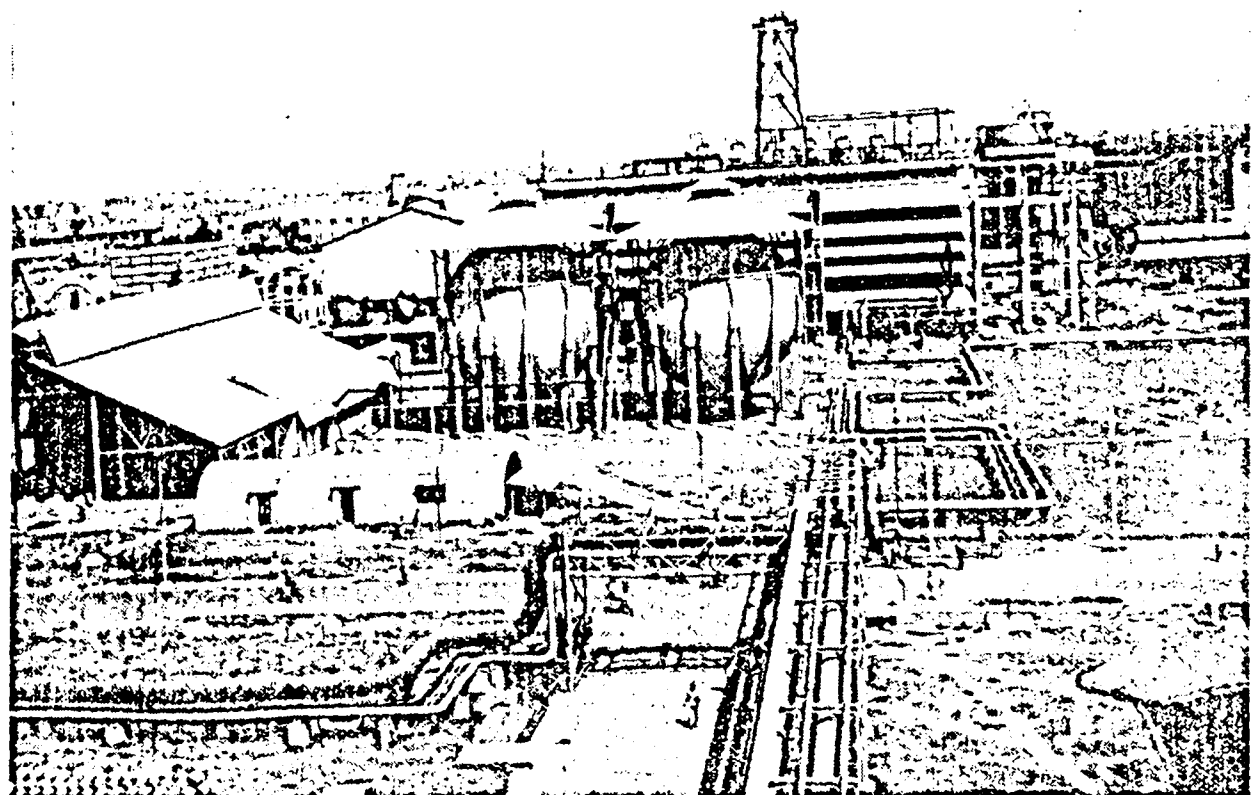
the fertility of the soil. There is a variety of bulky organic manures, namely, farmyard manure, compost, green manure, etcetera. Bulky organic manures contain very small quantities of plant food elements and hence they do not contribute much to the increase of plant food supply in the soil. The value of these manures, however, depends on the amount of humus they produce or add to the soil. The desirability of using farmyard manure, compost and vegetable wastes from other crops is undeniable, but supplies are severely limited and quite inadequate for the whole acreage of food crops. According to an expert, the only method of increasing the humus content of the soil is, therefore, through the application of inorganic or chemical fertilisers, producing larger crops and making available larger organic crop residues.

Consumption of Fertilisers

The demand for chemical fertilisers has increased rapidly during recent years. From 276,000 tons of ammonium sulphate in 1952, consumption rose to 422,000 tons in 1953, 550,000 tons in 1954, 552,400 tons in 1955 and 610,000 tons in 1956. In 1957 it is likely to go up substantially. The consumption of super-phosphate has also increased from 43,000 tons in 1951 to 100,000 tons. The increased demand for chemical fertilisers may be attributed to the economic price at which fertilisers are made available to cultivators by the Central Fertiliser Pool (administered by the Union Ministry of Food and Agriculture), and also the spectacular results achieved by their use in the intensive cultivation campaign and also the encouragement given to cultivators by the Government to obtain their supply of fertilisers on credit. Chemical fertilisers have come to stay in India as is evidenced by the growing demand for these.

A Central Fertiliser Pool has been operating since 1944 under a Government trading scheme on a 'no-profit-no loss basis' to regulate procurement and distribution of fertilisers to the States. The entire indigenous production of ammonium sulphate is purchased by the Pool. The quantity imported by the Government to meet the deficit also goes into the Pool. The Pool aims at an equitable distribution of the available supplies in the country at a minimum price and ensures maximum use of them to increase agricultural production. The distribution of fertilisers in the States has been so far arranged through a number of agencies like co-operatives, private dealers and Government sales depots. The scope of utilising other agencies like Panchayats, community projects and the National Extension Service blocks for making them available to cultivators is also being explored.

Two important steps have been taken by the Central Government to develop information on the use of fertilisers and to provide a suitable machinery for soil testing. These two steps will be of great help to farmers who will know more about the use of fertilisers and will have the benefit of advice about their soil conditions. With assistance from the Technical Co-operation Mission of the U.S.A., the Indian Council of Agricultural Research and the Indian Agricultural Research Institute are helping the States to develop information on the use of fertilisers. Different types of carefully controlled experiments are being conducted to determine the fertiliser practices best suited to different soil and crop conditions. It is proposed to set up a chain of 24 soil testing laboratories spread throughout the country. These laboratories will start functioning soon. The work of these laboratories will make possible



The ammonia synthesis plant with the two Horton Spheres in the foreground. Each Horton Sphere can hold 800 tons of liquid ammonia

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THE VITAL IMPORTANCE OF MACHINE TOOLS

PLANS TO EXPAND PRODUCTION

• By M. K. MATHULLA •

Managing Director, Hindustan Machine Tools Ltd.

ALTHOUGH some progress has been made since independence in the industrialisation of India, almost all the modern large-scale factories that are established have been built by foreigners with foreign plant and machinery. This dependence makes foreign exchange resources vital to the progress of the industrialisation plans. The acute shortage of foreign exchange now being experienced is for the most part due to the dependence on sources abroad for plant and machinery; and this shortage, in turn, is the principal limiting factor to rapid industrialisation, as resources of raw materials and manpower are abundant. The method of breaking this vicious circle is to produce at home the increasing requirements of plant and machinery. It is, therefore, necessary that, at the earliest possible stage in the future, India should be able to establish factories with plant and machinery manufactured at home and thus be free from the limitations imposed by the foreign exchange shortage. But before plant and machinery can be manufactured, it is necessary to make machine tools, with which the machinery for those factories will be produced. These reasons make the machine tool industry perhaps the most vital of basic industries in the context of expansion plans and economic independence.

Rise in Imports

In 1951-52, India imported machine tools of the value of Rs. 3 crores only, whereas in 1955-56 the imports went up to Rs. 6.4 crores, largely as a consequence of the first five year plan. The licences issued for the import of machine tools during 1956 amounted to Rs. 12 crores. One method which is commonly adopted to estimate the requirements of machine tools for a country is to base it on its relation to the estimated consumption of steel. India's consumption of steel is currently about 2 million tons a year. This is expected to increase to about 4½ million tons towards the end of the second five year plan period. The Government recently took a census of machine tools installed in the country which showed that at the end of December 1956, there were altogether 80,000 machine tools installed when the consumption of steel was around 2 million tons a year. When the consumption of steel doubles to over 4 million tons by the end of the second plan period, we will require approximately 160,000 machine tools to be installed. Hence, between now and the end of the second plan period, an additional 80,000 machine tools will have to be procured by imports and indigenous production. From all the available data, it is estimated that the figure for imports of machine tools is likely to be of the order of Rs. 15 crores to Rs. 17 crores a year by the end of the second five year plan unless a substantial portion of these requirements are produced indigenously. As against this, indigenous production of machine tools was only Rs. 47 lakhs in 1951 and Rs. 99 lakhs in 1956. India has, therefore, a tremendous leeway to make up in achieving self-sufficiency.

Wartime Shortages

The machine tool industry is vital from another point of view. This was demonstrated during the second world war when India was cut off from all sources of machine tools, and this seriously threat-

ened to paralyse all other industries engaged in the production of vital commodities. The introduction of machine tool control by the Government of India in 1941, and the timely help given by the U.K. and the United States, saved the situation. Under the scheme then worked out by the Government, some five firms received balancing plant worth about Rs. 22 lakhs. Another four firms were assisted in the outright purchase of machine tools from the U.K. and the United States. A team of seven machine tool experts were deputed from the U.K. to help the indigenous machine tool industry with technical advice and guidance. An inspection organisation was also set up which greatly helped to rationalise and control the quality and standards of indigenous machine tools. As a result of these measures, the industry made rapid progress and was able to meet the critical situation created by the war. The total number of graded machine tools manufactured in India rose from 273 in 1942 to 4,121 in 1946. Although the Indian machine tool industry made this remarkable progress in a comparatively short period, its general organisation was not such as to enable it to withstand open competition and the withdrawal of State support after the war. In the struggle for survival during the postwar period, many small-scale machine tool manufacturers disappeared. The partition of the country further cut off six graded and about 50 ungraded machine tool manufacturers.

Postwar Competition

The achievement of independence, therefore, saw the indigenous industry built up during the war virtually collapsing in the face of postwar competition and partition. Independent India then found it vital to re-establish the machine tool industry on a more lasting foundation. As, by its very nature, the machine tool industry did not hold out prospects of large and quick returns and the capital required for establishing the industry on a sound basis was substantial, the Government found private capital unwilling to invest the large amounts required under the capital-shy conditions prevailing in the immediate post-independence period. The Government, therefore, entered into a technical collaboration agreement with one of the best-known machine tool manufacturers in Europe, namely, Oerlikon Machine Tool Works, Buehrle and Co., of Switzerland, to set up a medium-heavy machine tool manufacturing unit for the production of high-speed precision machine tools. This agreement was reached in 1949 and the Hindustan Machine Tools factory in Jalahalli was established by the Government in the public sector with the technical collaboration, capital and management participation of Oerlikons. This was one of the first technical collaboration arrangements for establishing a new industry entered into by the Government of India after independence, moving for the first time into a major industrial activity of this nature; both its forerunners, the Sindri and Chittaranjan projects, were commenced or planned by the pre-independence Government.

Unfavourable Conditions

Being one of the first post-independence industrial projects, it had necessarily to contend with far more unfavourable conditions than the successor industries which have since been established. First of all, the postwar world found most of the leading industrial nations too preoccupied with rehabilitating their war-torn industries or converting them from wartime to peacetime activities and meeting the accumulated domestic demand. They were, therefore, unable to assist India in its postwar industrialisation. The United States, U.K., France, Germany and Japan were not yet in 1948-49 in the market for undertaking industrial projects in India. The choice before the Government for the machine tool project was, therefore, confined to a few countries like Switzerland (unaffected by the war) and Czechoslovakia. Secondly, the machine tool industry, with its high standards of precision and manual skill, involves a far longer time to establish itself. It takes years for labour of the required skill to be trained to the standards required for this precision machine-building industry. In fact, a British expert, commissioned by the Government to review the working of the Hindustan Machine Tool Project in 1954, reported that in his view it would be impossible for Indian workers

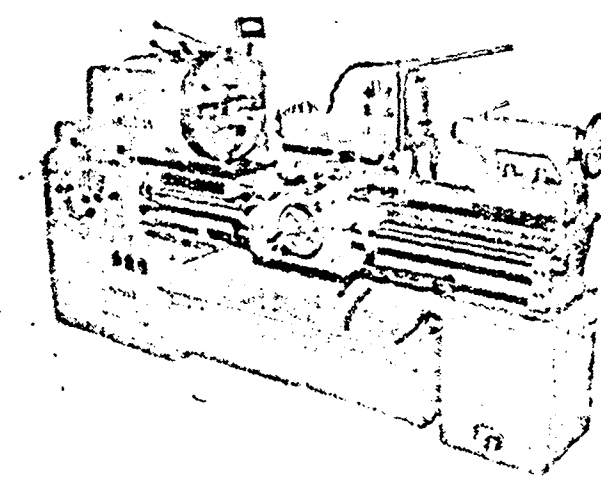
to acquire the high degree of traditional, manual, precision skill of the Swiss worker achieved over centuries and for this reason he predicted that the project would be "a colossal financial failure". Since then, however, in January 1957, the British Heavy Engineering Mission, headed by Sir Eric Coates, which at the request of the Government reviewed the Hindustan Machine Tools project, reported "that if Hindustan Machine Tools continue to progress as they appear to be doing at the present time, they should be considered to be an asset of considerable national importance". The Coates Mission also reported that the lathe manufactured by the Hindustan factory is "first class and compares favourably with machines of this type manufactured in any part of the world".

Co-ordination Problems

In setting up Hindustan Machine Tools in the public sector, adequate understanding and integration between the machine tool units in the private sector and the public sector do not appear to have been established from the beginning. Consequently, considerable differences of opinion and overlapping resulted. This anomaly was rectified by the appointment by the Government in early 1956 of the Machine Tool Committee representing both the public and the private sector industries, as also consumer interests. The Machine Tool Committee for the first time attempted to estimate the demand for different categories of machine tools during the second plan period and also assessed to the best of its ability the capacity of the existing industries. It thereafter proceeded to recommend an integrated plan for the development of the industry in the second plan period, avoiding as far as possible overlapping and consequent wastage of productive effort. The Government accepted the recommendations of the Machine Tool Committee. These arrangements appear to have eliminated all grounds for disputes and wasteful competition by the different units in the industry and it is hoped they will now settle down to a collective integrated effort to develop and expand the industry.

Under the scheme recommended by the Machine Tool Committee and accepted by the Government, the development of the principal categories of basic machine tools has been allotted to the following different units existing in the country:

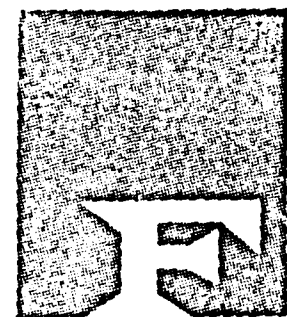
Firm	Item of manufacture
1. Cooper Engineering Ltd.	Geared shapers up to and including 32" stroke (gradual changeover from cone-pulley to geared head) Planers, up to and including 6' x 6' x 16' Sloters, up to and including 21" stroke.
2. Hindustan Machine Tools (Private) Ltd.	Lathes 17" swing, present and allied models. Milling Machines (No. 2 & No. 3) Plain, Vertical, Universal and Manufacturing (heavy type). Grinding Machines, O.D., Universal and I.D. Radical Drilling Machines. Lathes, 20" to 28" Swing. Production Jig Boreers. Lathes (other types) Capstans and Turrets.



The H-29 high-speed precision lathe



A row of H-22 high-precision lathes



What Forum of Free Enterprise Stands for

SINCE the Forum of Free Enterprise came into being with the object of educating public opinion on the values of Free Enterprise and the significant contribution which it can make to the rapid progress of economic development, a great deal of enthusiasm for its cause, and interest in its work has been generated. Along with this, controversy has been provoked as to whether the tenets of Free Enterprise are consistent with the social and economic ends which the country seeks to attain. The Forum is convinced that they are, and in this statement reiterates its attitude towards some of the basic issues which have been raised so that no misconception or doubt on its point of view can be left in the public mind.

Free Enterprise not "Laissez Faire"

We consider that "Laissez Faire" or Nineteenth Century Capitalism has no place in contemporary Indian life. These systems, whatever their usefulness might have been, have outlived it. Today they are as dead as the dodo and can make no contribution to the industrial, social and economic advancement we seek. Equally do we hold that the Marxist approach to socialism through State ownership of the means of production is outmoded in time and thoroughly discredited in practice.

Capitalism of today, or as we prefer to call it "Free Enterprise", operating within a planned economy, is the most alive and the most vigorous economic system in the world. Its motive power is rooted in the fulfilment of the individual, controlled and bounded always by the values and principles of the society in which he lives. Thus, Free Enterprise contributes to the moral and material betterment of society by the voluntarily harnessed efforts of the people which compose it. From this must spring a happier and a richer life for all. Reverse the process by introducing authoritarian planning, which places the State above the individual, and the result

will inevitably be confusion, frustration and the loss of liberties.

"The Socialist Pattern of Society"

As far as we know, this phrase has not yet been defined in specific terms. The Forum unreservedly accepts the concept of a fuller and better life for all, equality of opportunity, eradication of unjust privilege; in fine, the establishment of a Welfare State. Indeed we hold that these objectives will be attained more rapidly, more effectively, and with a greater degree of enthusiastic co-operation of the people, through Free Enterprise, than through any other system. Inherent in our acceptance of these social aims is also that of a planned economy, and the common existence and mutual interdependence of a State-controlled and Free Enterprise Sector. What we do not accept is the theory that this State-owned sector should continuously expand until it dominates the national economy, for then, as night follows day, will there be a regimentation of life, totally at variance with India's outlook and traditions, which have always recognised the place and worth of the individual in society.

The Bhakra-Nangal Dam, the Fertiliser Factory at Sindri, the Aarey Milk Colony in Bombay, to take only a few examples, are State achievements which are matters of pride not only to their authors but to the whole country. On the other hand, the Nationalisation of Life Insurance, the introduction of State Trading and the

acquisition of the Kolar Gold Fields are equally in our opinion examples of unwarranted State intervention. It is this trend which must be curbed and halted if the free way of life in our country is to be preserved and its economic progress through the democratic processes assured.

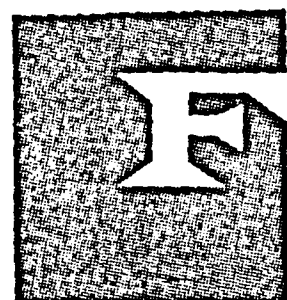
Free Enterprise and Scientific Advancement

A good deal has been said recently on the need to avoid obsolescent thinking in this age of atomic power and of breathtaking scientific advancement. It is important that we define our stand on this issue. We believe that the challenge of our times is to evolve a synthesis of these techniques and their effective use by free members of a democratic society. In many ways our country is blessed by the fact that she is embarking on her plans of industrialisation at a time when superb scientific aids are available to her. Possibly for the first time in history conditions prevail when the question of Bread or Freedom need not even be asked. For, today, science offers us not only Bread and Freedom, but also Speed of attainment thrown in for good measure. It would be a tragedy indeed if this bountiful opportunity were distorted and misconstrued to impose Centralised State Control as the instrument of applying the benefits of science to a regimented society. This and not our approach would be a demonstration of obsolete thinking.

Conclusion

For the reasons which we have given we claim that socially responsible private initiative, or Free Enterprise as we term it, is the most dynamic and effective system available to attain the moral and material ends which all of us so ardently hope for. That is why the Forum has pledged itself to the task it has undertaken, and that is why it will continue its effort in the certainty that in our good country the values of Free Enterprise will ultimately prevail.

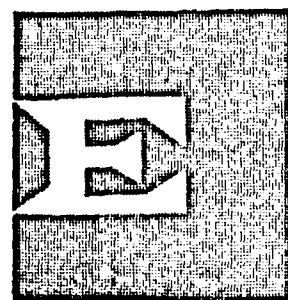
.....
 • The first Convention of the
 • Forum of Free Enterprise was
 • held in Bombay, on April 25, '57
 • at which many leading industrial-
 • lists, professionals, and busi-
 • nessmen were present. Write
 • for copies of speeches made by
 • Mr. A. D. Shroff & Mr. M. A.
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Firm	Item of manufacture
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4. Machine Tool Prototype Factory	Lathes, Geared head 10" Swing. Lathes, Capstan 1". Grinders, Surface 18"x24". Grinders, Tool and Cutter. Lathes, Capstan 14".
5. Mysore Kirloskar Ltd.	Lathes 12" to 28" Swing. Lathes—Capstan 14". Lathes—Capstan 24". Lathes—Turret 34".
6. Praga Tools Corporation Ltd.	Drilling Machines Bench. Drilling Machines Pillar 1" and 1 1/2". Milling Machines No. 1. Lathes, Bench.

Under the Hindustan Machine Tools project in Jalahalli, the construction of the factory started in the latter half of 1953 as the interval between



A view of the production shop where heavy parts are manufactured

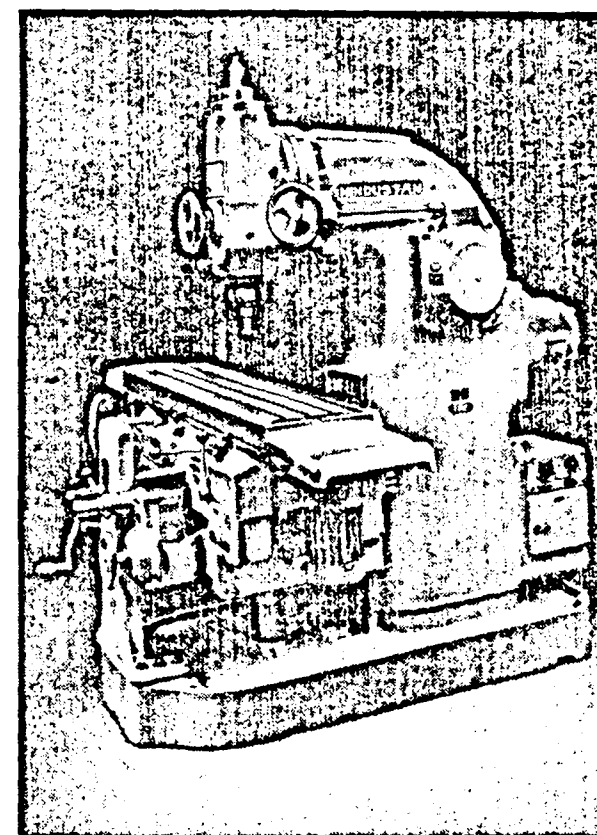
1949 and 1953 was mainly devoted to the selection of the site, planning of the factory, securing of the site and recruitment and training of supervisory and managerial staff. The factory commenced production late in 1955 with a 84" centre lathe specifically designed for it by its technical consultants. The first series of these lathes manufactured in the factory came off the production line on 31st May, 1956. Thereafter, production has gradually been stepped up to about 25 a month by January 1957 and 26 a month by May 1957. Although originally planned to work on a single-shift basis and to reach a production of 400 machines a year by 1960-61, Hindustan Machine Tools revised its original plan, in view of the vast increase in the demand for machine tools, and commenced introduction of multiple-shift working from about September 1956. As a consequence, production has been more than doubled and it is expected that in the current year, 1957-58, the target will exceed the 400 machines originally scheduled for production in 1960-61.

Revision of Contract

The 20-year contract concluded with Oerlikons and due to expire in 1974 was revised during 1956, whereby the capital and management participation of Oerlikons in the Hindustan Machine Tools Company was terminated, as it had run into numerous practical difficulties. The Government of India thereafter took over the complete management of the factory and bought over from Oerlikons their share capital in the company. During the last one year, rapid progress has been made in the Indianisation of the factory. The number of foreign technicians, which stood at 85 in 1956, has been reduced to 29 by May 1957.

A new limited technical collaboration arrangement with the well-known firm of Fritz Werner of Western Germany was entered into in early 1957 for the production of medium and heavy milling machines of six varieties. The production of these milling machines has already been undertaken and the first series of five machines produced in the factory, mainly assembled from components, came off the production lines in May 1957.

In view of the very substantial capacity of the Hindustan Machine Tools factory, plans are being considered to diversify the production further so that more items of basic machine tools, such as radial drilling machines and higher sizes of lathes will be manufactured in the factory in the early



A vertical milling machine

future. Simultaneously, plans are well in hand for the expansion of several other units, notably Mysore Kirloskars, Praga Tools and Ambarnath. If these plans materialise and are not impeded by foreign exchange or other difficulties, Hindustan Machine Tools, Mysore Kirloskars and other machine tool producers will be able to meet a substantial portion of the rising demand and, above all, make India self-sufficient by the end of the second plan in the most basic categories such as lathes, milling machines and radial drills. Once an accurate basic machine tool industry is well established, it will only be one more step before we establish our machine-building industry to manufacture the plant and machinery required for our numerous civil and defence factories of the future.

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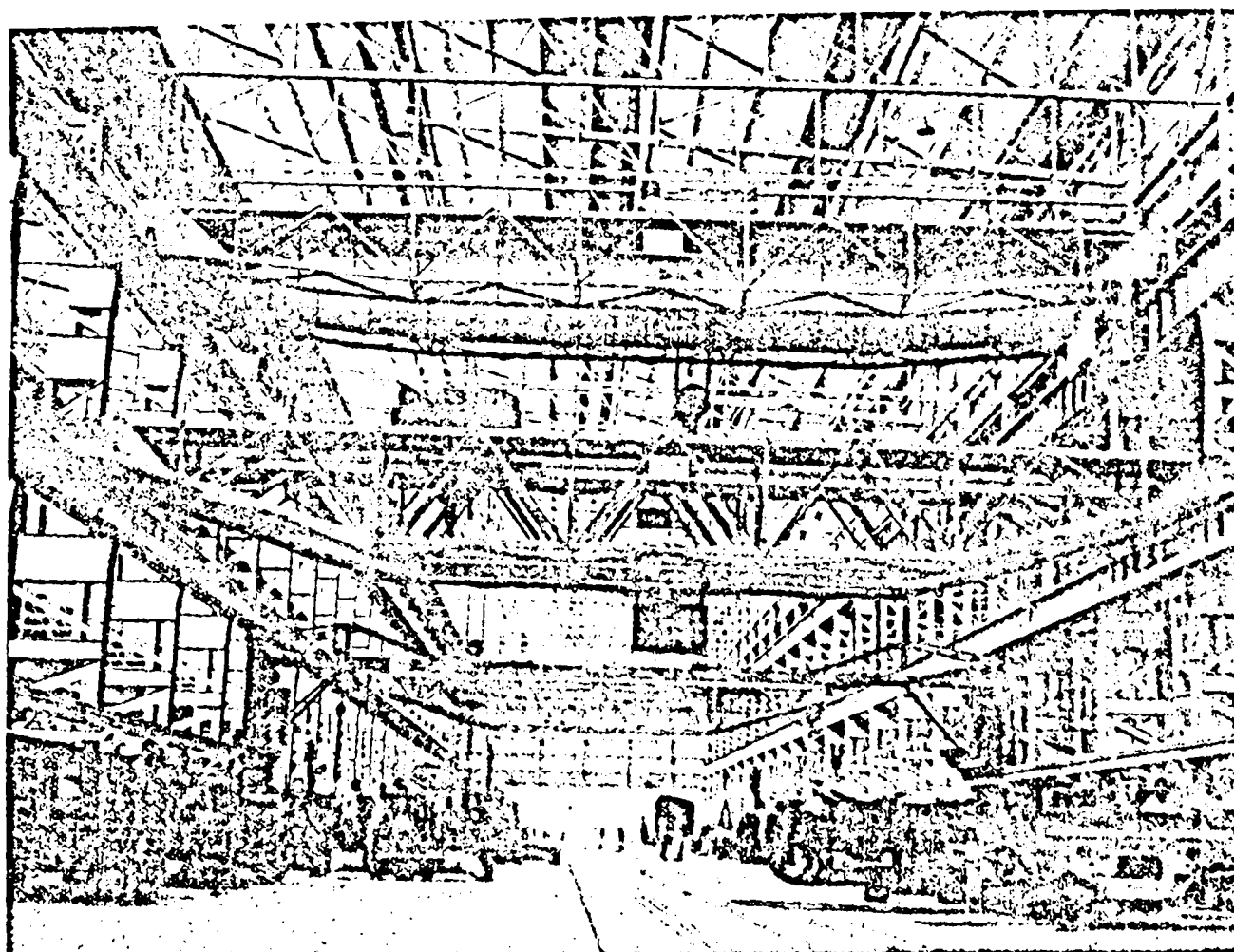
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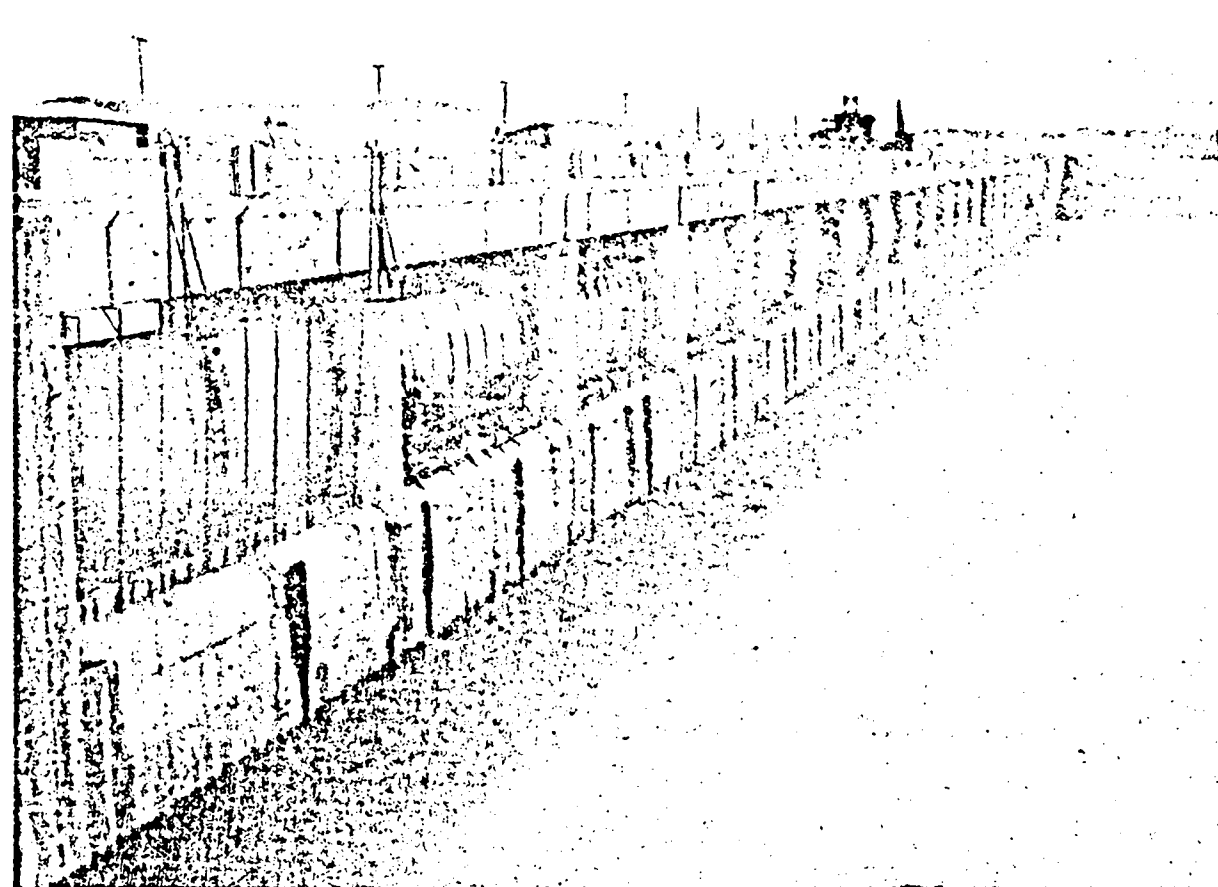
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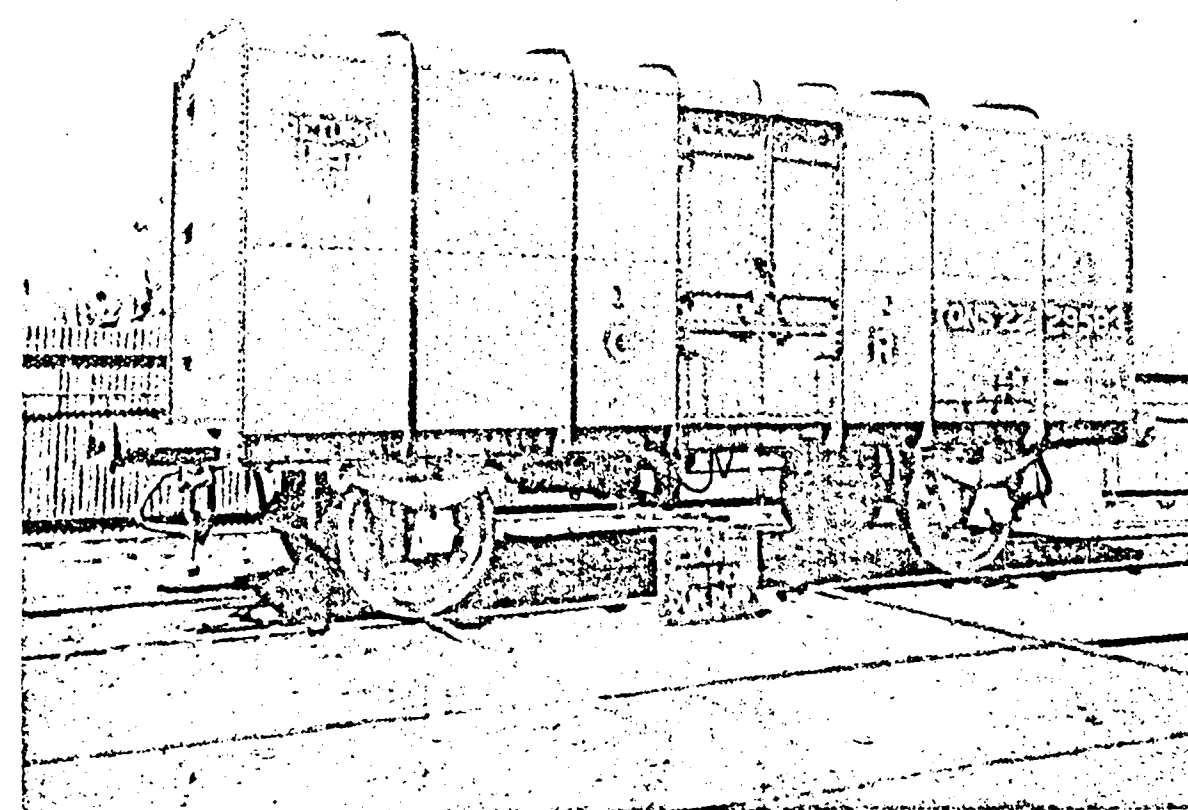
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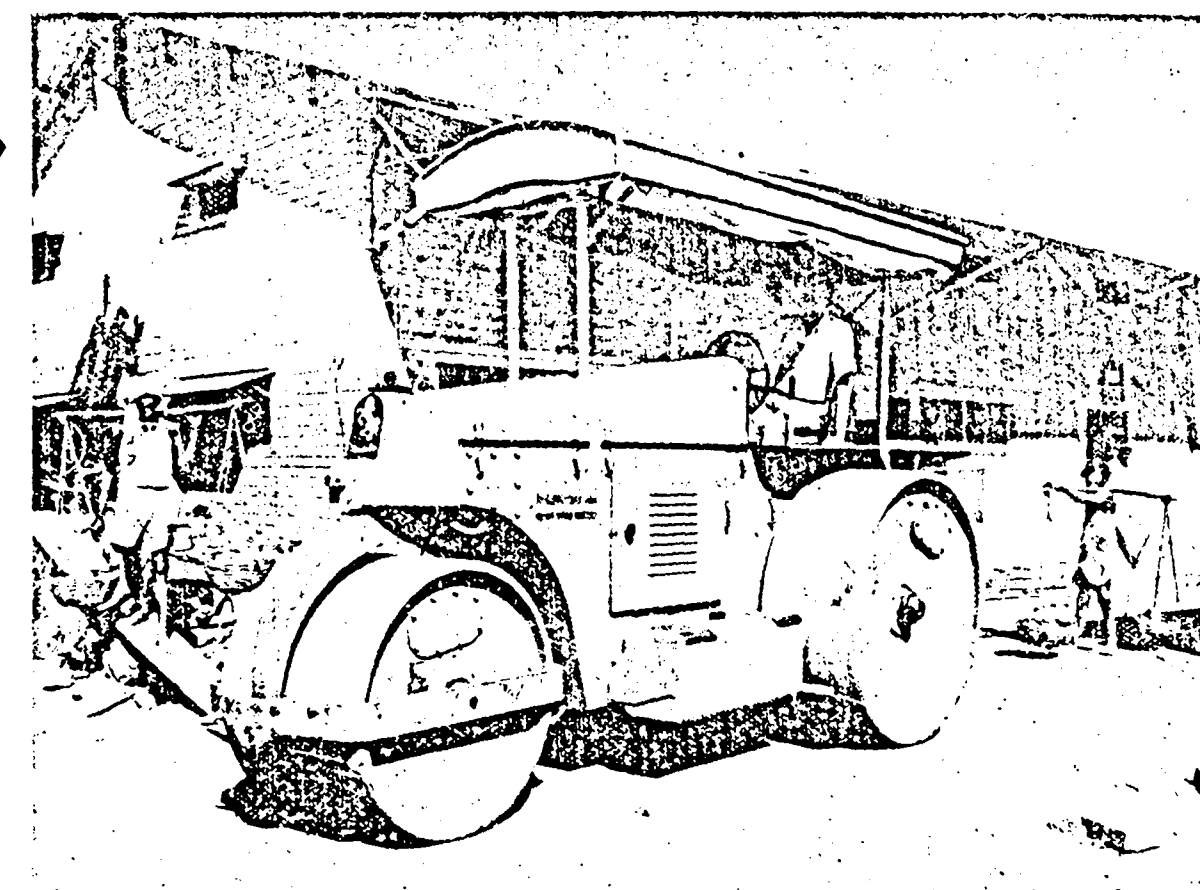
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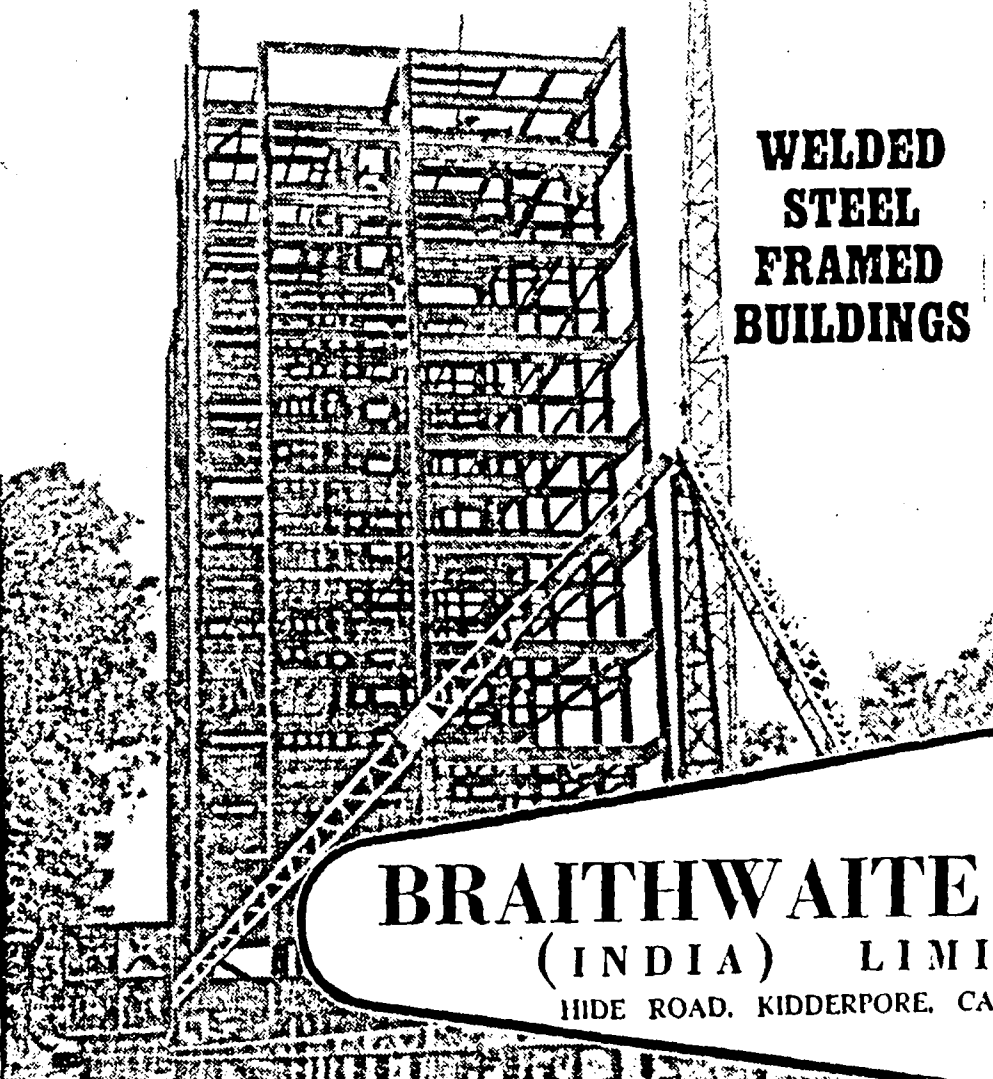
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NEED TO INCREASE STEEL SUPPLIES

• By A CORRESPONDENT •

IT has been said that India does not have any heavy engineering industry in the real sense of the term. This is amply borne out by the facts relating to the production and equipment of engineering concerns. In fact, it would not be an exaggeration to say that the industry is still in its intermediate stage, especially as it stands between steel manufacture on the one side and the making of industrial machinery on the other. The Planning Commission has given high priority to the manufacture of steel, since the tempo of industrial development will materially depend on its supply being adequate. In the *Programmes of Industrial Development, 1956-61*, it says: "Heavy engineering industries are a natural corollary of iron and steel works. The high priority accorded to them arises both on this account and for the fact that they will provide from within the country a wide range of industrial machinery and capital equipment, such as locomotives for railways and power plants for the generation of electricity. In the absence of facilities for their manufacture, a developing economy has to depend on foreign sources of supplies with attendant difficulties and uncertainties". It is precisely with a view to increasing the production of a wide range of machinery that the Commission has emphasised the need to establish heavy foundries, forges and structural shops. The development of these has been accorded a priority nearly as high as that given to steel expansion under the second plan.

The need to establish a machine-building industry is greater than ever before, as annual imports of machinery have recently been extremely large. The increase in the tempo of industrial development will create the need for bigger supplies while there is a serious shortage of foreign exchange. The rise in machinery imports not only reflects the quickening pace of economic progress; it also shows a weakness in the industrial structure, in that this machinery cannot be produced at home. It would be unfortunate if the programmes of industrial development are handicapped by the shortage of foreign exchange. This is an important reason why it is necessary to have bigger machine-building industries. The production of industrial machinery has increased remarkably during the last few years; but it is still much below requirements. Demand is already sufficient to make the establishment of the heavy engineering industry an economic proposition.

Foreign Collaboration

It has always been difficult to assess in detail the capacity of the engineering industry. This is, of course, due to its heterogeneous character; its activity ranges from making large components for oil refineries and harbours to small items such as buckets and wire nails. It is said that the engineering industry is partly a production industry and partly a processing industry. Casting and forging, for example, are less a manufacturing than a processing activity in nature. In construction engineering, the effort usually is to integrate production and processing. Although the engineering industry today is still in its 'light' and medium stages, an encouraging feature is that in recent years it has secured foreign collaboration on an extensive scale from American, British, European and Japanese manufacturers. This collaboration has succeeded because of the widespread belief that the industry has a bright future. Some examples of foreign collaboration are: in the manufacture of bicycles, Raleighs and Tube Investments are collaborating; Babcock and Wilcox are collaborating with Indian interests for the manufacture of boilers; Tatas and Stewarts and Lloyds are collaborating in the manufacture of tubes; Tata and Daimler Benz are manufacturing automobiles and Kirloskar-Brush are making motors. Foreign collaboration has also paved the way for limited capital participation; through it, valuable assistance has been secured, especially in designing, in drawing up specifications and in the purchase of machinery.

Heterogeneous Character

Although the engineering industry is heterogeneous in character, its most striking feature appears to be that its units are essentially interdependent. In fact, almost all units have to rely on other units for the supply of components and

accessories. One reason for this interdependence may be that economic considerations have necessitated the establishment of specialised enterprises. This tendency has received further impetus during the first plan, since there has occurred a considerable diversification in the production of engineering goods. It has been estimated that the value of capital goods and industrial machinery produced in 1955 was about Rs. 20 crores to Rs. 25 crores, against Rs. 3 crores to Rs. 4 crores at the commencement of the first plan. The second plan has laid special emphasis on the production of cotton textile and jute textile machinery, cement, sugar, and paper-making machinery, heavy electrical equipment, machine tools, and heavy foundries and forges. The Planning Commission says in its *Programmes of Industrial Development* that it is difficult at this stage to make a precise estimate of requirements of textile machinery during the second plan; but it refers to the estimate of about Rs. 17 crores made by the Textile Commissioner in July 1955. As for the manufacture of jute mill machinery, the National Industrial Development Corporation is taking an interest in this and the second plan includes financial aid for extending loans to jute mills. The Commission has placed the production target for jute machinery at Rs. 2.5 crores by 1960-61. The target suggested for paper making machinery is Rs. 4 crores. The Commission also visualises great possibilities for the production of cement machinery, for it says: "Though a target of cement machinery worth Rs. 2 crores per annum by 1960-61 has now been proposed, it

is needless to say that it would be of considerable advantage to step up the investment and output in this field."

Steel Supply

The expansion of the engineering industry, as a whole, will depend on an adequate supply of steel. The expansion programmes of the Tata Iron and Steel Company and the Indian Iron and Steel Company, and the construction of three new steel plants in the public sector, will help engineering concerns to increase their production capacity. It is proposed to increase annual steel production to nearly 6 million tons of ingots by 1960-61. The Planning Commission has admitted that the shortage of steel has acted as a serious handicap in the expansion of the engineering industry. The Commission has proposed, therefore, that until steel production increases, it would be advisable to allocate steel to the fabricating industry on the basis of priorities. This will not only help the industry to keep itself fairly fully occupied, but it will also encourage producers to undertake the desired expansion programmes. At present, the re-rolling industry suffers from a shortage of billets and scrap. The Engineering Association of India has expressed the view that re-rolling mills should be allowed to operate on a two-shift basis. Because of the shortage of raw material, most re-rolling mills are working on a single-shift basis. The same problem arises in some other spheres; for instance, the iron casting capacity, especially the capacity for making special types of iron, is

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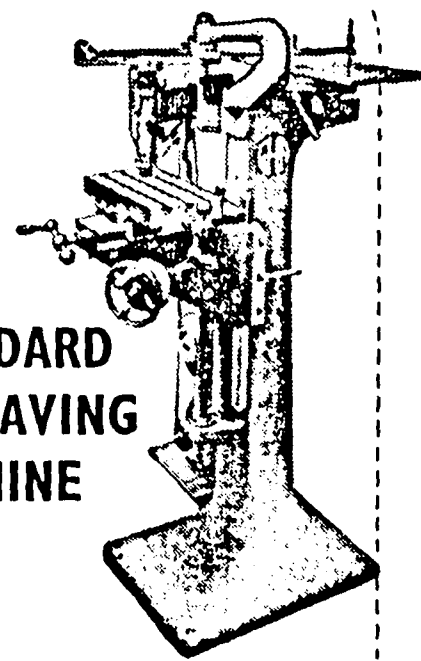
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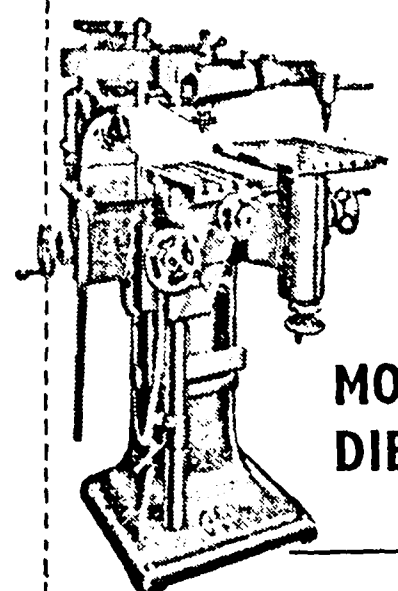
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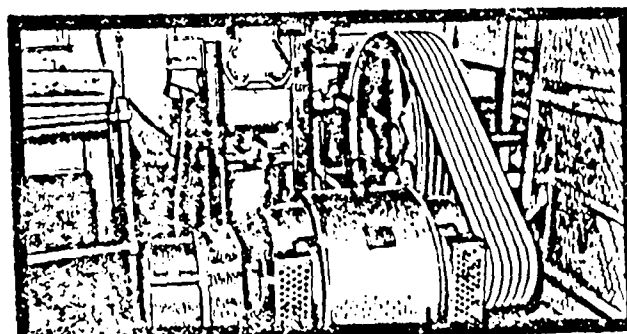
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still under-utilised. It is urgently necessary that the production capacity for making special iron and steel be developed.

Increase in Production

The progress of the engineering industries during the last five years has been remarkable. While the general index of production, with 1951 as base year, was 143 in 1956, it was as high as 293 for sewing machines, 467 for transformers, 574 for bicycles, 144 for automobiles, 251 for electric motors, 350 for grinding wheels and 950 for screws. The following table gives an idea of the magnitude of the task of increasing production and achieving the assigned targets under the second plan.

Industry	Estimated Production in 1955-56	Target Production in 1960-61
1. Structural fabrication	180,000 tons	500,000 tons
2. Automobiles	25,000 nos.	57,000 nos.
3. Ball and Roller bearings	889,000 nos.	2,400,000 nos.
4. Power-driven pumps	36,000 nos.	86,000 nos.
5. Diesel engines	100,000 h.p.	205,000 h.p.
6. Bicycles	1,250,000 nos.	1,250,000 nos.
7. Sewing machines	110,000 nos.	300,000 nos.
8. Industrial machinery	Rs. 5.9 crores	Rs. 33 crores
9. Railway wagons	87,000 nos.	25,000 nos.
10. Grinding wheels	800 tons	1,500 tons
11. Electric transformers	629,600 kVA	1,360,000 kVA
12. Electric motors	271,000 h.p.	600,000 h.p.
13. Electric cables and wires and A.C.S.R. conductors	8,730 tons	18,000 tons
14. Electric fans	180,000 nos.	600,000 nos.
15. Electric lamps	Rs. 2.7 crores	Rs. 5 crores
16. Dry batteries	Rs. 16.1 crores	Rs. 22.5 crores
17. Storage batteries	258,000 nos.	350,000 nos.

At present, the country depends on imports for a large variety of engineering goods. These imports are worth about Rs. 310 crores, which represents about 45 percent of the total import trade. Exports of engineering goods are still insignificant, being only Rs. 8 crores out of the total exports of Rs. 642 crores. This is the reason why the Engineering Export Promotion Council is trying to explore new markets in adjacent countries. In fact, it has already completed a few market surveys. The existence of a home market, which is ready to absorb nearly all that is produced—including some inferior goods—acts as a positive hindrance in increasing exports; but it is likely that a simpler policy for the refund of import duties on materials used for exported goods will help producers to capture new markets.

Allocation Policy

There is a need for greater realism in the steel allocation policy. The practice of annual allocation of steel has been given up in favour of quarterly allocation, as in the past. But some think that a special agency should be created with a view to distributing steel on an equitable basis. The chronic shortage of pig iron and cast iron scrap has already created a serious problem for the engineering industry. The domestic requirements of pig iron are about 600,000 tons, against an annual production of 300,000 tons. Unless steps are taken to increase supplies of pig iron and hard coke, it will be difficult to attain the targets fixed under the second plan. It is said that the monthly production of hard coke is of the order of 20,000 tons while the requirements during the second plan are estimated at 60,000 to 70,000 tons a month.

The industry in the private sector has definite views on the development of the heavy engineering industry. It was suggested to the Coates Mission, for instance, that the new project should be complementary to the existing units producing industrial machinery and that it should help carry out vertical integration in the industry. At this writing, the reports submitted by the Russian experts and the Coates Mission have not been published. It is said that the Russian experts have suggested that a plan for utilising the long-term credit offer of Rs. 60 crores should be drawn up before they undertake to implement the project. The Jehangir Ghandy Committee favoured the establishment of multiple units, as suggested by the British experts, against the construction of an integrated plant recommended by the Russians.

The Prime Minister has recently said that the financial provision in the plan for heavy industries should be substantially increased and that the first priority should be given in utilising the Russian credit offer for machine-building. This issue has also been recently discussed by the Planning Commission. In the light of recent developments, therefore, it is likely that the Government will soon come to a concrete decision. It is reported that the Prime Minister is in favour of accepting the Russian scheme for an integrated plant. This integrated plant will consist of six separate units: a foundry-forge shop, a heavy plates and vessels unit, a heavy structural shop, a unit for the manufacture of coalmining equipment, a heavy machine-building unit and a heavy machine tool works. The Government is said to favour the Russian recommendation to construct the integrated plant. The authorities expect to receive credit assistance from both Britain and Russia. Among the other countries which may extend assistance for the project are Czechoslovakia and Western Germany. These two countries have already shown an interest in the

foundry-forge project which was initiated earlier by the National Industrial Development Corporation. Meanwhile, the Government's recent decision to construct an integrated plant, according to the conception of the Russian experts, is ascribed by knowledgeable circles to the greater emphasis laid by the Planning Commission on the development of heavy industries.

Construction Costs

Attention has already been focussed on the construction costs and the probable foreign exchange expenditure that plants for the manufacture of heavy machinery will involve. It is reported that the foundry-forge shop will entail an expenditure of Rs. 22 crores (foreign exchange Rs. 13 crores), machine-building plant Rs. 24 crores (Rs. 16 crores) and heavy machine tool plant Rs. 11 crores (Rs. 7 crores). Although no detailed estimate has yet been prepared for the alloy and tool steel plant, it is said that the total cost of the project will be about Rs. 100 crores, as compared with the earlier estimate of Rs. 80 crores to Rs. 90 crores, with a foreign exchange expenditure of approximately Rs. 60 crores. It is said that the Government has prepared a tentative plan for utilising the Russian credit offer of Rs. 60 crores. A sum of Rs. 27 crores is likely to be spent for importing machinery and equipment from Russia for two units of the heavy engineering project, namely, the machine-building plant and the unit for producing mining equipment. A sum of Rs. 16 crores has been allocated for the thermal plant of the Neyveli lignite project. The Government will also develop the Korba coalfield with the Russian credit offer, and this is likely to absorb Rs. 8 crores. Smaller allotments of Rs. 1 crore each have been set aside for the manufacture of optical glass and for balancing and reconditioning the methanol plant in Sindri. From these estimates of expenditure, it appears that the Government does not expect that Russia will undertake to construct the

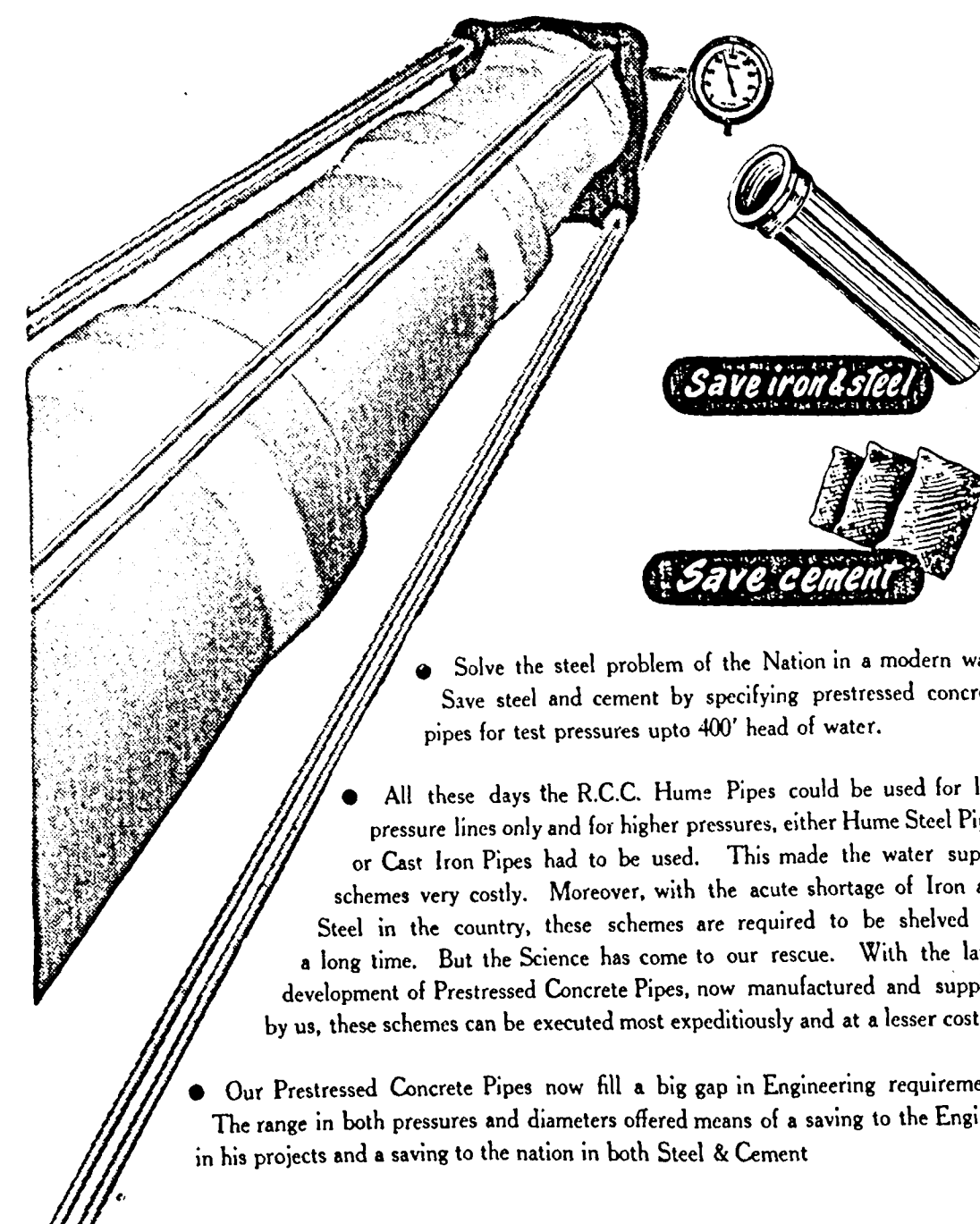
foundry-forge unit. It is now reported that Czechoslovakia might extend assistance for this part of the project. Western Germany may collaborate in the construction of a heavy machine tool plant while Britain could collaborate in setting up the structural fabricating and plate and vessel shops.

Change in Priorities

The Planning Commission, under the initiative of the Prime Minister, appears to hold the view that the construction of these projects under the second plan should not be delayed. So it is likely that some of the second plan schemes may be reduced in size or even postponed in order to promote the heavy engineering project.

The engineering industry has been concerned about the announcement of the Central Ministry of Iron and Steel on increasing steel prices by Rs. 70 a ton, following the enhancement of excise duty on steel ingots from Rs. 4 to Rs. 40 a ton. This may particularly affect engineering concerns whose production costs are otherwise also increasing. But the prospects for the industry, as a whole, are bright. Although the demand for the heaviest types of engineering goods might not be sufficient in the initial phase, there is reason to believe that engineering units in the private sector might buy some of the heavy machinery which the State projects manufacture. The manufacturing units in the private and public sectors will, it is hoped, be complementary, although the authorities should see that they do not offer any concealed preferences to the units it is proposed to build in the public sector. In fact, units in both the sectors should be given equal facilities for development and if regulations are at all to be imposed, they should be equally applicable to units in both the sectors. In spite of handicaps, the engineering industry has made good progress. It is well-organised and there is hope that in future years it will be in a position to meet a much greater part of the demand for engineering goods.

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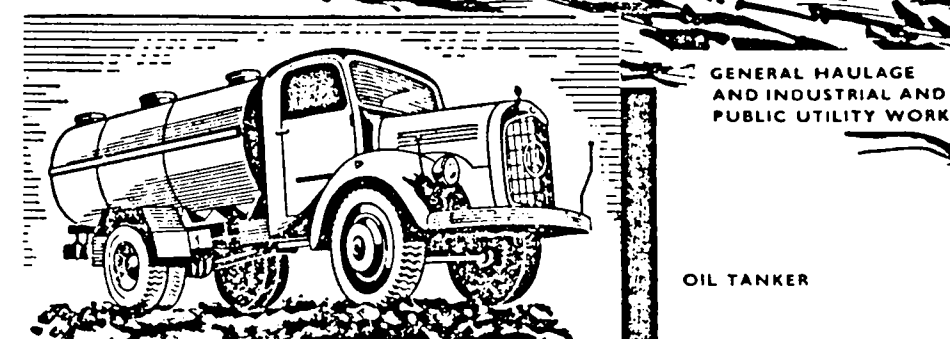
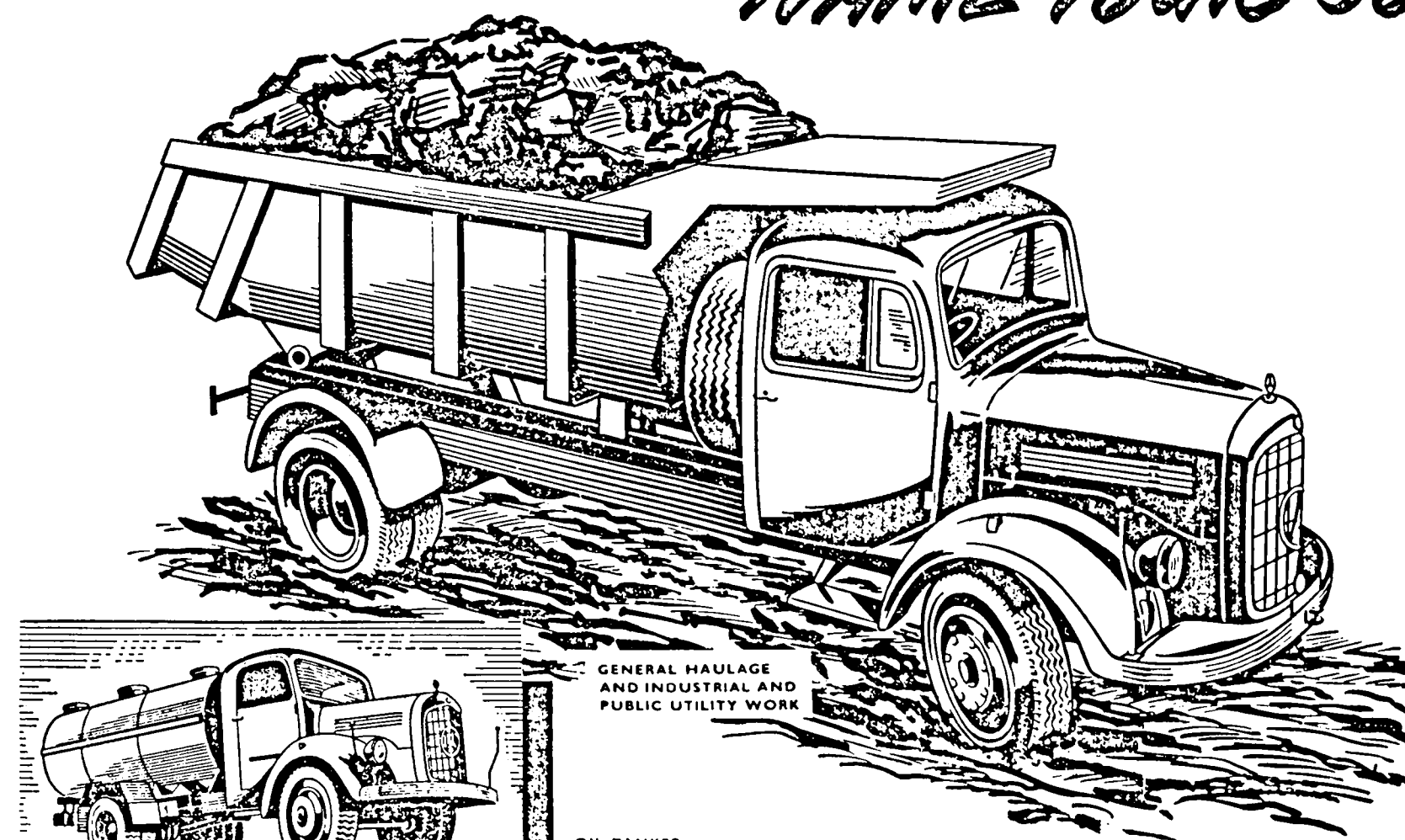
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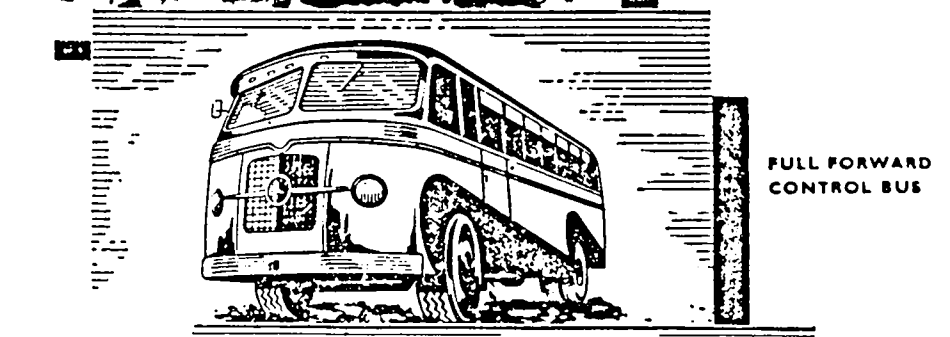
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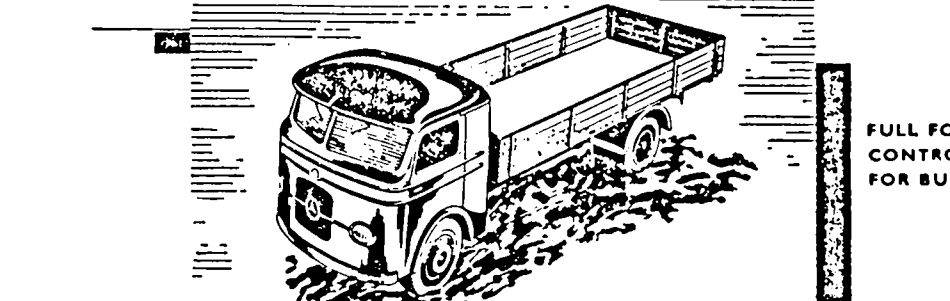


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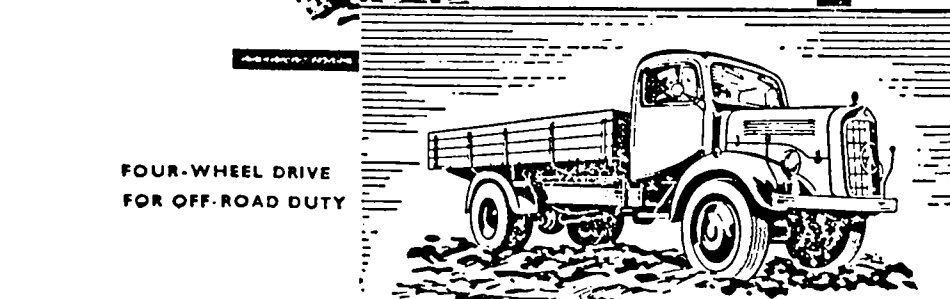
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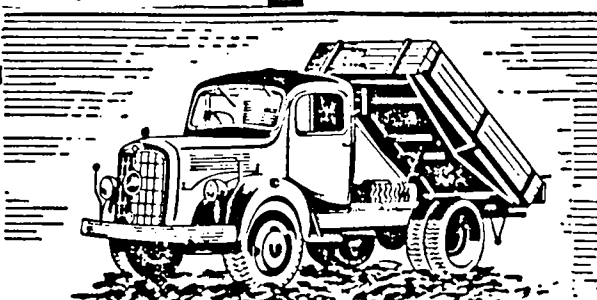
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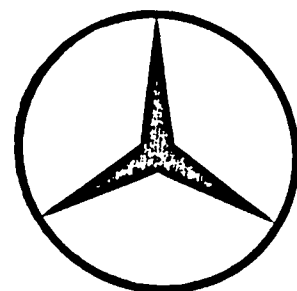
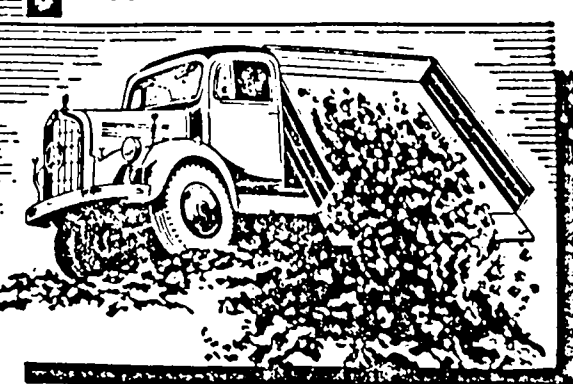
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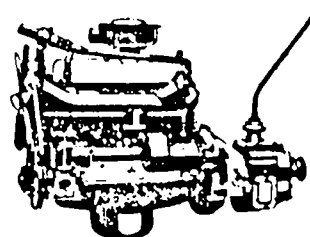


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TOWARDS SELF-SUFFICIENCY IN LOCOMOTIVES

STRIKING INCREASE IN PRODUCTION

• By KARNAIL SINGH •

Member for Engineering, Railway Board

THE railway system in India is over 100 years old. The first train to run was from Bombay to Thana in April 1853. In the early period of development, two repair workshops started the manufacture of locomotives. The first workshop to undertake the manufacture of locomotives was in Jamalpur on the East Indian Railway. Between 1885 and 1926, these workshops built 214 broad-gauge locomotives, 103 boilers and 99 tenders. The Ajmer Workshops on the Bombay, Baroda and Central India Railway—the other workshops to build locomotives—built 435 locomotives between 1896 and 1940. The workshops manufacturing the locomotives did not have any serious difficulties of a mechanical or technical character. In fact, the Ajmer Workshops undertook the entire design of locomotives. The first world war made the Government realise the need for a policy of making India self-sufficient in the supply of materials for the railways. To encourage private enterprise to construct locomotives in India, it published on 30th September, 1921, a communiqué giving a general undertaking that tenders would be invited annually in India for all railway locomotives and locomotive boilers required by the Government during the 12 years commencing from 1923. Requirements were estimated at about 160 locomotives and 160 additional boilers during 1923 and 1924, and 400 locomotives and 400 additional boilers thereafter. Within three months of this declaration, the Peninsular Locomotive Co. Ltd. was incorporated in India with a subscribed ordinary share capital of Rs. 60 lakhs under the chairmanship of Mr. Herbert Jaugham Read, head of a well-known firm of English locomotive manufacturers. The works were designed for an annual output of 200 locomotives—regarded at the time as the economic size for such a factory—and were constructed in Jamshedpur. But the company had not commenced operations even in 1924 when, after spending about Rs. 30 lakhs on buildings and machinery, it applied for protection to the Indian Tariff Board, which was at that time considering the grant of protection to the steel industry.

Findings of the Tariff Board

The Tariff Board considered the establishment of the locomotive industry desirable on both national and economic grounds. In view of the protective duty manufacturers enjoyed in Australia and Canada, it would have recommended the encouragement of the Indian industry, except that the annual requirements of the Indian railways during the next few years were reduced to between 60 and 100 locomotives. This output was not thought by the Tariff Board to be sufficiently large even for a single factory. It felt that the cost of any protective measures which might be taken would not be commensurate with the results until domestic demand approximated to the output of the smallest unit which could be economically and efficiently operated. The Tariff Board stated: "We consider it desirable on national grounds that the

industry should be established in India, and we believe that this could eventually be done, provided substantial assistance were given by the Government in the earlier years. But the existence of a sufficient market for locomotives in India is an indispensable preliminary condition, and at present this condition is not satisfied. If protection were given now, the country would carry a heavy burden during the next five years and at the end of that period the progress made would be insufficient to justify the sacrifice".

The Peninsular Locomotive Company went out of business soon afterwards without manufacturing a single locomotive. Its works were purchased by the Government and converted for use as shops for the construction of carriage and wagon underframes for the Indian railways. A scheme for the manufacture of boilers at the Great Indian Peninsular Railway workshops in Parel, the heavy forgings being manufactured in Jamalpur, and the manufacture of the underframes, cylinders and running gear, including the final erection of locomotives being undertaken in the North Western Railway workshops in Moghalpura, was examined by the Railway Board in 1931. This scheme, which had the advantage that it called for a small capital outlay, had to be rejected, mainly because: (1) the shops in Jamalpur, Parel and Moghalpura did not lend themselves to suitable conversion, (2) control over the costs of locomotives manufactured at three different shops could not be satisfactory; and (3) the correct allocation of the expenditure incurred in such shops between "repair work" and "manufacture" would be difficult.

New Workshop

The remodelling of the Tatanagar workshops for the manufacture of locomotives was again considered. The structural alterations necessary, and the cost of labour and of providing quarters, would have been appreciable, so the scheme was abandoned. The building of a new shop appeared to be the only alternative. In 1933, it was estimated that the cost of such a shop equipped to manufacture 50 to 60 locomotives a year would be Rs. 80 lakhs. The cost of production was not estimated, as during the seven years ending 1936-37, the number of new locomotives sanctioned for Class I railways had averaged only 27 broad-gauge and 36 metre-gauge locomotives a year. It was exceedingly difficult to predict the effect of the better utilisation of locomotive power on the demand for locomotives during the next few years. Besides, international prices of locomotives during this period were attractively low. The building of locomotive boilers, as a first stage in the manufacture of locomotives, was the next scheme considered in 1935. With an investment of Rs. 22.5 lakhs it was estimated that boilers could be produced at roughly 12 percent over and above the then purchase price of an imported boiler.

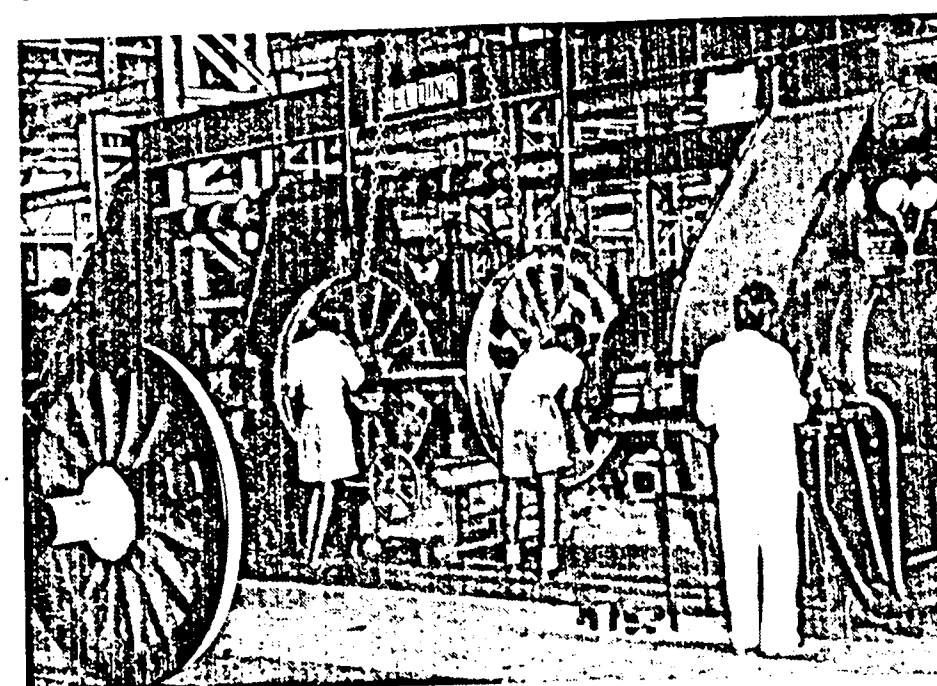
The uncertainty of an adequate and steady demand for locomotives was put forward as the main objection to the economical manufacture of locomotives in India. In the meantime, there was continuous agitation in the Central legislature by Indian leaders for the manufacture of locomotives in the country. At last, in 1939, the Government of India decided to appoint an expert committee to examine in detail the possibilities and economics of manufacturing locomotives in railway workshops.

Report of Expert Committee

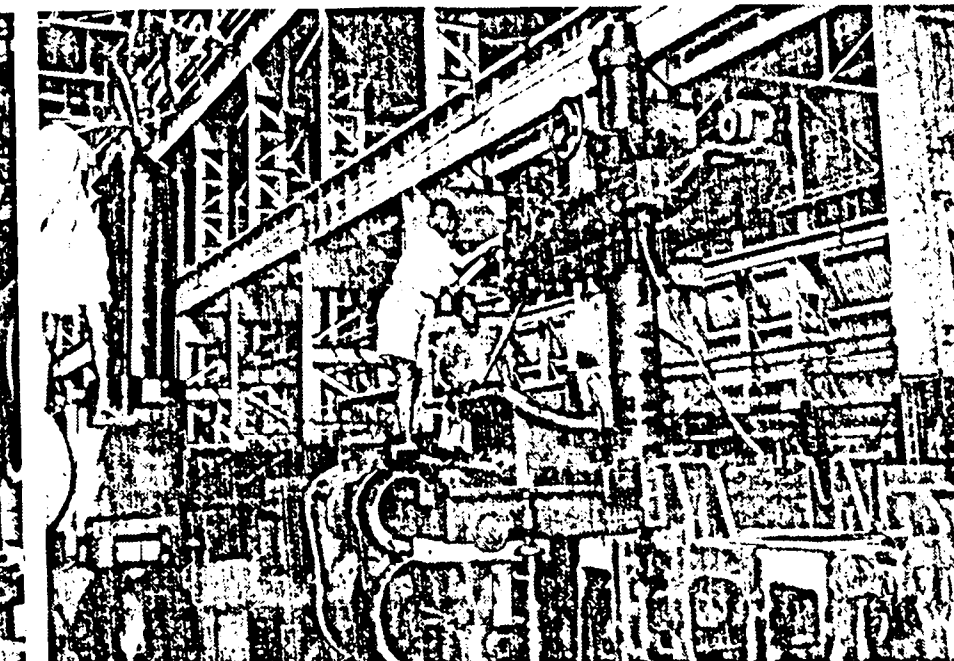
The committee submitted its report on 12th January, 1940. It said that the previous objections had ceased to exist and against an economic unit capable of manufacturing 100 locomotives a year, the requirements would be in the region of 108 broad-gauge and 33 metre-gauge locomotives. It further estimated that a locomotive manufactured in the country would be about 20 percent cheaper than the imported one. As for the actual location of the manufacturing unit, it considered that the scheme involving the minimum additional outlay would be to convert the Kanchrapara repair shops into manufacturing shops. The committee also recommended the continuance of the manufacture of metre-gauge locomotives in Ajmer.

Again the second world war intervened and nothing happened. Meanwhile, the railways, equipped mostly with average locomotives and those also being deficient in numbers, creaked under the load of vastly increased traffic. On the cessation of hostilities, the proposals were re-examined. It was found that the Kanchrapara repair shops could no longer be released, so an adjacent site in Chandmari was selected to build a new factory. The new site had also to be abandoned on the partition of the country.

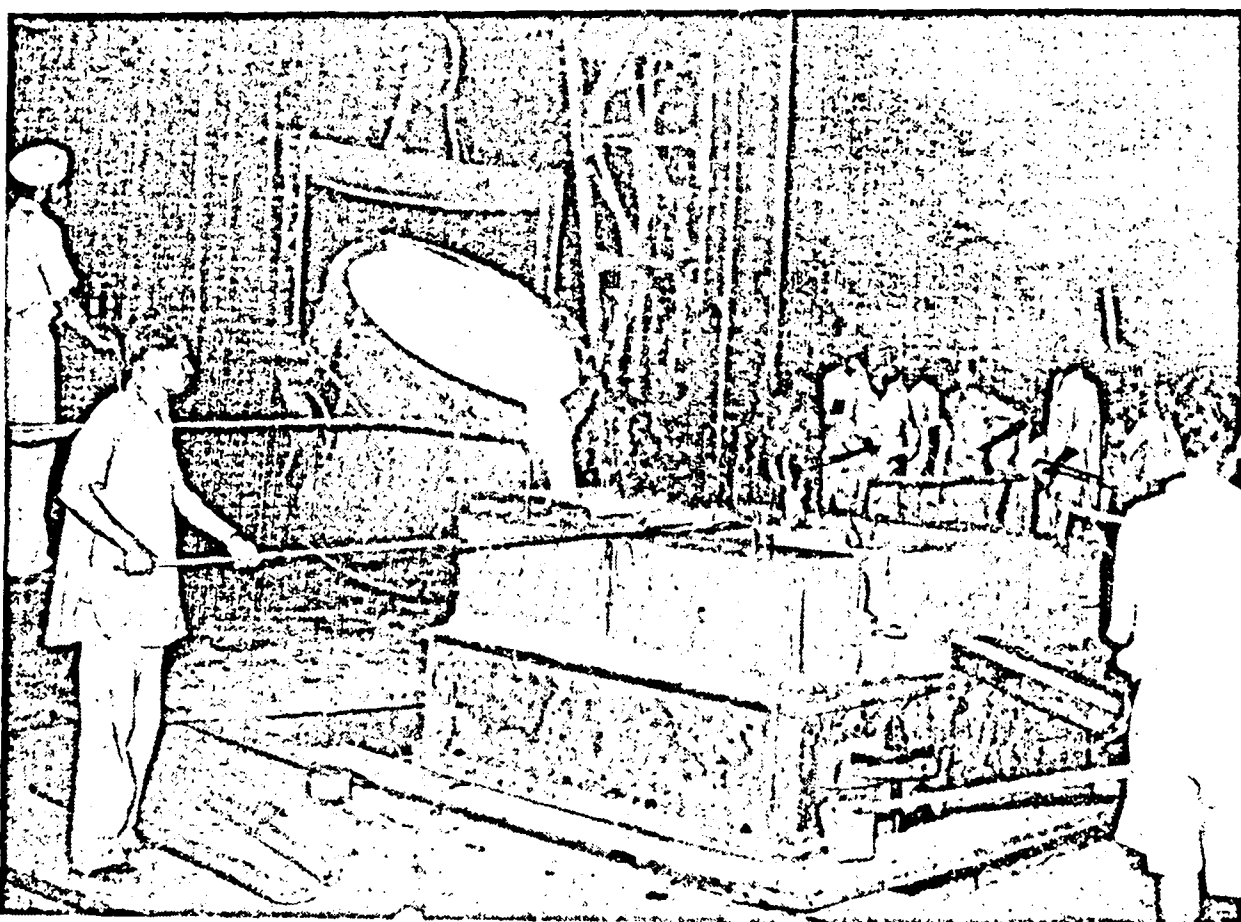
India thus aspired for a long time to build her own locomotives. In August 1947, an agreement was signed between the Railway Board and Tata Sons Ltd. The Tata Locomotive and Engineering Co. Ltd. was established in Jamshedpur for the manufacture of locomotives and boilers. Simultaneously, in September 1947, a site was selected at a distance of 150 miles from Calcutta on the main line of the Eastern Railway for establishing a locomotive manufacturing works. The workshops and township built at this site at a cost of Rs. 14.8 crores bear the name of Deshbandhu Chittaranjan Das. Today, Chittaranjan and T.E.L.C.O. between them are producing most of the steam locomotives required for the country—not only to replace the over-aged stock, but also to provide additional locomotives required for rapidly expanding traffic requirements. So far, over 500 broad-gauge locomotives have been manufactured by Chittaranjan and over 200 metre-gauge locomotives by T.E.L.C.O. The annual production capacity of Chittaranjan has now reached a figure of 200 average-size locomotives and T.E.L.C.O. is making



Assembling wheels in the wheel shop of a locomotive works



Machining of a cylinder in the heavy machine shop



Pouring metal into a cylinder mould

50 metre-gauge locomotives. Except for the raw and basic materials and proprietary items, the two units are producing all the components required for the locomotives.

Modern Machines

The Chittaranjan locomotive works, with a township built on an area of about seven square miles, are modern. The covered accommodation inside the workshops is about one million square feet. There are nearly 1,000 items of machinery and plant installed in these shops. The machines are of modern design and each has an independent motor drive. The W.G. class locomotives currently being produced in Chittaranjan, have approximately 150,000 components of 5,340 different types.

Of these, about 1,300 types, mainly such items as bolts and nuts, raw materials such as rough steel castings, and finished parts mostly of a proprietary nature like lubricators, regulator valves and headers, are purchased from the trade. The remaining items are made and the finishing of the rough castings is done in the workshops in Chittaranjan. It is essential that apart from the dimensional inspection of each one of the components that go to make up a locomotive, the physical and chemical composition of the raw materials which are used in the manufacture of components is checked. For quality control, a whole-time inspection organisation, under an independent chief inspecting officer, functions. A senior chemist and metallurgist is also attached to the works. In the production

shops, including the assembly shops, the piecework system of payment is in force. The basic wages are guaranteed and piecework earnings are directly related to the saving in time.

A works drawing office, jig and tool drawing office and a production organisation have been provided. The production department has been organised on modern lines and has various sections for pre-planning, time studies, rate-fixing and progress. The cost of production of locomotives has been gradually coming down as production has gone up. In the early stages, a locomotive produced in Chittaranjan was costing about Rs. 7½ lakhs, against the landed cost of Rs. 5.35 lakhs for an imported locomotive of a similar type. The cost of the same locomotive turned out by the Chittaranjan works today is approximately Rs. 4½ lakhs. The reduction in cost has been achieved in spite of increases in the cost of raw materials.

The rapid development of other types of motive power is now receiving the attention of the Railway Board. Proposals are in hand for the manufacture of diesel and electric locomotives in the existing workshops in Chittaranjan and at TELCO. The Ministry of Railways has well-organised design offices for various items and the design office for locomotives is situated in Chittaranjan. In the design office, apart from the production of designs of locomotives needed for efficient transportation, the standardisation of locomotives and components, the improvement in the design features are dealt with. Problems connected with locomotive maintenance are studied.

Foreign Technicians

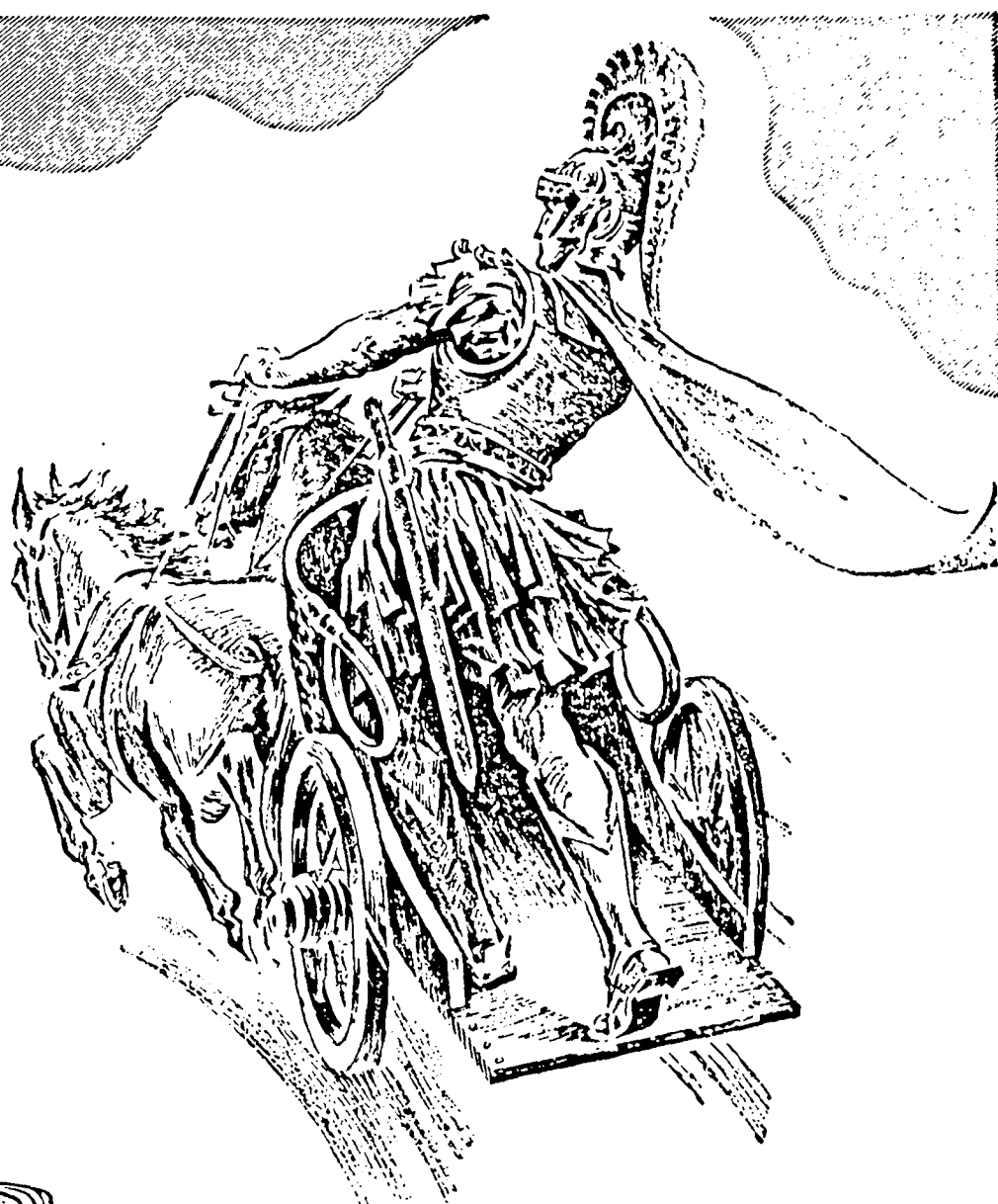
In the early stages of manufacture in Chittaranjan, technicians from the U.K. were brought to assist the works in developing production. It must be remembered that the Chittaranjan locomotive works was started with a nucleus of 400 men drawn from different railway repair workshops and has been gradually developed. Today it has slightly over 4,000 men, most of whom started dealing with locomotive components only after 1950. To meet the demand for more and more trained technicians, a technical school has been established in Chittaranjan. In this school, over 400 apprentices are being trained to become skilled artisans and supervisors.

Achilles' heel

The wonder hero of the Trojan War, Achilles, was invulnerable—except at the heels.

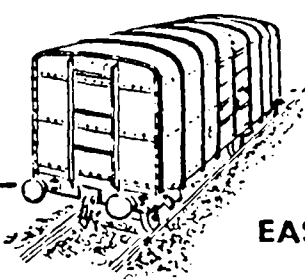
In these days of power propulsion, 'wheels' rather than 'heels' are the symbol of speed. And when they say that our Plan for prosperity rides on the railway wheels, it is not mere rhetoric. The wheels must not be allowed to clog if the Plan is to succeed.

Indian Railways' 2,50,000 wagons must work their wheels faster and harder to carry more goods.



UNLOAD TODAY—NOW

KEEP THE WAGONS MOVING



EASTERN RAILWAY

QUICK PROGRESS IN EXPANDING WAGON MANUFACTURE

SELF-SUFFICIENCY IN SECOND PLAN

• By A SPECIAL CORRESPONDENT •

THE initial monetary outlay required for a wagon building unit of an economic size, including the manufacture of wagon components, is large. The railways are the only buyers of wagons in India. In the past, there was naturally considerable hesitation on the part of entrepreneurs to enter this sphere of manufacture unless an assurance existed for the utilisation of the capacity developed. In the pre-independence period, Government policies did not always inspire confidence in this direction. In the absence of a planned programme of railway development, the procurement of rolling stock fluctuated a great deal from year to year. No specialised industrial undertaking could work economically under these conditions.

Until 1949-50, the Wagon Manufacturing Panel consisted of only three firms, all situated in Calcutta. The production of wagons in that period was in the neighbourhood of 3,000 wagons a year. It was in 1950-51 that the Ministry of Railways took effective steps for the development and expansion of wagon manufacturing units. Firstly, a steady inflow of orders for the manufacturing units was assured; large orders for the same type of wagons were repeated from year to year. Financial assistance in the shape of on-account payments against raw materials was provided for in these contracts. This system of payments to all established wagon builders has continued ever since. The manufacturing capacity is now being booked more than a year in advance to enable timely planning for supplies of raw material. The railways have, in addition, maintained close liaison with the Iron and Steel Controller to ensure adequate supplies of raw steel.

Expansion of Capacity

Towards early 1953, four new firms, two in Calcutta and one each in Bihar and Bombay, undertook the manufacture of wagons, commencing with educational orders of sizeable quantities, and later developing into dependable manufacturers of rolling stock. In the meantime, the old established manufacturers substantially expanded their original capacity. Indigenous output of the wagons thus steadily increased from 3,707 in 1951-52 to 15,947 wagons by 1956-57. The table below gives the actual production of wagons by these indigenous manufacturers:

Year	Number of wagons
1951-52	3,707
1952-53	6,368
1953-54	6,882
1954-55	10,689
1955-56	14,317
1956-57	15,947

The indigenous manufacturers have successfully built varying types of rolling stock, and it will not be incorrect to state that most types of wagons can now be manufactured in the country. The Indian railways are operating a large number of locally built bogie trucks, oil tanks, well wagons, parcel and motor vans and the hopper wagons, almost the heaviest unit of goods stock used for carrying iron ores to steel plants. The total value of rolling stock orders executed in 1956-57 by the Indian wagon building industry, which is wholly in the private sector, would be about Rs. 17 crores.

Second Plan Demands

Large demands for new rolling stock were expected in the second plan, and this high level of requirement was expected to continue even thereafter. A Committee (the Railway Equipment Committee) was set up in 1955 to locate idle capacity and to suggest ways and means for expanding the existing plants and/or of setting up new units for indigenously producing items of railway equipment and rolling stock, which could not be manufactured with the existing resources. The Committee submitted its report

in May 1956. It recommended that the existing capacity of the established wagon manufacturers should be increased, and also that more wagon building units be established in the country. As a result of this recommendation, the indigenous installed capacity of the present manufacturers has been increased to 20,000 wagons a year, and over a dozen new firms have been selected for placing educational orders in the first instance. The new wagon units are spread out in various regions of the country.

Old Stock Replacement

The replacement of the obsolete wagon stock continues to be a problem. Due to the heavy strain of the war period and almost a total lack of attention in the immediate postwar years to railway rehabilitation, arrears accumulated abnormally. When in the first five year plan this came to be considered, it was found that the major problem to be faced was the inadequacy of rolling stock of which a considerable proportion had been overaged. At least, 20 percent of the 221,441 wagons then in service were well past their normal span of useful life. During the first plan period, the total number of wagons procured from abroad and from indigenous sources were 61,240—41,996 indigenous and 19,274 imports. This brought the total stock of wagons at the beginning of the second five year plan to nearly 282,681, but of this, as is estimated in the second plan, as many as 49,568 were overaged needing replacement.

It is probable that a good proportion of this overaged stock will be retained in service due to the policy of utilising part of the obsolete fleet. The second plan estimates that the annual requirement of the railways during the five-year period will be 25,000 wagons a year, that is a total of 125,000. This, together with at least 80 percent of the overaged stock, comes to a total of nearly 165,000 wagons which should be produced to make the railways adequate in their wagon fleet. According to the original programme, a total of 107,247 wagons are to be procured during the second plan, which will still leave arrears of replacement amounting to at least 6.6 percent of the broad-gauge and 11.9 percent of the metre-gauge wagons in 1961. This will be a considerable improvement on the position in 1956 when 16.5 percent and 17.2 percent of the wagon stock was overaged, but it would still not be a very satisfactory prospect even to have this proportion of overaged stock in service by the end of the second plan.

There was however a broad hint in the second plan report that as far as possible, the Government would try to achieve self-sufficiency in indigenous wagon manufacturing capacity through stepping up local production. This the Government is now doing. In the first year of the second plan, steps were taken, in accordance with the recommendations of the Railway Equipment Committee, to raise production capacity.

The total number of wagons that was to be imported under the second plan, was 20,000 over

the five year period. It is reported that no wagons were imported during the first year of the plan. This may have more to do with the existing exchange scarcity than with any unexpectedly big rise in output, but there is no doubt that production has been rising at a remarkable pace. The private wagon-building industry has responded well to the needs of the growing economy, and so far as the supply of ordinary wagons goes, the production position, it is said, has already reached a point of self-sufficiency. One serious difficulty has been that of steel supply which the engineering industries, in general, have been experiencing. Even though the production capacity is being expanded, it is by no means certain that the steel needed for their production will be forthcoming, or will be available in time, the country's capacity for imports being what it now is. Assuming that steel supply is adequate, which the Government must ensure in view of the urgency of the development demand on railway transport, not only will the railways be relieved of a major worry, but the country also will have saved, in terms of foreign exchange expenditure, a fairly big sum like Rs. 81 crores, which it is proposed to spend on wagon imports during the second plan. The wagons that still need to be imported are the special types which the country does not produce at present. But the Railway Board, it is reported, is now making efforts to initiate their manufacture in the country also.

Manufacture of Underframes

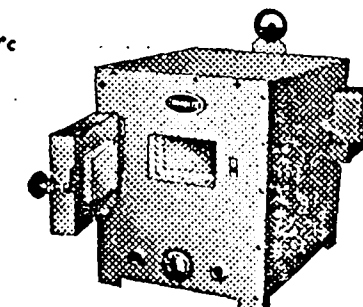
In addition to the wagons, steps have been taken to increase the indigenous capacity of underframe production, of which so far not more than 300 a year have been produced, and this capacity is limited to only one manufacturer. As a result of the recommendations of the Railway Equipment Committee, four new firms have been selected for the manufacture of coaching underframes. As this capacity will naturally take some time to develop, efforts were made recently to persuade some of the established indigenous wagon builders to undertake and/or expand the capacity of the manufacture of underframes. As a result, orders have been placed on three experienced indigenous firms for 1,091 underframes, valued at Rs. 3 crores. This represents nearly 12 months' production, and it is hoped it will, in due course, be stepped up to meet in full the railway requirements.

It is with extreme satisfaction that one can view the past development and performance of the wagon-manufacturing industry—an industry which has radically altered the pattern of imports of railway wagons and is a striking example of what is possible when planned and effective steps are taken by the parties concerned to develop indigenous manufacture. While the expanding economy of the country ensures continued bright prospects for this industry, the railways have for all times been assured of dependable suppliers to whom they can turn in times of peace and emergency.

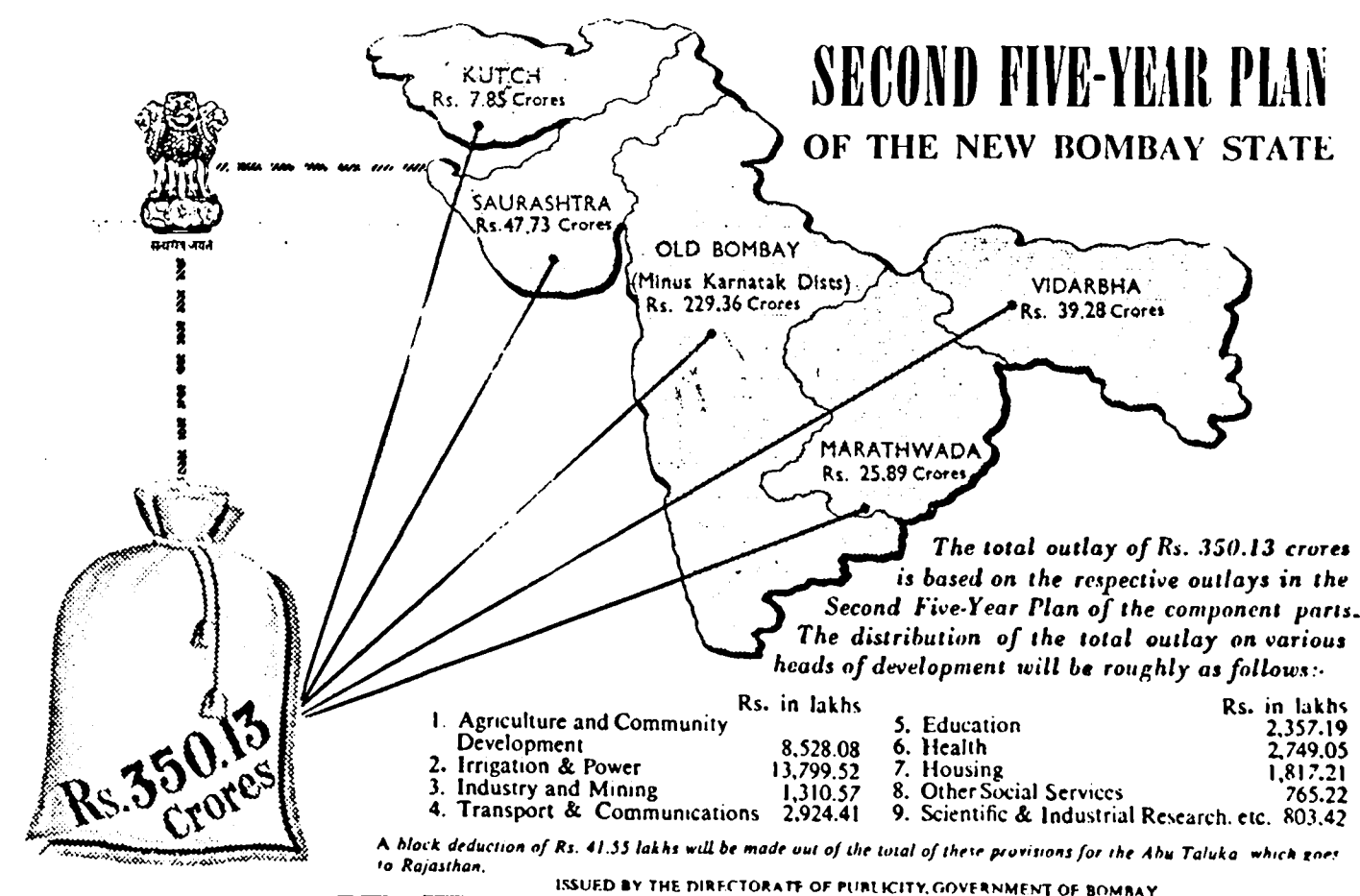
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THE ECONOMIC ASPECTS OF SHIPBUILDING

NEED TO INCREASE PRODUCTION CAPACITY

• By K. Y. KRISHNAMURTHI •

SINCE times immemorial, there has been considerable maritime activity in India. Historical records prove the existence of extensive ship and boat building activity, as well as that of navigation in rivers and the sea, as early as the eleventh century. Those were not merely the haphazard exploits of a few adventurers. Shipping and shipbuilding, it seems, were well-established and well-regulated enterprises in the Mauryan era. There is also evidence to show that there were during this period a highly developed and skilled indigenous shipbuilding craft, extensive harbour facilities and regulations for the classification of ships. Ships played no small part in the expansion of Indian trade and commerce and also in the colonisation by Indian rulers of far-off lands.

The East India Company, which began its activity with commerce, seems to have recognised the fairly advanced state of the Indian shipbuilding industry and extended its patronage to it in the early days. When the Company gradually turned to a new phase of infiltration and colonisation of the country, its attitude towards the industry underwent a change. This brought a steady decline in the fortunes of Indian shipbuilding. The introduction of steam power for the propulsion of ships, as well as of steel in place of timber, brought about far-reaching changes in shipbuilding techniques. The new forces thus released had an adverse impact on the industry, and made it, in course of time, absolutely defunct towards the middle of the nineteenth century.

After about a century of inactivity, Indian shipbuilding entered a phase of revival. The credit for sponsoring this revival goes to the late Mr. Walchand Hirachand who was an industrialist of vision and courage. To execute his ideas, he, as the chairman of the Scindia Steam Navigation Company, strove hard to establish a modern shipbuilding yard in India. But his project came into fruition only in the middle of 1941 when the foundation stone for the construction of a shipyard was laid in Visakhapatnam. This modern yard would not have become a practical proposition had it not been for the second world war which brought home the fact that shipping is essential for any country in an emergency.

Visakhapatnam Shipyard

After examining sites in various other ports, the Scindia Company, on the advice of its British consulting engineers, Sir Alexander Gibb and Partners, finally selected the site on which the shipyard is now situated in Visakhapatnam. As it happened, the construction of the shipyard was started during the peak years of the war. This created numerous difficulties, which gave a continual setback to the project. The construction cost considerably exceeded the original estimates as prices soared. Machinery and equipment ordered from abroad were very much delayed. Nevertheless, the first stage of construction, constituting two berths and workshops for fabricating the hull as well as for fitting out the ship, was almost completed in 1942, when yet another misfortune befell. The Japanese air raids on Visakhapatnam port in April 1942 brought about the closure of the shipyard at the instance of the Government of India. For about a year and a half, the Company put up a temporary repair yard in Bombay where some war jobs were executed. In retrospect, it is obvious that the closure of activity at a crucial stage in the establishment of the shipyard in 1942 was unfortunate since it gave a serious setback to the already chequered progress of the industry.

Early in 1943, the construction of the shipyard was resumed, but the tempo of work was exceedingly slow. This accounted for the first stage of the shipyard's construction, two building berths being completed very late in 1947. This, in brief, is the story of modern shipbuilding in India. There are, of course, some small shipbuilding units which make crafts on the Hooghly and on

the west coast, but modern shipbuilding is identified only with the shipyard in Visakhapatnam.

Government Participation

Between 1947 and 1952, the shipyard built eight ocean-going steamships of a standard design, under the ownership and management of the Scindia Steam Navigation Company. After building four of these ships for themselves, Scindias found themselves unable either to finance the construction of ships in the shipyard or the development of the shipyard itself into an economic unit. They, therefore, made representations to the Government that the latter take over the management of the shipyard. In March 1952, a new company, promoted jointly by the Government of India and the Scindia Company, in which the former had a share-holding of two-thirds and the latter one-third, took over the ownership and management of the Visakhapatnam shipyard. Since then, with the assistance of a French firm of shipbuilders, *Ateliers et Chantiers de la Loire* (who are the technical consultants to the shipyard), the shipyard has made considerable progress. It has started producing the latest type of streamlined modern diesel ships. A development programme costing about Rs. 2 crores is

now in its final phase of execution. The production capacity, which is now about two and a half to three ships a year, will increase after all the important units in the development programme have been completed, to about four ships a year. The capacity can be further expanded to six ships without many more development units having to be added.

Large Berths

The shipyard is now equipped with four large building berths and a small berth for the construction of smaller craft. On these berths can be built ships up to 550 feet in length and 15,000 tons in deadweight. There is a fitting-out jetty 1,200 feet long, but before long, this will be extended further to meet the fitting-out requirements of six ships a year. Even after the shipyard produces ships of about 50,000 deadweight tons a year, this rate of production can hardly meet the growing requirements of Indian shipping for expansion and replacement. If the country is to achieve the target of two million tons of shipping as quickly as possible, there is much to be done because the present tonnage is only 600,000. To acquire about 1,500,000 tons of shipping is no mean task. In terms of money, it will entail an expenditure of nearly Rs. 400

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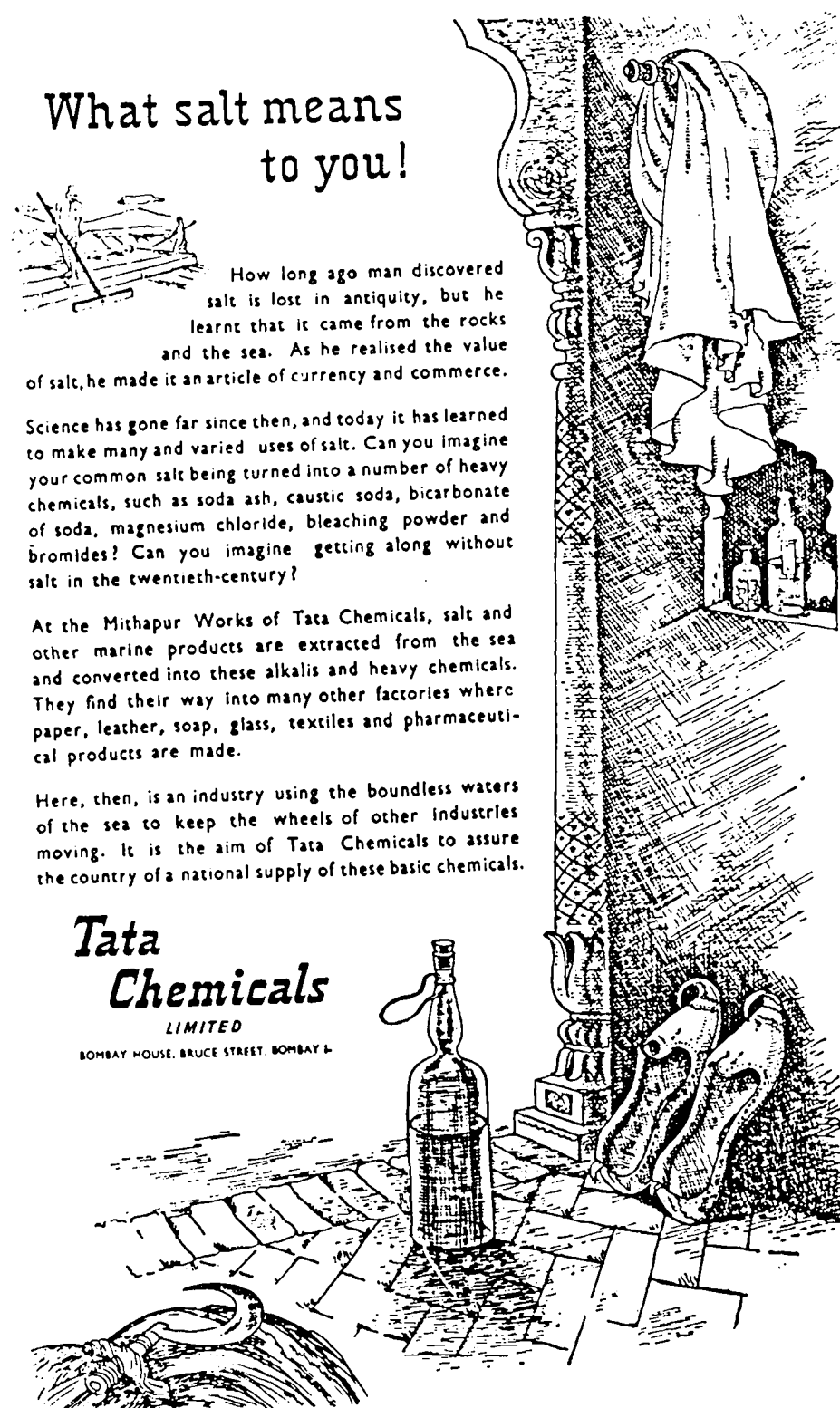
How long ago man discovered salt is lost in antiquity, but he learnt that it came from the rocks and the sea. As he realised the value of salt, he made it an article of currency and commerce.

Science has gone far since then, and today it has learned to make many and varied uses of salt. Can you imagine your common salt being turned into a number of heavy chemicals, such as soda ash, caustic soda, bicarbonate of soda, magnesium chloride, bleaching powder and bromides? Can you imagine getting along without salt in the twentieth-century?

At the Mithapur Works of Tata Chemicals, salt and other marine products are extracted from the sea and converted into these alkalis and heavy chemicals. They find their way into many other factories where paper, leather, soap, glass, textiles and pharmaceutical products are made.

Here, then, is an industry using the boundless waters of the sea to keep the wheels of other industries moving. It is the aim of Tata Chemicals to assure the country of a national supply of these basic chemicals.

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crores. Even if the money could be obtained, ready ships are hardly available and costs are excessive. As far as new orders are concerned, almost every shipyard in the world today is fully booked for deliveries up to the end of 1961. Therefore, even with the best will in the world, it is impossible to reach the target of two million tons, at least for next 15 or 20 years. This points to the need for expanding shipbuilding capacity in India, without which no programme of rapid increase in shipping tonnage will be practicable. This is the context in which the importance of Indian shipbuilding should be assessed.

An Assembly Job

Shipbuilding is essentially an "assembly" job. Except for the hull of a ship, which is fabricated and erected in the shipyard, the rest of the work consists of procuring machinery, equipment, fittings and materials and putting them together. Of the materials used in shipbuilding, a very large proportion are of foreign manufacture. Only the timber and perhaps a few common items like bolts and nuts, rivets and ordinary fittings and materials used in house-keeping are manufactured in India. Thus, the basic problem confronting the industry is quickly to develop the manufacture of as many of the imported items as are possible. Even steel is being imported at present, as steel for shipbuilding is required in very special sizes to be economical and these sizes are not yet being produced in India. It is hoped that, with the new steel plants going into production, this problem will be solved and the import of steel eliminated in due course. As far as the other materials are concerned, the principal item is the propelling machinery and its auxiliaries. This, incidentally, constitutes the largest single and costliest component of a ship. The problem, therefore, is whether the propelling machinery can be manufactured locally. It is not possible to undertake the manufacture of this machinery while its present offtake is so small. It would, therefore, be too expensive to produce it. Production can be taken up only if a reasonable offtake is ensured. The answer obviously lies in increasing shipbuilding capacity as soon as possible. Thus, for a different reason we come again to the same conclusion.

It is gratifying that the Government of India has recognised this fact and has, in principle, de-

cided to set up a second shipyard. When this shipyard goes into production, the propelling machinery required for both the shipyards in India will perhaps justify its manufacture. Even if it is not strictly economical to do so for some time, it may be well worth establishing a factory for the manufacture of propelling machinery. This applies also to the other items of equipment required for ships which are now being imported. In the circumstances, the only way in which the shipbuilding industry can be made self-sufficient is to give top priority to the project for a second shipyard and for a factory to build marine engines. These two are inter-dependent. Between them, they will add to the efficiency and economy of the shipbuilding industry as a whole, and render the target of two million tons of shipping easier to achieve.

Problem of Personnel

For a country like India with a vast coastline, the need for achieving a fairly adequate shipbuilding capacity as well as the establishment of the subsidiary industries (required to make shipbuilding self-sufficient) can hardly be over-emphasised. But heavy projects of this nature need a lot of planning and preparation and cannot be established overnight. Perhaps it is well to go slow rather than to go wrong. At the same time, the decisions on policy should be prompt and timely. Another important problem facing the industry is the problem of personnel. Shipbuilding is a highly specialised industry from this point of view. The techniques of modern shipbuilding are fast changing and advancing. The problem of personnel, therefore, assumes a special significance while India is still in an early stage of development in shipbuilding. The aim should be that when the industry is well established, it should be highly efficient. This cannot be the case unless it is planned from now. If the right type of personnel and equipment are provided, it will enable the industry to adopt all the modern methods of construction. Suitable machinery for keeping abreast of changes in the techniques should also be provided. All these call for a lot of planning, organisation and finance. Above all, an integrated policy on the part of the Government for the development of shipbuilding, side by side with the growth of shipping, is essential. From this point of view, the latest re-organisation of Central Ministries which provides for

shipping and shipbuilding to be dealt with by one Ministry, namely, the Ministry of Transport, is to be welcomed.

Economics of Industry

The discussion on Indian shipbuilding would perhaps be incomplete without at least a brief analysis of its economics. That shipbuilding costs are high is universally accepted. The cost of shipbuilding in India does not compare unfavourably with that in other countries, barring the Scandinavian countries. Shipbuilding costs are high everywhere. Indian costs are considered to be lower than costs in the U.S.A. and Australia and are about the same as in France and Italy. An important fact about shipbuilding in other countries is specialisation. The shipyards themselves do not do most of the work that is done in India. The installation of machinery, furnishing and decoration and a host of other items of work are executed by other agencies, which specialise in such work and which can, therefore, execute it expeditiously as well as economically. The standard of skill as well as the per capita productivity of workmen is high in those countries, but the reasons are obvious, and there is no occasion to be pessimistic about the future on this account.

At present, shipbuilding in India is being subsidised by the Government. The subsidy to shipbuilding is also a well-accepted principle in many countries. This is no reason, however, for complacency about the economics of the industry. Every endeavour should be made to bring down the quantum of the subsidy borne by the Government at present. This will be achieved when more steel is available from within the country, the propelling machinery and auxiliaries are produced in India, modern methods are adopted more extensively, and organisational efficiency and per capita output improve. These, then, are the problems. The first two are external and the Government seems already to have recognised their importance. The latter two are internal, and are engaging the attention of the shipyard management. There is a great future for shipbuilding in India. But whether the progress it makes is slow or rapid depends on the shifts and changes in the Government's policy on shipbuilding, which is an industry of great strategic importance.

PROBLEMS IN THE MANUFACTURE OF AIRCRAFT

DEVELOPING SUPPORTING INDUSTRIES

● By J. M. SHRINAGESH ●

General Manager, Hindustan Aircraft (Private) Ltd.

THE problems and prospects of India's aircraft industry cannot be fully explained without considering first the history of the industry and its present position, and later the developments that have taken place in other countries. The industry in India is at present confined to Hindustan Aircraft, which was first set up as a private firm by Messrs. Walchand Hirachand, initially with an American collaborator, just prior to the beginning of the second world war, for the assembly and construction of aircraft. The factory started constructing, or rather assembling, aircraft within six months of its inception. However, soon afterwards, the war turned mainly to the eastern theatre; and the manufacture of aircraft was given up, because of the exigencies of war, in favour of overhaul and maintenance of aircraft in the C.B.I. theatre. In fact, Hindustan Aircraft was converted into the jigging base in the east, virtually the only one, for the overhaul and maintenance of aircraft operating in the eastern theatre.

Had the factory progressed for some time as a manufactory, the employees of Hindustan Aircraft would have been conversant with manufacturing techniques, and would have been in a position to utilise that experience in building aircraft or other allied equipment after the war. However, the conversion of the factory into an overhaul base, very soon after it started manufacturing its first aircraft, resulted in most of the employees being trained for overhaul and repair work. Hence the process of acquisition of manufacturing techniques received a setback. This factor is of considerable importance when we examine in detail the prospects for the development of an aircraft industry in India.

Overhaul Techniques

As everyone knows, overhaul techniques are very different from techniques required for the manufacture of aircraft. Whereas the former are concerned mainly with stripping, cleaning, replacing of parts and reassembling, the latter require the conversion of raw material into components and parts with a high degree of interchangeability. This requires extreme accuracy in the execution of work. It is this interchangeability that makes for good manufacture. In overhaul work, patchwork and handwork are acceptable and in fact sometimes unavoidable; they are accordingly encouraged. But, in manufacture, there can be no thought of reworking a detailed part which is not quite accurate, or remodelling a part which does not quite fit. I have emphasised this difference, because it is important in all aspects of aircraft manufacture. The very high speeds of modern aircraft, and the resultant stresses, require manufacture to very fine tolerances and to a higher degree of accuracy than in other engineering industries.

In tracing the history and growth of India's aircraft industry, it should be mentioned that the overhaul aspect of H.A.L.'s life continued until the end of the war in the east, and H.A.L. continued to be a very large (the largest) and probably the only base of importance for the overhaul and maintenance of aircraft (both civil and military) in the east. Immediately after the war, H.A.L.'s operations were reduced to a normal peacetime level. H.A.L. did try to cater to India's defence requirements and the requirements of the Indian Air Force. But, in view of the approaching transfer of power, it was difficult to foretell normal peacetime requirements or estimate the steady civil requirements of training and passenger aeroplanes. The consequent uncertainty resulted in a serious depletion of the labour force, from 15,000 in 1945 to 3,000 in 1947, and gives a very good indication of the industry at that time. In fact, it seemed doubtful at one time whether the industry would continue as an aircraft industry, as the Department of Postwar Development recommended the production of equipment, such as bicycles, agricultural implements and railway stock, on an experimental basis. The industry only continued as an aircraft industry because of the report of

the U.K. Aircraft Mission and the transfer of power.

In 1947, H.A.L. undertook the conversion and overhaul of Dakotas (both aircraft and engines) which were purchased from the Disposals authorities by the many new airlines (being formed to operate the various routes in India). In addition, H.A.L. came to the assistance of the Indian Air Force in supplying a great amount of equipment and rehabilitating a large number of military aircraft, rescued virtually from the scrap heap, at a time when it was impossible to get such aircraft from outside sources. The number of scrapped aircraft that were taken from the scrap dumps, rehabilitated and reconverted to meet the operational requirements of the Air Force, the difficulties that were met in completing this work and the way in which this infant industry overcame the difficulties are remarkable, the more so as many of these aircraft are still flying today, ten years after they were rehabilitated, and are still operationally sound.

Building Trainer

With the achievement of independence, an important decision was taken to convert the overhaul capacity of H.A.L. into a manufactory and to build under licence a basic type of trainer for the Air Force; hence the conversion from an overhaul base to a manufactory began in 1950. This process will continue for another two years before the overhaul and maintenance organisation of the factory is separated completely from that of manufacture. It seems surprising that the process of separation of overhaul and maintenance from that of manufacture should take as long as nine years. This apparent slowness is accounted for by another peculiarity of the Indian aircraft industry. Because aviation in India is quite new and still in the process of early growth, aircraft requirements are very limited and spasmodic. To be an economic unit, the factory has to supplement its manufacturing programme with other activities like maintenance and overhaul, manufacture of rail coaches and building of bus bodies, as is done in certain other aircraft factories abroad.

Perhaps I should explain in more detail the spasmodic nature of the demand for which the aircraft industry has to cater. Take, for example, civil requirements. Recently, an order for six to ten Viscount aircraft has been placed in Britain by the Indian Airlines Corporation, for operation of their main routes, by this type of aircraft. The total number of aircraft on order is so small, especially when the order is not likely to be repeated for some time to come, that their manufacture in such small quantities becomes most uneconomical. If the aircraft industry, as represented by H.A.L., has to survive, it has to supplement its initial programme of manufacture with that of overhaul and maintenance and other diverse activities, such as manufacture of rail coaches, till such time as its aircraft manufacturing division is able to stand on its own legs economically. That is the reason why it has not been advisable to separate the overhaul and maintenance work from that of manufacture quickly. It must be emphasised here that it is most essential to separate the two types of work if accuracy and close tolerances and a high degree of interchangeability have to be maintained.

Jigging and Tooling

This necessity for accuracy and interchangeability makes the aircraft industry depend very much more on jigging and tooling than most other industries. In fact, the accuracy of aircraft work depends almost entirely on the proper and accurate use of costly jigs. Unfortunately, if the demand for the total number of aircraft is small, it is impracticable and uneconomical to jig up the manufacture of such aircraft to any degree. In America, where the requirements of aircraft are large, it is customary to use jigs and fixtures extensively as a matter of course; in France and Britain, where aircraft requirements do not reach such high figures, a less extensive use has to be made of jigs and fixtures. The extensive use of jigs and tools

will reduce the employment of highly skilled workmen, as in the case of the manufacture of the Supersonic F100. The labour employed on the manufacture of this aircraft needed only a short period of training because the work was very highly jigged.

As early as 1950, H.A.L. embarked on the manufacture of an elementary trainer of its own design, and successfully accomplished its task by producing the HT-2. Since then, it has been tested, proved, modified and manufactured in considerable numbers and has now replaced the *Tiger Moth* as the elementary trainer of the I.A.F. It may here be mentioned that the HT-2 has proved itself an aeroplane of the topmost class, surpassing even the de Havilland Chipmunk for performance and reliability. Due to the inherently good design and all-metal construction, it is highly aerobatic and an excellent aircraft to handle, as well as easy to service and maintain. Although the design work on the HT-2 was started as early as 1950, it is only now that the production target has been completed—nearly seven years later.

Testing and Proving

The time taken to complete this project seems to be abnormally long, which brings us to the third peculiarity of the aircraft industry—the long lead time due to the necessity of testing and proving the design very carefully before embarking on production. Although the HT-2 was designed and the first type certificate issued in 1953, the trials and further trials and the attempts to perfect it continued over a period of more than two years, the lead time from the start of the design to the completion of production being something like five to six years. Here the difficulty is not so much the passage of time, but the fact that the aircraft itself might become obsolete in the interval, due to developments in the aircraft industry being very rapid. In a recent White Paper, the British Government has declared its intention of giving up interest in manned aircraft after the P-1, and concentrating on unmanned guided missiles. Military aircraft designed in the last year or two in Britain, or on the design boards now, might thus be considered obsolete.

Because of the obsolescence of aircraft, and the fact that the changes taking place in the world today in aircraft are so rapid, it is most important that the lead time should be reduced to a minimum. Various efforts have been made by different countries to reduce the lead time in the manufacture of aircraft. Some French firms have attempted to reduce the amount of jigging utilised. But such a practice does not lead to good interchangeability or high quality of production. Some British firms have attempted to reduce the testing period. In the case of the Viscount, the effort was successful because of the excellence of the Dart engine; but another such effort by another manufacturer proved disastrous. American firms and the American Government have spent considerable efforts and large sums of money in experimentation and development, on a very large scale. With their vast potential, they have been able to utilise the knowledge and experience gained to predict the performance and stability of aircraft, even before production is undertaken, and to embark on large-scale manufacture before the testing period had been completed; they were thus able to produce aircraft in a much shorter time than most other countries.

Spasmodic Demand

The problems mentioned above are the problems of any aircraft industry, because the industry is beset by three peculiarities which make it different from other industries; first, the very spasmodic nature of the demand; second, the very high cost of accurate jigging; and third, the long lead time. They are not peculiar only to the Indian aircraft industry. The problems of India's aircraft industry are not, however, confined to the problems which beset the aircraft industries of other countries. There are, in addition, difficulties arising from the fact that the transfer from overhaul to manufacture has been undertaken and

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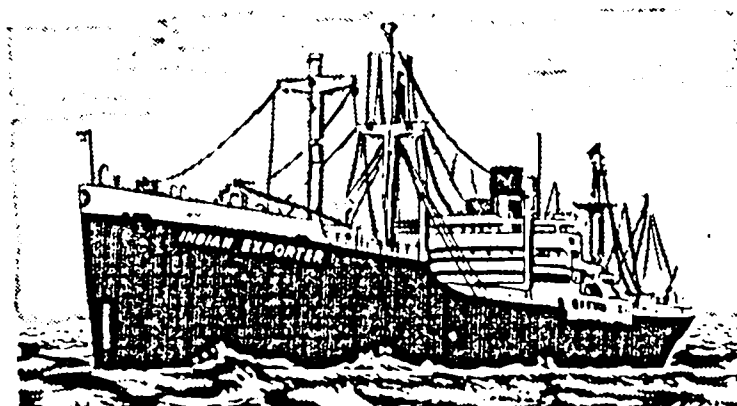
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carried out only recently. As a result, manufacturing techniques are not too well known nor too well advanced. In addition, there is a still greater problem with which the Indian industry is faced, and that is the lack of supporting industries. In most industrialised countries, the aircraft industry depends to a great extent on sub-contractors, and on obtaining its materials and a large percentage of its manufactured parts from other industries quickly. Unfortunately, in India this is not possible; and, particularly with reference to raw materials and accessories, it has to depend on purchases from abroad. At first sight, this problem does not seem a very serious one. But if we examine it in more detail, we find that obtaining raw materials from large distances often entails placing orders some considerable time ahead. For example, recently some special steels have been quoted from the U.K. and the Continent at 18 to 24 months' delivery. If, therefore, these materials have to be ordered from abroad, then the planning and the purchase arrangements have to be made at least 24 months ahead. The extension of the lead time in the manufacture of aircraft, if the raw materials have to be ordered 24 months ahead, is so large, as to make it almost impracticable to manufacture aircraft in India. In fact, this is one of the biggest problems facing the industry today, because by the time the aircraft required are produced, they are either obsolete or no longer required.

Small Demand

It may be said that the way to overcome this problem would be to encourage the establishment of local allied industries. This seems the obvious and most feasible way out of the difficulty. However, this is again not as easy as it appears at first sight. The demand for the raw material, for accessories or for the ancillary equipment, is comparatively so small that few industries are prepared to undertake manufacture purely for the sake of the aircraft industry in India. This is particularly so when changes in the development of aircraft entail modifications from time to time, necessitating a change in the raw materials, or accessories, or ancillary equipment. It has, for example, taken quite a few years to encourage the aluminium industry to produce the alloy sheet required for the trainer aircraft of today. The aluminium industry requires still greater encouragement before it can economically produce the alloy extrusions required by the aircraft industry. Added to this, it should be remembered that, even before we have been able to develop one of the aluminium alloys here, the aircraft industries of other countries have already turned to lighter materials such as magnesium and titanium. As for special steels, the situation is still more difficult, because some special steels are used only in minute quantities. No steel industry would like to disrupt its normal manufacturing processes for the manufacture of a few feet of special steel, or a few ounces of special alloy.

These, in effect, are the problems of the aircraft industry. How are we going to solve these problems? Take first the question of learning manufacturing techniques, as opposed to overhaul. Techniques in manufacture are changing more and more rapidly. It is important, therefore, that these techniques should be learnt as early as possible. From that point of view, it does not matter whether we manufacture an obsolete aircraft or a current type of aircraft, so long as we do manufacture some craft, because while we manufacture, we learn. Obviously, however, we should, as far as possible, manufacture not purely for the sake of learning, but also in order to produce a product of value. There should, therefore, be a close liaison between the users of the aircraft and the factory, both of which are governmental agencies.

Learning from Experience

Just as in the manufacturing field we learn techniques step by step, and accustom ourselves to more and more intricate methods, so also in the field of design we have to learn step by step. Learning from the experience of others as well as from our own experiments. Unfortunately, most of our learning has come from the experience of others and very little comes from our own research. Not only in manufacture, but also in design, we should, therefore, as far as possible, design and produce our own craft, so that we may obtain the maximum experience of design and manufacture, and predict accurately the performance of aircraft. On the design side, for example, it is essential that the behaviour of an aircraft in the subsonic field should be well known, before designers attempt to tackle the problem of supersonic flight. Although a lot has been written about the behaviour of aircraft in the subsonic field, theory is in itself not enough for the successful designing of transonic and supersonic aircraft.

We now come to the problem of jiggging. It is clearly impracticable and uneconomic to jig highly for the manufacture of a few aircraft. So we must as far as possible manufacture the largest number

that are required; and, for that reason, we should, as far as possible, combine the requirements of different classes of users, mainly because India is economically yet a young country, and cannot afford, as America can, to manufacture different types of aircraft for different requirements. From the point of view of the industry, therefore, the indents like the Indian Air Force and the Indian Airlines should compromise on an aircraft that would suit India generally. For light transport, for example, it is not absolutely essential that we should have the best, the most modern, the fastest, or the most highly advanced craft. It is sufficient to compromise with the requirements in both the defence and transportation fields, so as to enable aircraft to be produced in India in large quantities, and so as to support the industry in its attempts to learn design and manufacturing techniques.

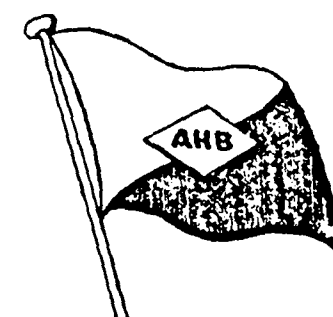
Import of Raw Materials

The problem of lead time is one that has worried all countries in the world. The lead time for producing aircraft, which is long, should be reduced considerably, if the product is not to be obsolete by the time it comes off the assembly line. In India, we have the same problem. It may be possible for us to draw from the experience of other countries, e.g., from France, in doing a certain amount of hand work; from Britain in attempting to reduce the experimental time; and from the United States in manufacturing large quantities and spending money on experimentation. Possibly a combination of these methods might enable us to reduce our lead time and produce the aircraft in sufficient time to make it of value in our own field. However, our lead time has been considerably lengthened by the fact that we have to import raw materials and accessories from abroad. The solution for this is obviously to build our own local supporting industries. It is important that we should build as rapidly as possible industries for the manufacture of essential raw materials, so that we should not have to wait for 18 to 24 months for materials which may be in short supply. It should be possible for us to produce small quantities of these essential materials, and at least have the basic techniques available, so that, in the event of a shortage of supply, or a delay in supply, we could fall back on our own production.

For accessories and instruments, much wider and more detailed planning will be necessary, because we shall have to standardise, and to limit the types of instruments, and the types of accessories that we use in our aircraft. With standardisation and a limitation in the number of types used, it may be possible for us to encourage the electrical and other industries, to set up manufacture of such instruments and accessories on a reasonable scale. I have not the slightest doubt that the manufacture would be successful, because of the high ability of Indian craftsmen. In the manufacture of delicate instruments, in fact, Indian craftsmen are likely to prove more skilful than craftsmen of other countries, and they are quite capable of acquiring the necessary experience to be able to manufacture to accurate dimensions. The skill of Indian workmen has already been well established in these fields, and in industries like the Motor Industries in Bangalore, in Bharat Electronics, and also in such engineering concerns as the Jay Engineering Works, Usha sewing machines, and other similar manufactures.

Safety Essential

Finally, the aircraft has to be safe in all respects; and therefore a considerable amount of money has to be spent on the development of equipment and materials used in the industry, and a lot of testing has to be carried out. All this adds to its cost. Naturally, with the small demand in India, such expenditure on experimentation cannot be easily justified and charged to the buyer; it must, as in other countries, be subsidised. All this does, I hope, make it clear that it is as easy to kill an industry as to develop it, and that the prospects of an industry depend on the extent to which these problems are given serious consideration. Fortunately for the industry, the problems narrated above have been thoroughly understood; and some of them are now in the process of solution and are being given special consideration by committees already set up by the Government. From this point of view, the future of the industry appears bright. Let us hope that it will be, because on it depends also the future of those people who are engaged in the industry today, and the hopes of those who have the interests of the industry at heart.



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PROSPECTS FOR THE MANUFACTURE OF COMMERCIAL VEHICLES NEED TO DEVELOP ANCILLARY UNITS

• By A CORRESPONDENT •

It is eight years since the Government, with a view to creating an Indian automobile industry, made it obligatory for all motor vehicles imported into India to be sent from the countries of origin in a completely knocked down condition. That is, all the main units—engines, gearboxes, axles, etcetera—had to be finally assembled in India. This important decision helped lay the foundation for the immediate development of assembly plants by those who hoped to retain a share of the market for motor vehicles. In 1949, 12 firms undertook the assembly of motor vehicles from imported unassembled units and they also undertook the obligation to develop production in India progressively. By 1952, two firms only, Hindustan Motors and Premier Automobiles, had made any substantial progress. The remainder had not installed plant or machinery which would enable them to produce any chassis components. At this time, the Government referred the question to the Tariff Commission. The Commission made a full enquiry and thereafter in its report made recommendations for the earliest practicable implementation of the Government's decision to create an automobile industry. These recommendations were accepted by the Government in May 1953. It is proposed to review briefly the progress which has been made in the commercial vehicle section of the industry during the last four years; and to suggest the directions in which future progress must lie.

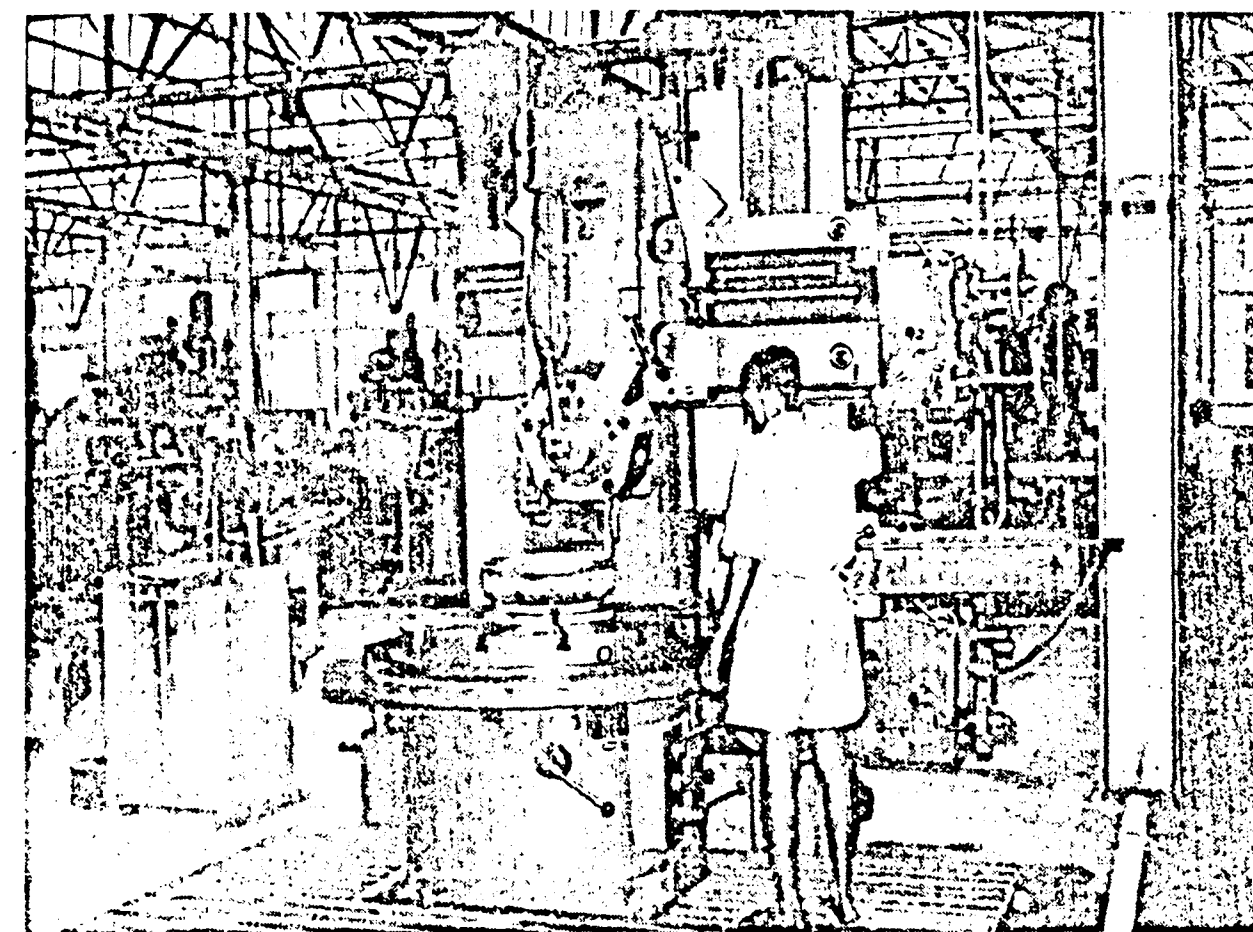
Trucks and Buses

The Government's acceptance of the Tariff Commission's recommendations resulted in four firms taking up the manufacture of commercial vehicles. These firms and the types of vehicles allotted to them were as follows:

- (i) Medium capacity trucks and buses powered by a petrol engine—Hindustan Motors, Premier Automobiles and Automobile Products of India.
- (ii) Heavy duty trucks and buses powered by a diesel engine—Ashok Motors.

Early in 1954, Automobile Products of India withdrew from the projected manufacture of commercial vehicles and some time later Tata-Benz were accepted as manufacturers of medium capacity trucks and buses powered by a diesel engine. The significant trend towards the use of diesel engines in commercial vehicles of three-ton payload capacities and upwards was further emphasised by the inclusion of a diesel engine suitable for medium capacity vehicles in the range of products to be manufactured by Amalgamations Ltd. and the utilisation of this engine by Hindustan Motors and Premier Automobiles respectively as an alternative power unit to the standard petrol engines. More recently, Automobile Products of India have undertaken the manufacture of another well-known diesel engine.

As far as chassis and their power units are concerned,



A section of the machine shop in a commercial vehicle manufacturing unit

therefore, the pattern emerges of four chassis manufacturers, two of whom manufacture their own diesel engines, and two engine manufacturers providing a range of trucks and buses with payload capacities of from three to eight tons. Of these four chassis, Tata-Mercedes-Benz and Leyland have diesel engines only as their power units, while Studebaker and Dodge vehicles have petrol engines as their standard fitting with a Perkins diesel engine as an alternative. It is only the present restrictions on maximum laden weights of motor vehicles that have retarded the extension of manufacture to heavier trucks and buses than those currently in production in India. Already a few major municipal and State road transport organisations find the range of vehicles included in manufacturing programmes inadequate so they import heavier chassis. Before long, it seems inevitable that manufacture will be extended to cover trucks with payload capacities in excess of eight tons and heaviest duty type buses designed for the maximum seating capacity possible in relation to reasonable overall dimensions.

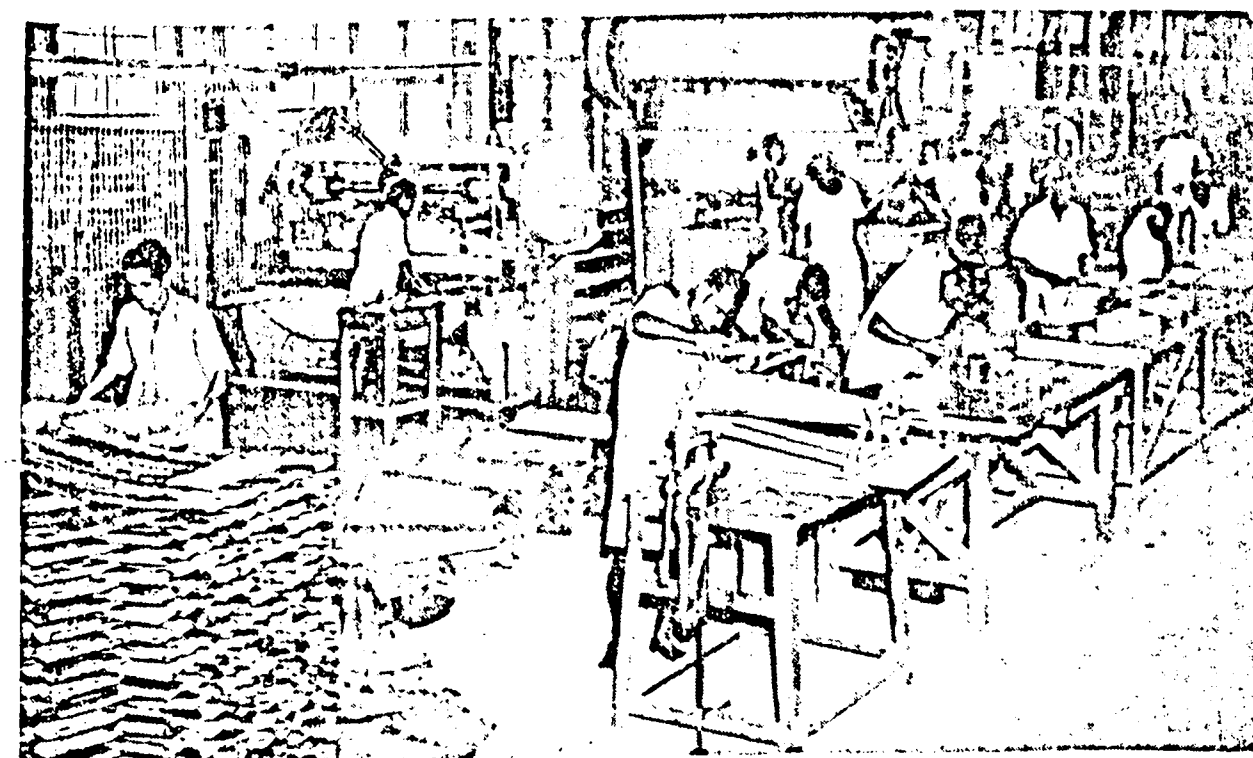
In any country an automobile industry must depend on a large number of other industries for

its raw materials, semi-fabricated parts and finished materials purchased from ancillary units. In India, the manufacture of motor vehicles, particularly commercial vehicles in the heavier load carrying categories, has been severely handicapped because there are not enough ancillary industries. Most of the steel used in high quality motor vehicles is alloy steel which is not yet available from Indian sources. No progress yet has been made in the manufacture of electrical equipment, such as starter motors and dynamos. Iron castings, particularly those for engines, complex forgings, the former requiring highest quality iron and the latter largely fabricated from high tensile alloy steel, are not readily available. These and a large variety of other essential materials, which it is not practicable or economic for the vehicle manufacturer to produce, are urgently needed.

Important Developments

But, as is usual, demand is creating supply and in the last three years there has been a very marked and progressive increase in the range of products required by motor vehicle manufacturers which are becoming available from Indian sources. It is not intended to give details of all these products, but it is possible to cite a few important developments. Many foundries for ferrous and non-ferrous castings are coming into existence; and many schemes now being considered are intended to provide forgings of a quality and size up to, for example, the crankshaft forging for the largest commercial vehicle engines likely to be produced in India in the not too distant future. The manufacture of diesel engine fuel injection equipment is being established. The industries ancillary to the automobile are on the move and it only needs a steady increase in the number of commercial vehicles being produced annually to create market conditions favourable for further progress.

Fortunately, there is every indication not only that the demand for commercial vehicles will increase very considerably in the next five years but also that at least some of the artificial restrictions hampering the growth of road transport are being removed. If the road system can be improved quickly to enable commercial vehicles with gross laden weight of up to 30,000 lbs to ply for hire on all State highways and up to, say, 45,000 lbs on national highways, without restrictions on distances and with no hindrance in their transit from one State to another, then the demand will increase much more rapidly. Then, from being at its inception an uneconomic industry of which so many prophets foretold failure, the commercial vehicle industry, supported by an adequate number of an-



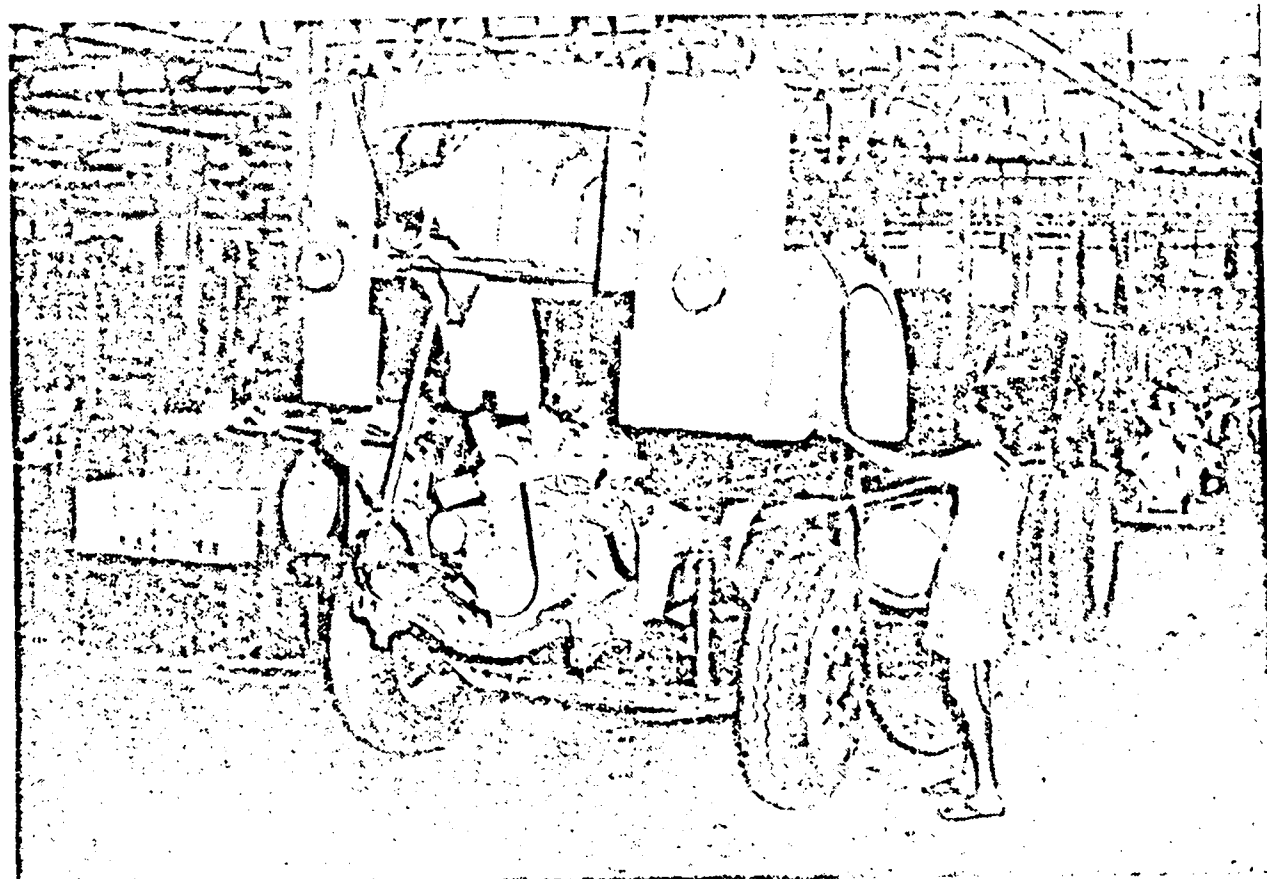
The fabrication of sheet metal components

cillary manufacturers and finding an ever-increasing range of raw materials available locally, will begin an era of prosperity.

Ancillary Industries

For healthy progress, however, two matters have to be given very careful consideration by commercial vehicle manufacturers. Firstly, the creation of ancillary enterprises for the production of components and accessories which it is not economical to manufacture in automobile factories has already been described as an urgent necessity if the automobile industry is to develop satisfactorily. Such enterprises, however, can only be brought into being if the demand for their products makes their manufacture possible at prices comparable to those of imported materials. The solution to this problem lies in a high degree of co-operation between the firms engaged in developing the manufacture of commercial vehicles, with a view to modifying their designs so that standardisation is practicable. If, for example, a single type of silencer were standardised for all commercial vehicles manufactured in India, then the demand for this silencer would be considerable and might justify the setting up of an ancillary unit to manufacture it, whereas it would be far less economic for a firm to engage in the production of several types of silencers with a correspondingly reduced output of each type. There is no question that ancillary enterprises will develop but the rate at which this development takes place will depend to a great extent on the degree to which India's automobile manufacturers make a joint effort to create sufficient demand to encourage industrialists to cater to their requirements.

The second point to consider is that no industry in any country can develop satisfactorily if it is permanently dependent on foreign assistance in the field of design and research. Under such conditions, design is not primarily directed towards meeting the overseas collaborators' specific requirements but towards meeting those of the home market, while at the same time providing for the best compromise to meet the conflicting demands of a number of overseas markets. There is, there-



The front-end structure of a vehicle is being placed in position at the end of the assembly line

fore, an immediate and urgent need for the creation of design sections in every Indian automobile factory in which young engineers will obtain the experience necessary to enable them to initiate changes which will make their companies' products more suitable for Indian conditions without adversely affecting the design, performance or quality of the vehicle as a whole. As such designers become experienced and competent, they will be able to contribute increasingly to the solution of the problem of standardisation.

Looking at the progress achieved, it seems unquestionable that the commercial vehicle industry

is already established and must succeed. From the two newcomers who have progressed little beyond the stage of establishing facilities for machining imported raw materials, castings and forgings, to the oldest established manufacturer in Calcutta, there is a wide variation in achievement. But it is clear now that the four manufacturers are equally determined to achieve what they have set out to do, namely, to carry out the programmes of phased manufacture of commercial vehicles. This means that within a few years, the final goal will be within sight; and one more new industry will be firmly established.

FLUCTUATIONS IN DEMAND FOR DIESEL ENGINES

RAW MATERIAL SHORTAGES WORRY INDUSTRY

• By A SPECIAL CORRESPONDENT •

THE history of the diesel engine industry goes back to 1925-26, when Kirloskar Brothers Ltd. manufactured the first oil engine in India. Cooper Engineering Ltd. came on the scene later, in 1930-32. At the same time, certain manufacturers in Punjab started making horizontal engines but their enterprises were hardly on a "production" basis. During the war, there was a shortage of various components, so the output of diesel engines shrank, and in places was more or less suspended. When the war ended in 1945, certain manufacturers planned to expand the industry on to a "production" basis. They established factories to make engines on a larger scale in anticipation of future demand. It is noteworthy that this expansion was planned long before the Planning Commission was ever thought of. It was planned on the assumption that the agriculturist would use these engines and the prospects for them were therefore good. This anticipation on the part of the private sector helped the progress of the country, particularly the efforts to grow more food. The industry concentrated on the development of diesel engines of smaller sizes, which the agriculturist could use for pumps and other purposes.

Trend in Imports

Before 1939, there were only two firms in the industry and the bulk of the requirements were

met from imports. Between 1937 and 1943, imports averaged 2,000 engines a month. During the war, there were hardly any imports, but later, the demand for engines having increased, imports rose considerably. In 1947 and 1948, imports of diesel engines below 20 horse-power were about 11,000 and in 1951-52 they were 72,355. The figures show that most of these imports were of engines below 10 horse-power. During the last ten years, diesel engines of smaller horse-power have become very popular for use in pumping sets. Having gained experience and found it advantageous, the farmer has started to use them increasingly. The industry has therefore made rapid progress, the number of producing units having increased from two in 1939 to ten in 1951. At present, there are 18 manufacturers making both horizontal and vertical diesel engines. Total production during 1956 was about 15,000, of which 57 percent were vertical, high-speed engines. All this output is between the range of 5 to 40 horse-power. One of the firms can manufacture engines of up to 256 horse-power, according to requirements.

Installed Capacity

The industry employs 6,000 workers and the total known installed capacity is 30,000 engines of up to 40 horse-power. The development which has taken place is largely due to the initiative

shown by Indian manufacturers, the assistance given by the Government, the improvement of quality and the efforts to achieve self-sufficiency. Having planned the production of engines of up to 40 horse-power, the major manufacturers are already preparing for an expansion in range and quantity. The quality of the indigenous product has improved considerably. Today small diesel engines are being exported to south-east Asia and the Middle East. They have withstood competition in quality and price from foreign manufacturers.

Stationary Types

The diesel engine industry may be divided into two parts: one makes stationary types of diesel engines; and the other makes transport, particularly automotive, types. Most of the remarks here pertain to stationary types of diesel engines. These have become really popular only since the end of the war. The pent-up demand of the war days was suddenly released later, with the result that there was a sudden rise in requirements. This coincided with a period of food shortages and caused the Government to liberalise imports, so a very large number of engines came on the market in 1951. At that time, demand was estimated at only 5,000 engines, but imports during the year

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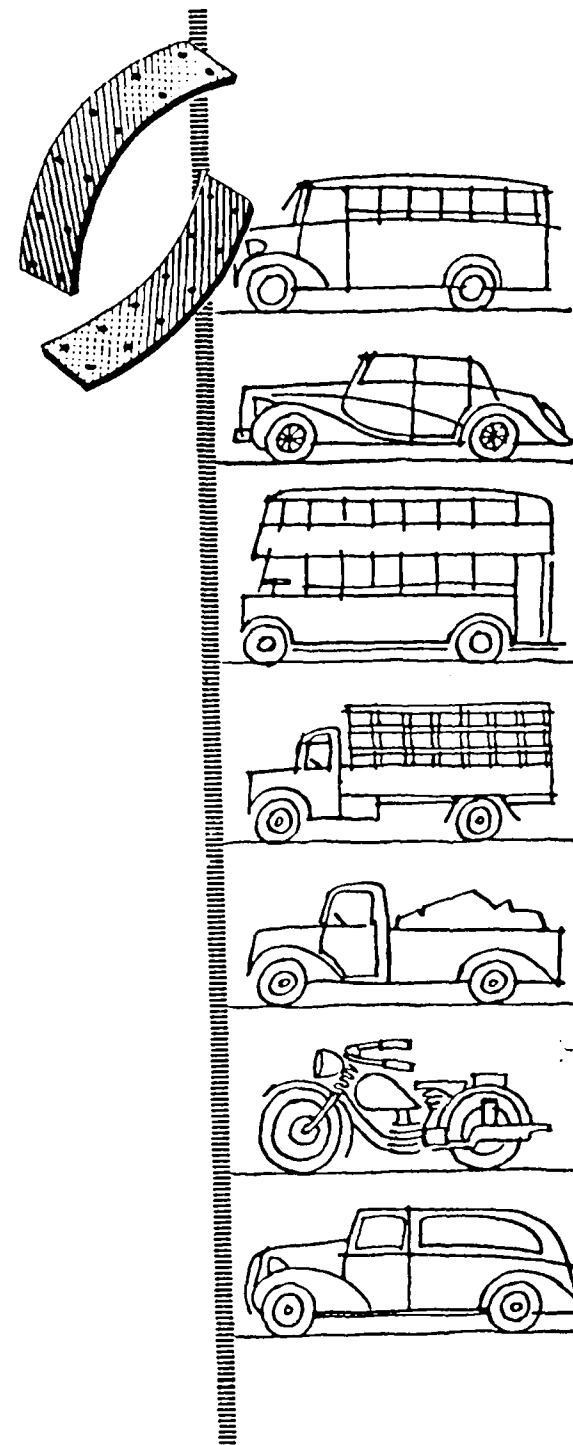


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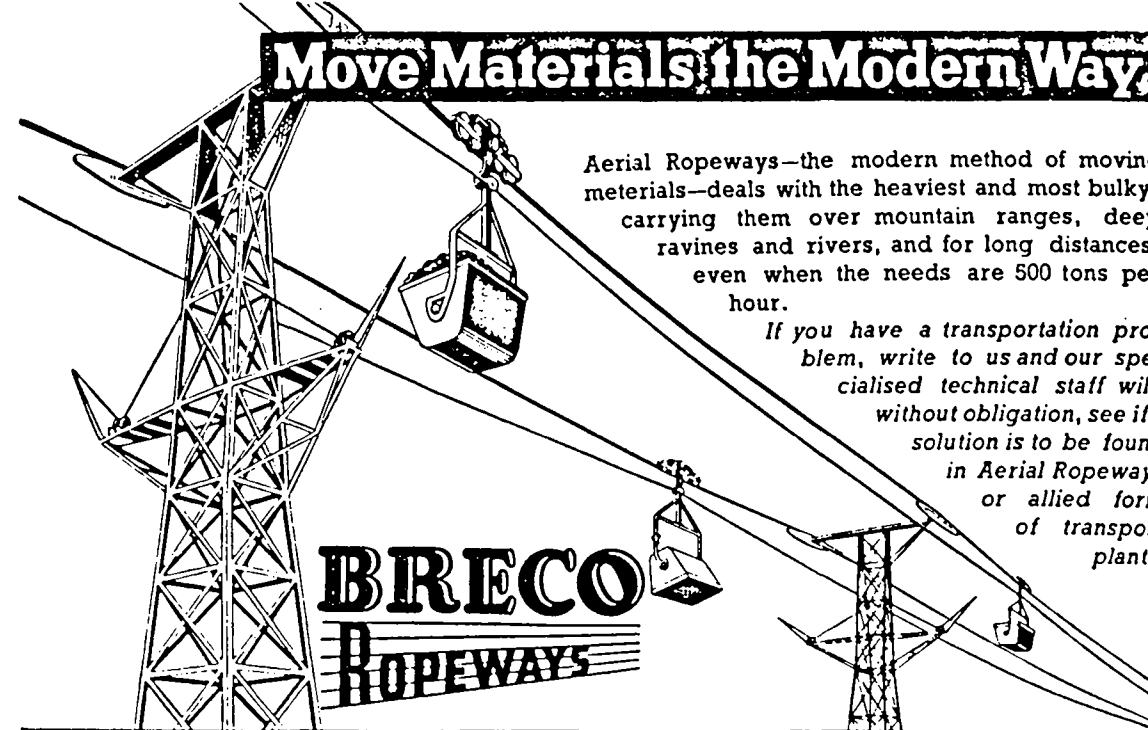
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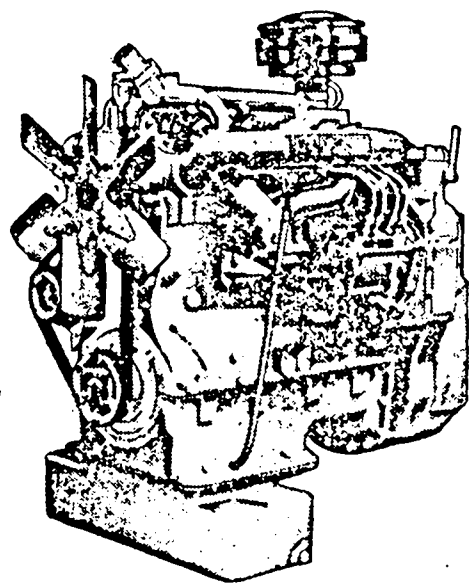
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were about 75,000 engines. This created a very great problem for local manufacturers. In 1952, prices collapsed, resulting in a serious glut of engines with no customers to buy them. Manufacturers passed through bad days for the next two or three years. The Government then adopted a policy of restricted imports for oil engines of up to 30 horse-power. This step was taken on the representation of the Indian Diesel Engine Manufacturers Association of India. It helped the local industry in developing its range and quality. These were the initial difficulties which had to be faced in competition with established foreign manufacturers.

Other Difficulties

But other difficulties have arisen since. Under the five year plans, a large demand has developed and manufacturers are flooded with orders. The industry has long had to suffer sharp fluctuations in demand. But in spite of the five year plans, it is doubtful whether this basic pattern of demand has changed. The policies of the Central Government and the planning authorities seem to have altered considerably during the last ten years. During the first five year plan, the emphasis was on growing more food, but last year it shifted towards heavy industries, with the result that the demand for engines dropped. But the shortage of food has again become acute and the emphasis is returning to food plans, so farmers are now being encouraged to buy more engines. Although demand at present is very large, nobody is sure how long this policy will continue. It is very difficult for the private sector suddenly to expand and then, after a change of policy, to shrink again. That is why manufacturers are at present hesitating to increase their production capacity. Besides this uncertainty, there is a practical difficulty in expansion and that is the shortage of controlled raw materials. It is hard to get the iron required always in accordance with quota allotments. As this is the position with the present scale of production, manufacturers are reluctant to expand and commit their finances only to find that there is not enough raw material to keep the whole factory busy. Labour laws hamper expansion, as a possible shrinkage in demand will make it difficult for manufacturers to retrench surplus workers. Transport facilities, particularly on the railways, are poor. It is almost impossible to rely on the railways to bring raw materials and carry away goods in time.

Capital Scarcity

It is difficult to raise finance for the expansion of industries. The Government has offered money through the Industrial Finance Corporation, but for every rupee given by the Corporation, another has to be found as equity capital or from reserves. Neither of these latter sources are sufficient in today's capital market conditions. In spite of all these troubles, manufacturers are taking courage and expanding to the best of their ability. If the present level of demand is maintained, and official policy remains consistent, expansion is sure to follow. Compared with other manufacturers, the diesel engine industry is in a fairly good position to supply orders. It is hardly more than one or two months behind its orders, compared with 12 or 18 months in the case of some other engineering industries.

The diesel engine industry has great scope for expansion. It is the experience the world over that the demand for small horse-power engines is considerably more than the demand for larger ones. This pattern will have to be followed if the industry is to expand properly. It has many years of experience, and is the best judge of what is required. The figures published in the plans have consistently been proven wrong; the so-called gaps in demand are not exactly gaps. Manufacturers feel their way forward as demand increases.

Making Larger Engines

The development visualised by the Planning Commission takes into consideration the production of very large engines. According to published reports, the Government proposes to spend about Rs. 3 crores or Rs. 4 crores to manufacture 2,000 to 10,000 horse-power engines. This is wrong. It is uneconomical to establish a factory to produce only 2,000 to 10,000 horse-power engines when the demand is for hardly two or three engines a year. Actually, these engines could be produced more economically if a few machines with a capital investment of not more than Rs. 50 lakhs could be installed next to an established factory. With Rs. 25 lakhs of equity capital, the private industry is today producing about 35,000 to 40,000 horse-power a year. Therefore, to produce 3,000 horse-power with Rs. 3 crores is absurd. It is, therefore, suggested that the Government should reconsider the question, especially in view of the shortage of foreign exchange. If it is prepared to do so, manufacturers will do their duty and help produce the bigger engines.

DEVELOPMENT NEEDS OF ELECTRIC SUPPLY UNDERTAKINGS

RAISING THE STANDARD RATE OF RETURN

• By R. P. AIYER •

FROM its modest beginnings in the 1880s, India's electric supply industry, which is on the threshold of large-scale expansion, has now come of age. Expansion in recent years can bear comparison with trends in other parts of the world; at the conclusion of the second five year plan, the country will have an installed capacity of 6.9 million kW. To the observer who is striking is the large-scale development of power facilities as part of the various multi-purpose river valley projects. But it must be realised that this rise in power production has for its basis the pioneering work done by the private electric supply undertakings. With the completion of the public river valley projects, the importance of the public sector in power generation will grow. But it will still be the task of the privately-owned utilities to distribute to the consumer a large proportion of the power generated in the public sector, apart from itself generating a sizeable amount of energy.

In spite of the large-scale expansion which has recently taken place and the development programme of the second five year plan, the per capita consumption of power in India, it is expected, will increase from 25 units at the end of the first plan to about 50 units at the end of the second. This compares unfavourably with the United States, which produces 37½ percent of the world's electric power, but has only 6 percent of the world's population. In the electric supply industry, almost no undertaking can be accused of being too bold, especially as power requirements, it is expected, will double every five years, at least during the next three five year plan periods. The industry is set on a course of rapid expansion and it will be appropriate to discuss the problems it has to surmount.

Although most of the problems inherent in the utilisation of power are common to the public and the private sectors of the industry, the latter has some special ones arising from State regulation. The regulatory climate under which the electric supply industry is functioning has been created by the Electricity Supply Act, 1948, and its present amended version. The financial code embodied in the law lays down certain principles which a licensee has to follow. In particular, his rates for the supply of electricity must be geared to the reasonable return permitted under the Act. In other words, the financial provisions are designed to provide the licensee with a reasonable return so as to enable him to raise funds in the market for the proper fulfilment of his duties.

Nature of Problems

From the provisions of the Sixth Schedule have arisen a number of problems and none has agitated the industry more than the basic issue of what constitutes the reasonable return. When the principal Act became law in 1948, the reasonable return was fixed at 5 percent. Money market conditions were then somewhat buoyant. But conditions rapidly changed, and before long the electric supply industry found itself deep in a crisis created by the restrictive limit of 5 percent continuing in operation by force of statute, whereas interest rates in other fields had freely risen under economic pressure.

It was in such a situation that the industry asked the Central Government, as early as 1951, for an increase of 1 percent in the rate of return. Proposals for amending the Act in this and other aspects were considered for a number of years and were eventually enacted in the Electricity Supply (Amendment) Act of 1956. The amending Act, among other things, fixed the "standard rate" for any year of account as "the Reserve Bank rate ruling at the beginning of that year plus two percent". With Bank rate ruling at 3½ percent, this, in effect, meant that the investor in the industry could earn 5½ percent—an increase of only ½ percent above the previous figure. The basic object in linking the "standard rate" to the Reserve Bank rate was, to quote the Statement of Objects and Reasons appended to the 1956 Electricity Supply (Amendment) Bill, to "enable the automatic adjustment of the standard rate with

the money market". This provision was nullified with the Reserve Bank announcement that from 1st February, 1957, "its rate of interest on advances to scheduled banks against Government and other eligible securities under Section 17(4)(b) of the Reserve Bank of India Act, 1934, has been raised to 4 percent per annum", while at the same time, notifying that Bank rate "remains unchanged".

Higher Bank Rate

This *de facto* rise in the Reserve Bank's discounting rate tended to frustrate the intention of Parliament that the return to the investor in the electricity supply industry should automatically adjust itself in accordance with rates in the money market. The subsequent announcement by the Reserve Bank that "Bank rate has been raised from 3½ percent to 4 percent with effect from 16th May, 1957" has apparently set right the anomaly of the official Bank rate lagging behind the discount rate, but there are two connected problems in the context of the Electricity (Supply) Act which still agitate the industry. The first directly arises out of the provisions of the Sixth Schedule to the Act which defines the "standard rate" for any given year as "the Reserve Bank rate ruling at the beginning of that year, plus 2 per centum". The effect of this is that, although Bank rate was virtually raised to 4 percent from 1st February,

1957, electricity undertakings will, as matters stand, be unable to adjust the return automatically with the money market until 1st April, 1958, because of Bank rate having been raised only from 16th May, 1957, i.e., after 1st April, 1957, the relevant date under the law. In other words, with the rise in the interest rate on advances against securities having become effective from 1st February, 1957, the need for the industry being permitted to adjust the "standard rate" in line with the dearer money market became patent even before the financial year 1st April, 1957, to 31st March, 1958.

Formal Recognition

In his Budget speech, the Finance Minister, referring to the increase in Bank rate, made the statement that "the effective lending rate of the Reserve Bank to scheduled banks has been 4 percent for some months now" and spoke of the Bank's decision as "only a formal recognition of a *de facto* situation". These remarks show that the industry's request for the increase in Bank rate being given effect to retrospectively from 1st April, 1957, is justified. Although Bank rate has now been officially raised and brought into line with the advance rate, the second connected problem which worries the industry is that the Reserve Bank might again in the future increase its advance rate

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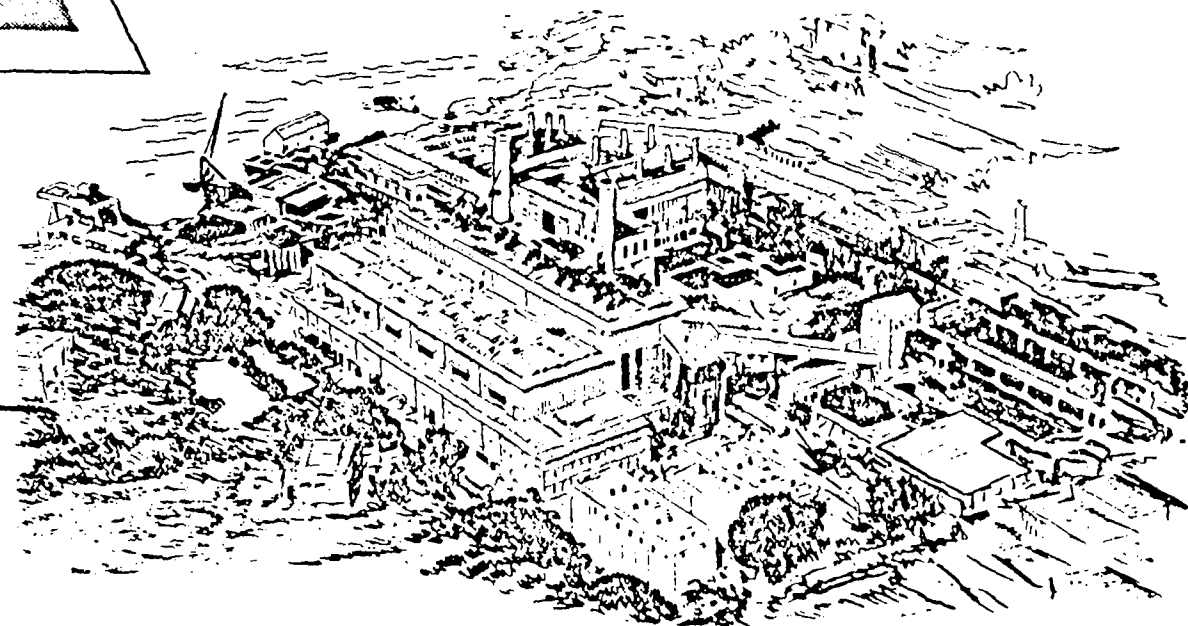
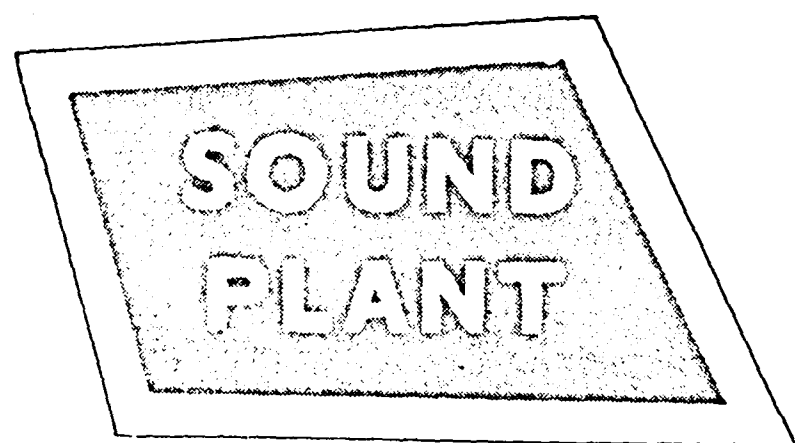
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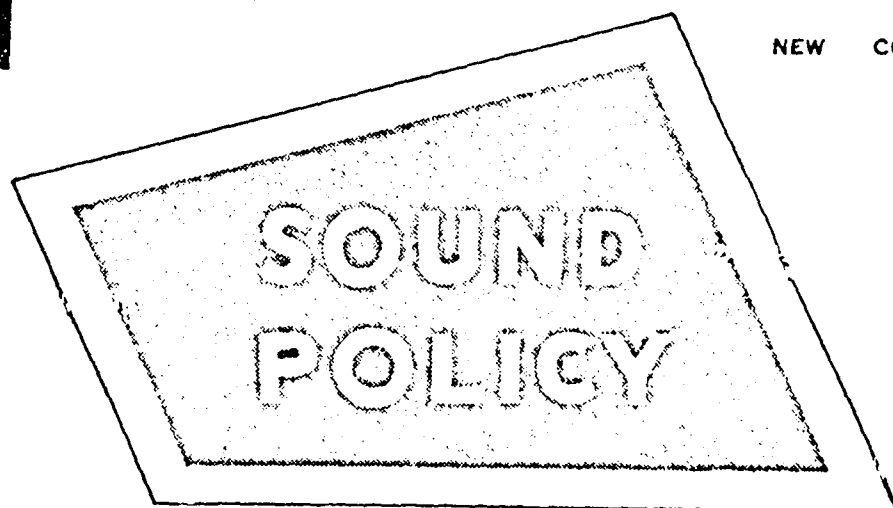


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without increasing Bank rate. This indicates the need for the industry to be protected against a repetition of the situation it faced last April. Yet another point to consider is whether even the present Bank rate of 4 percent correctly reflects money market conditions. As the Economist of London says, "the shift of 1 percent in Bank rate still leaves it unrealistic". The primary object of the rate regulation is to introduce into a field of quasi-monopoly those safeguards which elsewhere protect consumers through competition. While it may be true that the return permitted on the equity investment in any regulated industry should not be compared with consumer industries, nevertheless, it should satisfy the test of helping attract fresh capital for development.

Heavy Capital Investment

It is not often realised how capital intensive the electric supply industry is. This feature may be highlighted in the table given below, indicating the wide disparity in the ratios of gross sales to capital employed as between different industries (the figures refer to 1953-54).

Company	Classification	Ratio of Gross Revenue to Capital Employed
A	Hydro-electric generation and bulk supply	0.194
B	Steam generation and distribution	0.221
C	Distribution only	0.296
D	Cotton and silk textiles	2.295
E	Cement	1.015
F	Manganese mining	2.156

The low ratio of gross sales to capital employed emphasises the fact that, compared with other industries, far greater amounts of capital have to be invested in electric supply for attaining a relatively small sales turnover. The heavy investment required is an outstanding feature of the electric supply industry. The obligation of an electric supply utility to supply power to the consumer at all times, and in any amount, can be appreciated if one compares the method by which goods and services are supplied in other fields of industry and trade. Deliveries from a grocery store are made or a call for a taxi service is answered on the basis of availability. In fact, in industry generally, the demand for goods or services is met over a period of time. By contrast, in the electric supply industry, there has to be enough equipment and manpower available, all along the line, to render service the moment it is required.

A major problem still evading a solution arises from the situation created by differing depreciation provisions as between the Income-Tax Act and the Electricity Supply Act, giving rise to deferred tax liability. The introduction of the development rebate has somewhat mitigated the situation, but the deferred tax problem will remain as long as the depreciation provisions of the Income-Tax Act and the Electricity Supply Act remain divergent. Therefore, unless proper measures are taken, the return to the investor will not be fair. The Taxation Enquiry Commission has seen the necessity for suitable modification of the Electricity Supply Act, and it can only be hoped that, before long, the difficulties will be removed.

Electricity Boards

Another basic feature of the Electricity Supply Act is that State Governments are obliged to constitute electricity boards to promote electricity development. The public corporation, semi-autonomous in nature, is a recent development and is still in the process of adaptation. It has resulted from the endeavour to combine the best features of private enterprise, that is, efficient commercial management, with the degree of State control and accountability required from large-scale public concerns. Certain State Governments have had doubts about the advantages of these boards as compared with departmental management. These doubts are answered in the Statement of Objects and Reasons appended to the Electricity Supply Bill, 1946, which says that it is bodies like an electricity board which are "the most suitable organisations for working the grid systems on quasi-commercial lines." Delhi and the States of Madhya Pradesh, Bombay, West Bengal and Kerala have already constituted electricity boards. There are indications that before 1st July, 1957, all other States in the Indian Union will have constituted theirs.

The future pattern of the electric supply industry can be foreseen from the development which has already taken place during the first five year plan, the addition to the generating capacity planned during the second, and the development visualised during the third plan. The hydro-power potential in India which can be economically exploited has been estimated at about 35 million kW. Of this, only 1.1 million kW was developed during the

first five year plan. This, of course, does not take into account the possible development of a further 35 million kW estimated in the Himalayan region. Under the second five year plan, an addition of 3.2 million kW of generating capacity is expected and doubling of capacity is visualised under each of the three successive five year plans.

Nuclear Power

In the meantime, the possibility of nuclear power development during the next few years is becoming a reality. Atomic electric power plants represent the use of a new source of heat for generating electricity. A turbine can run on steam from any fuel—coal, oil, gas or atomic energy. A kilowatt-hour of electricity generated from atomic fuel has no special virtue. The problem is one of selecting the most economical method of generating power in a given set of circumstances.

A kilowatt-hour of atomic power is expected to cost about 0.6 to 0.7 anna. This means that atomic power can be justified economically only in places which are far from hydro-electric sites or coalfields. In the case of thermal stations, a matter of great significance is the saving an atomic power station will effect by making coal supplies unnecessary, thus relieving the railway administration of long wagon hauls. An interesting point here is that in the case of one thermal power station, it has been estimated that the difference in loaded and received weights of coal wagons amounts to an additional expenditure of Rs. 5 lakhs a year due to shortages, pilferage, etcetera, en route, plus the railway freight on such losses. On this basis, if the target of 60 million tons of coal a year is achieved at the end of the second five year plan, there will be a loss to the country of about Rs. 7.5 crores each year on account of these factors. This saving could form the nucleus of the finance needed for an atomic power station. While there is a case for the establishment of an atomic power station in some suitable site in Gujarat or Saurashtra, the problem is complicated by the high capital cost involved in the construction of such a station. Indications, therefore, are that until the country's power-potential from thermal and hydro sources has neared its limit, atomic

power development may not become a pressing necessity. For some years to come, therefore, the country will have to rely on the conventional methods of electric power generation.

A question which may arise with some force is the place of the undertakings operated by commercial enterprise in the future set-up of the electric supply industry. In the States of Madras and Andhra, special Acts conferring on the Governments power to acquire undertakings prematurely on four months' notice already exist. These are merely enabling Acts, and an influential section in the Central Government is opposed to the implementation of the Acts. Attempts by other State Governments to enact analogous legislation continue to be made, but so far without success. In an economy as dynamic as India's, it certainly is unwise to go by outmoded concepts based on doctrinaire considerations, and the country's interests demand that no talent should be wasted, especially when "nationalisation" will mean only changing ownership and not creating new assets. The electric supply industry, as constituted in the so-called private sector, has within itself the talent and the experience born of pioneering efforts, and it will be wrong to replace them simply for the sake of replacement. The trends, however, are for Government policies to set a course which will make for further development, and in this context, the industry, as represented by the private sector, can look forward to many years of fruitful activity.

Prospects for the Future

Such activity, to be really fruitful, should have a fair regulatory climate, and consequently, legislative thinking should march in step with the needs of the situation. The principal need is the reasonableness of the return to the investor in the industry, so that the utility is able to maintain its credit, and the investor is induced to offer his savings. This must permit a rate of return which is more than the prevailing cost of money, and must include something which will encourage and make possible the expansion of facilities to meet the ever-growing requirements. The past record of the industry is a reassuring indication of its capacity to fulfil the target set before it.

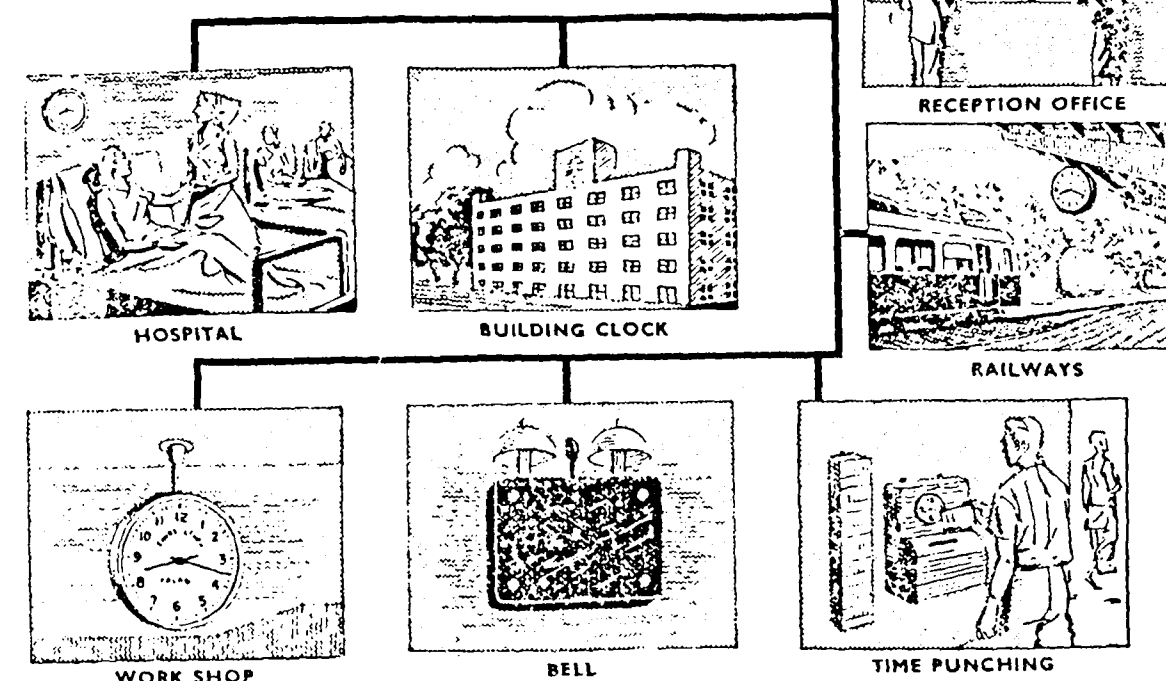
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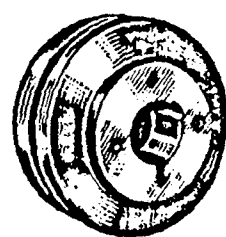
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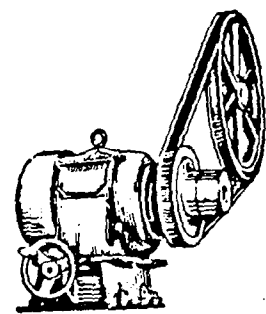


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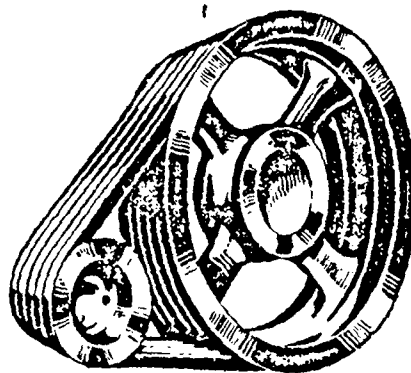
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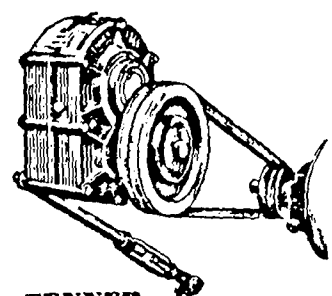
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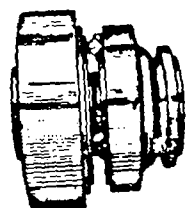
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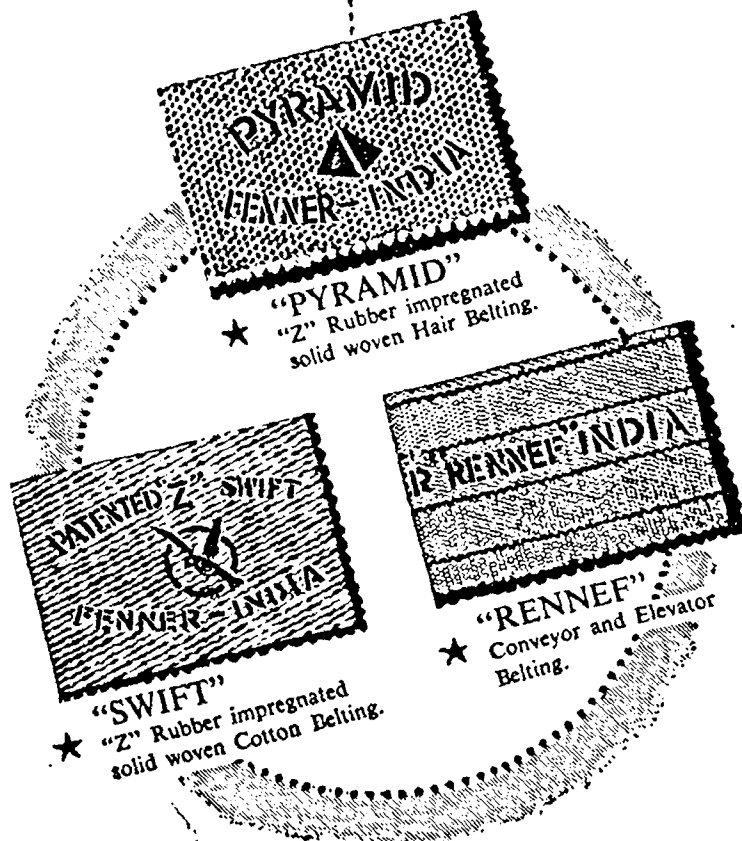
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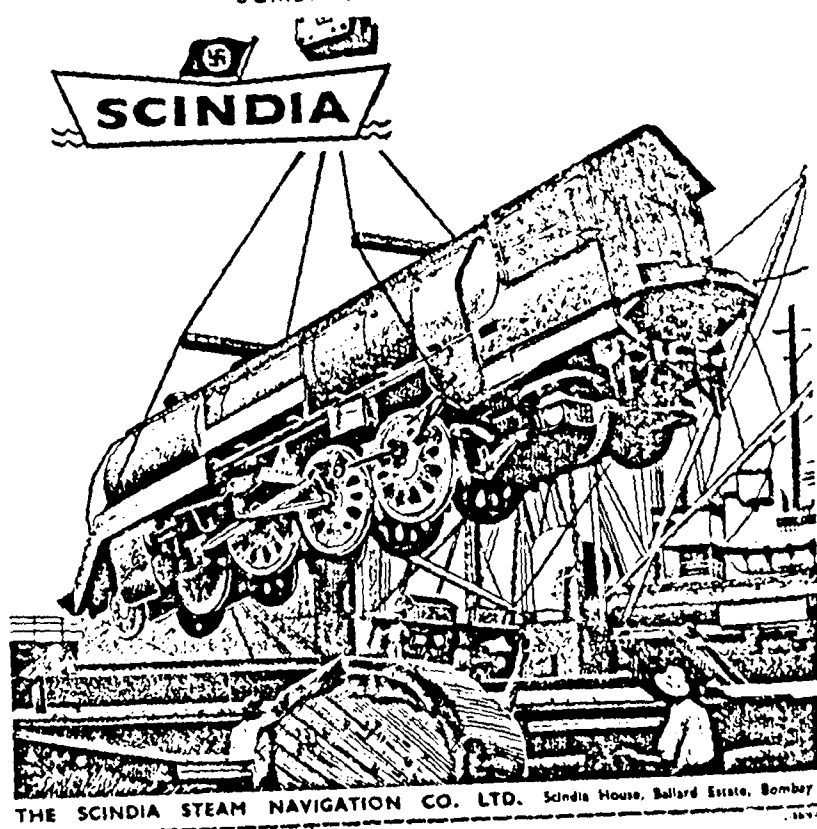
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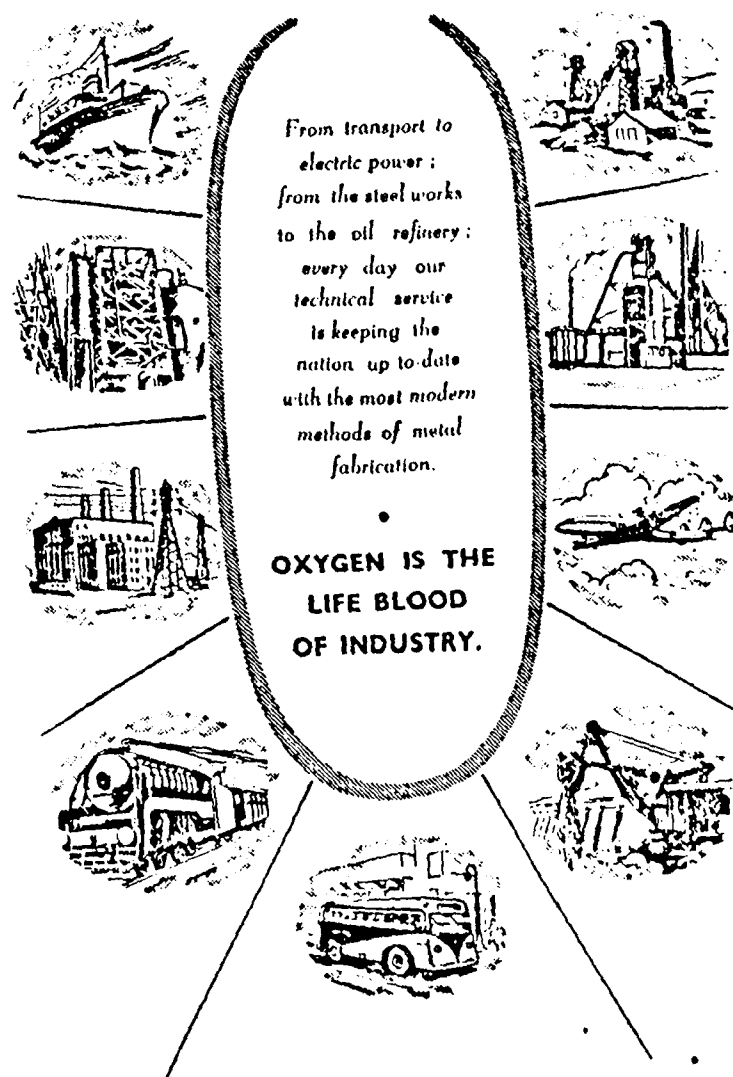
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ELECTRICAL EQUIPMENT MANUFACTURE IMPLICATIONS OF HIGHER TARGETS FOR GENERATING CAPACITY

• By D. K. SINHA •

WITH the signing of an agreement on 17th November, 1953, between the Government of India and the Associated Electrical Industries Ltd. of the U.K., there has commenced an important stage in the history of the manufacture of electrical goods in this country. The beginnings of the electrical industry in India can be traced back to 1921. But the progress it made up to 1939 did not go beyond the stage of manufacturing a few items such as lamps, fans and batteries—in the category of light electrical equipment. The demand for electrical machinery and equipment was met largely from imports; but as the use of electricity by industries increased and the demand for electrical goods rose, some enterprising people were attracted by the idea of manufacturing these goods. When the second world war broke out, there were two manufacturers of electric motors and one manufacturer of transformers, although it cannot be said that they had done more than completed successfully the experimental production of these machines. The industry, however, began developing under the tempo of war needs and the manufacture of motors and transformers was taken up by quite a number of units.

To India, the war brought benefits in some ways, for it, more than anything else, underlined the importance of economic self-sufficiency. It demonstrated the danger inherent in depending on overseas supplies of many important commodities. To do away with this dependence, the Government, in a statement of industrial policy issued on 1st April, 1945, announced its decision to take positive steps to encourage and promote rapid industrialisation. There were vast potential resources of water, cultivable land and minerals which could be exploited to increase wealth. Since electricity was necessary for making the fullest and most effective use of resources, the Government created a Central Technical Power Board to advise provinces and States on planning new schemes for hydro-electric as well as thermal generating stations. A number of industrial panels were appointed to investigate the existing position and make proposals for future lines of development. The Electrical Machinery and Equipment Panel was constituted to make recommendations on the postwar development of the existing and the new electrical industries.

Power Generating Capacity

During the war, the power generating capacity of the over-worked plants was depleted, the production of goods for civilian consumption was seriously affected and industries were suffering from the drastic cuts in power supplies. The rehabilitation of power plants was, therefore, most important. According to a communication from the Electrical Commissioner to the Electrical Machinery and Equipment Panel, the actual installed capacity of the generating plants in public electricity undertakings and the anticipated capacity in 1946, 1953, 1958 and 1963 was to be as shown in the table below.

STATEMENT NO. I

	Kilowatts	Percentage increase compared with the 1939 figures.
1939	1,136,075	—
1946	1,403,930	24
1953	2,725,664	145
1958	3,286,200	194
1963	3,848,000	245

From these figures, it will be seen that the expansion in generating capacity was expected to be large. It was proposed that in 1953, it should be roughly two-and-a-half times, and in 1963 three-and-a-half times, what it was in 1939. The production of electricity on such a large scale implied that machines should be manufactured so as to enable industries to utilise the power generated. It was also necessary to provide the prime movers to utilise power for agricultural and industrial development. The development of industries, on which the industrial policy statement of 1945 had laid the greatest emphasis, therefore largely depended on the establishment and development of heavy electrical industries to supply such things as motors,

generators, transformers, electric wires and cables, switchgear, energy meters, insulators, refrigeration, air-conditioning and traction equipment.

The Electrical Machinery and Equipment Panel's survey of the electrical industry at the time showed that in the category of heavy electrical equipment, although the manufacture of motors, transformers, cables and switchgear had started, the output was small and there was large gap between indigenous supply and likely demand. The manufacture of motors, for instance, was confined to A.C. three phase, squirrel cage types, from one to ten horse-power, with rated capacity standing at 75,500 horse-power. The manufacture of transformers was largely in the range of 25 kVA to 100 kVA, and up to 11 kV on the H.T. side, although a small number of transformers of 500 kVA and 22 kV on the H.T. side had also been manufactured;

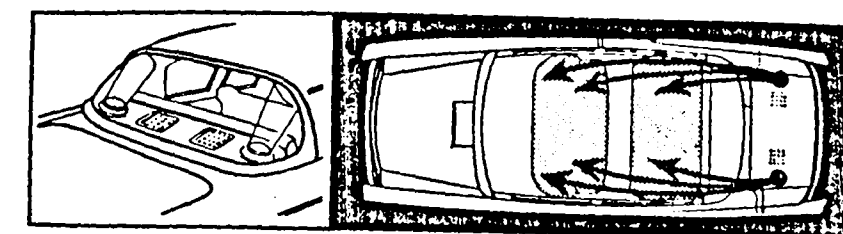
the annual capacity was approximately 80,000 kVA. The cable and wire industry was producing bare copper conductors, rubber insulated cables and flexibles and cotton-covered winding wires. But there was no manufacture of plastic insulated cables and flexibles, aluminium conductors, paper insulated power cables or dry core paper insulated telephone cables. Switchgear manufacture was almost non-existent, although manually-operated disconnecting switches for voltages of up to 33 kV, and simple types of switchboards and fabricated switchboards, had been made by some units. How the position then stood in relation to the annual requirements expected in the next five years ending 1951 may be seen from Statement II.

The position in the case of heavy electrical equipment required by hydro-electric, steam and diesel engine driven power stations was worse, for

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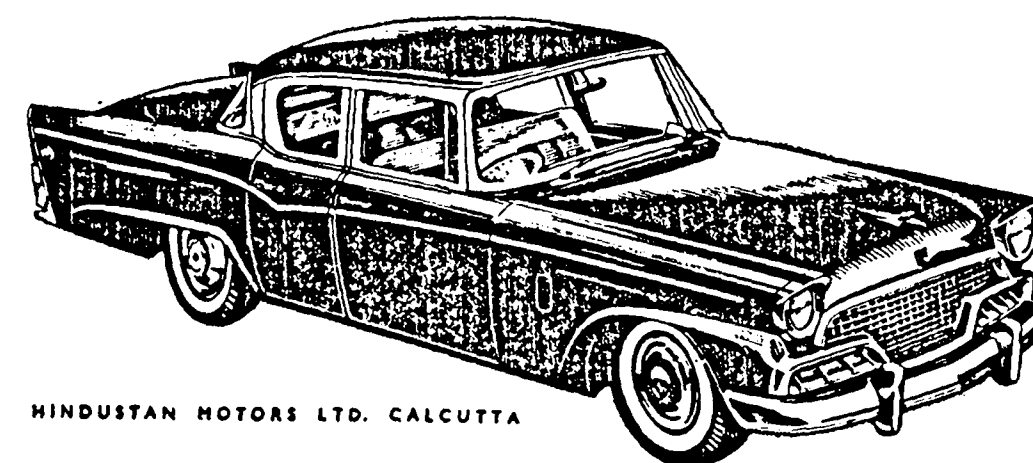
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Vizianagram.

there was no capacity whatsoever for their manufacture. The following are the categories of heavy electrical goods that were required by the various provincial and State Governments for their power expansion schemes.

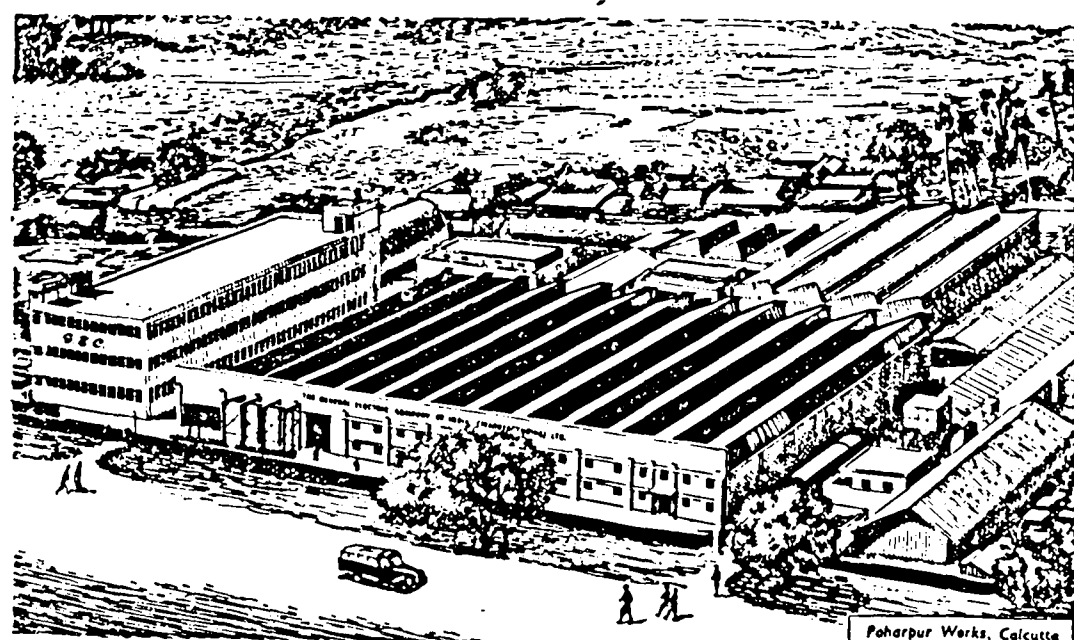
1. Turbo-alternators of individual capacity of 1,000 kW and over.
2. Water tube boilers of individual capacity of 11,000 lbs. an hour and over.
3. Water wheel alternator sets of individual capacity of 500 kW and over.

4. Diesel generating plant having an individual capacity of 500 kW and over.
5. Transformers of voltage 13.2 kV and over and of lower voltages aggregating 5,000 kVA capacity and over for any particular project.
6. High voltage switchgear of 13.2 kV and over and all lower voltages aggregating 5,000 kVA capacity and over for any particular project.
7. Synchronous condensers, rotary converters and motor generator sets having an individual capacity of 250 kW and over.

STATEMENT NO. II

Industry	Annual Production capacity in 1946.	Estimated annual consumption during the first five year period.
Motors and Generators:		
(a) A.C. three phase slipring motors.		4,500 Nos.
(b) A.C. fractional H.P. motors		18,000 Nos.
(c) A.C. three phase squirrel cage motors	75,500 Nos.	75,000 Nos.
(d) A.C. starters		60,000 Nos.
(e) A.C. generators		4,000 Nos.
Transformers	80,000 kVA	300,000 kVA.
Electric Cables and Wires:		
(a) Bare copper conductors	24,000 tons	14,000 tons.
(b) Aluminium conductors		3,500 tons.
(c) Rubber insulated cables	40 million yds.	250 million yds.
(d) Insulated winding wires	300 tons	350 tons.
Switchgear:		
(a) Knife switches and fuses, including iron-clad domestic and industrial switchgear		
(b) Manually-operated disconnecting switches	Very limited	Rs. 4 crores.
(c) Simple type switchboards		
(d) Fabricated switchboards		
(e) Circuit breakers		
Insulators	1,000 tons	5,000 tons
Electrical Measuring Instruments	Very limited	300,000 Nos.

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8. Mercury arc rectifiers of an individual capacity of 250 kW and over.
9. Extra high voltage cables of 13.2 kV and over.

In the existing circumstances, these goods had necessarily to be obtained from abroad. European countries, such as the U.K., France, Switzerland and Sweden, and the United States, to whom alone India could look for her requirements of electrical equipment for the generation of electricity, were hard at work to meet their own rehabilitation and development needs. Besides this, they were contributing to the recovery programme of the war-devastated countries, and were therefore unable to spare anything.

Project Reports

In the circumstances, the need was felt for a big effort to establish the heavy electrical industry on a large scale in India. Such an industry, when established, could provide employment to several thousand people. It could offer the facilities necessary for training highly skilled artisans and technicians. And it could promote the establishment of a number of new industries, apart from fostering the development and expansion of the existing ones. Most people realised that the factory which would take up the manufacture of heavy electrical equipment would be big and would require huge expenditure. The then Ministry of Industry and Supply accordingly constituted a special committee to examine the proposal to set up a Government factory for the manufacture of heavy electrical plant and equipment. This committee recommended that detailed project reports should be obtained from electrical manufacturers who were internationally known. The Government, therefore, entered into agreements with two foreign firms, Associated Electrical Industries of the U.K. and the International General Electric Company of the United States. These firms were asked to make an extensive study of the problems involved and to submit project reports.

Preliminary reports from the firms were received, but further consideration of the project was postponed because it was estimated that the factory would cost Rs. 24 crores and the Government was short of money. When the first five year plan was prepared in 1950-51, it was found that the total generating capacity stood at 1.71 million kW. Comparing this with the figures given in Statement I, it will be seen that the development of generating capacity had not proceeded as expected. One of the reasons was that it had not been possible to obtain from abroad suitable plant and machinery in the prevailing conditions of inflation and scarcity. Even the rehabilitation of certain war-worn plants had not been completed. The industrial development of India, as then planned, had set a target of 7 million kW to be achieved by 1965. This, it should be noted, was much higher than what was visualised by the Department of Planning and Development in 1945-46. So the requirement of heavy electrical equipment for generation, distribution and utilisation was going to be substantially larger.

The Planning Commission found that in the case of the capital goods industries and industries manufacturing intermediate products, the available capacity was very inadequate. The developing economy could not afford to depend on other countries to supply these goods. Accordingly, the indigenous manufacture of heavy electrical equipment, like the manufacture of many other capital goods, was considered a basic requirement. The Planning Commission included it in the first five year plan and provided Rs. 7 crores for a project in the public sector. Nothing, however, was done in the first two years of the first plan period because high priority was being given to other projects. Only in the latter part of the plan period were steps taken in connection with the preparation of a project for the manufacture of heavy electrical machinery. The project reports submitted in 1948-49 had by then become out of date.

Anxiety in the Private Sector

The Government's interest in establishing a factory for the manufacture of heavy electrical equipment in the public sector disturbed many private manufacturers. The latter had, in the meantime, been encouraged to prepare expansion schemes for the progressive manufacture of heavy equipment. That they had acted on this understanding is borne out by Statement III on the progress of the electric motor and transformer industries during 1949, when the Government became lukewarm towards the idea which in 1953 was again revived.

In view of the efforts the private sector had already made, it submitted a scheme for manufacturing heavy electrical goods over the next few years through the existing industry with the active assistance and co-operation of the Government. The Ministry of Industry and Commerce and the Central Water and Power Commission had prepared a statement of the targets and output to be achieved by 1960. This was examined by manufacturers.

who claimed that their immediate expansion plans were quite capable of supplying all the requirements of heavy electrical equipment except turbines and generators.

According to the plans already approved, the domestic transformer industry was to manufacture ratings up to 10,000 kVA by 1960, with capacity standing somewhere between 700,000 and 850,000 kVA, which was considered sufficient to meet the estimated demand of 1,001,256 kVA by working double shifts if necessary. Similarly, the electric motor industry had plans to manufacture A.C. motors, including synchronous motors, of 400 to 2,200 volts up to 1,000 horse-power; D.C. motors and generators up to 150 horse-power; and traction motors up to 420 horse-power. The capacity of the industry would be 500,000 horse-power, which was the target aimed at.

Production of Switchgears

The possible requirements of switchgears and control gears, the existing manufacturers claimed, could also be made with the expanded capacity of the industry. Outdoor type isolating switchgears for voltages of up to 132 kV had already been produced and the industry had approved plans for the manufacture of a wide variety of other types of

required specially designed factory buildings, large cranes, modern tooling and efficient lay-out of the manufacturing departments, which was lacking in the existing organisation. As for the suggestion made by the private industry to invite all the units as a whole, including the railways and ordnance workshops, to collaborate in the manufacture of hydraulic turbines and generators, the Committee expressed the view that a large development of the electrical industry of this character, if dispersed in several factories, would be very complicated and inefficient and it would take a long time before the targets were achieved. It held that a single manufacturing organisation with a well co-ordinated plan was absolutely necessary, and therefore recommended that immediate steps should be taken to set up a State-owned factory to manufacture heavy electrical equipment.

Need for Collaboration

It also expressed the view that the most practical method of establishing the industry within a reasonable period would be to secure the collaboration of a manufacturer of international standing. This recommendation of the Committee was accepted by the Government and a final decision to set up a State-owned factory to manufacture heavy electrical equipment was taken. The Government, in

STATEMENT NO. III

Industry	1949		1953	
	Production H.P.	Range of production up to H.P.	Production H.P.	Range of production up to H.P.
Electric Motors	69,547	30	162,000	160
Transformers	109,200 kVA	1,000kVA and 22 kV on the H.T. side.	308,400	3,000 kVA and 37.5 kV on the H.T. side.

H.T. switchgears of up to 132 kV. As for control gears, it had the capacity for manufacturing over 5,000 units of A.C. motor starters a year with a range of up to 200 horse-power and D.C. motor control gears for motors of up to 50 horse-power. The types manufactured included direct-on-line, star-delta (air and oil break) and auto-transformer starters for squirrel cage induction motors and stator and rotor starters for slip ring motors. The industry therefore felt quite confident that it would be in a position to meet the bulk, if not the whole, of the demand for switchgears and control gears.

This account of the expansion of the electrical industry suggests that only one item of heavy plant, namely hydraulic turbines and generators, was left out of the manufacturing programme. In the opinion of the producers, it was not economical to make turbines and generators alone in a factory; it would be preferable to invite the existing industries as a whole, including the railways and ordnance workshops, to collaborate in the manufacture of hydraulic turbines and generators by distributing portions and components of the work to be done among heavy engineering factories. If requirements up to 1965 could be taken care of in this way by collaboration among the existing manufacturers, it might be expected that some of them would soon come forward severally or jointly to take up the manufacture of turbines and generators also. The industry had the experience and the know-how.

The Gadkary Committee

The Government appointed a committee in October 1954, with Mr. S. A. Gadkary as convener, to report on a scheme for the manufacture of heavy electrical equipment. The terms of reference of the Gadkary Committee were:

1. The exact requirements in the matter of heavy electrical equipment.
2. The extent to which these can be met by current production in India and by its possible expansion in the immediate future, taking into account the unused capacity available in Government establishments and workshops, including State workshops.
3. The residue of the requirements left to be covered.
4. How this residue ought to be met speedily and economically and through what agency.

The Committee reported that the electrical industry had neither taken up nor made any plans for the manufacture of the following: (i) hydraulic turbines with accessories; (ii) hydraulic turbo-generators; (iii) D.C. generators (30 kW and above); (iv) static capacitors; (v) traction control equipment; (vi) rectifiers; and (vii) insulating materials for high tension use.

Besides, in the opinion of the Committee, the lay-out and physical limitations of most of the existing factories were such that they could not be extended or adapted to cover the manufacture of heavy electrical plant and equipment. The manufacture of such equipment, it was pointed out, re-

consultation with experts, considered the various aspects of the problem and ultimately concluded an agreement with the Associated Electrical Industries of the U.K. The factory, it has since been decided, will be located in Bhopal. A private limited company with an authorised capital of Rs. 30 crores, completely owned by the Government, was accordingly incorporated on 29th August, 1956, under the Indian Companies Act, 1956, to control and manage the project.

The factory is scheduled to go into production in 1960 and develop to its full capacity over a period of seven years thereafter. Its manufacturing programme will include turbine generators, transformers, static capacitors, circuit breakers, switchboards and control desks, traction equipment, A.C. industrial motors and insulating materials of all varieties. While heavy transformers, industrial motors, traction motors and switchgears are likely to be produced before the end of the second plan, more basic items of equipment such as hydraulic turbines and generators and generators for diesel sets will be produced in the early years of the third plan.

Future Prospects

The project for heavy electrical equipment is sure to make good progress as the demand for such equipment is quickly increasing. Industry's requirements of power are growing, and so are those of small towns, where the attempt is to attain the target of 7 million kW (originally set for 1965) by 1961, and a new target of about 15 million kW has tentatively been fixed for 1965. At present, imports of heavy electrical goods are of the order of Rs. 18 crores to Rs. 20 crores, but they are likely to go up considerably with the higher targets for generating capacity. The factory was initially planned for an annual turnover of Rs. 8 crores worth of electrical equipment. Because of heavy imports and the consequent strain on foreign exchange resources, the programme of annual turnover has been revised and increased to Rs. 16 crores to Rs. 18 crores. This may be just sufficient to meet the present level of demand.

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INCREASED DEMAND FOR ELECTRIC MOTORS

IMPROVING THE QUALITY OF THE PRODUCTS

• By SUBROTO GHOSE •

ELECTRIC motors are of various types depending upon the use to which they are put and the nature of the electricity available, i.e., direct or alternating currents. Direct current motors are essentially of three types—short wound, series wound and compound wound. The most widely used alternating current motors are the induction type (squirrel cage or slipring), the synchronous type, the variable speed or commutator type and the single phase type of fractional and low horse-power. Of the above types, A.C. three phase, squirrel cage and slipring types of motors of up to 100 horse-power are being regularly manufactured in India on an organised scale. The demand, however, is mainly for motors of up to 30 horse-power. The largest motor that has been produced so far is of the order of 300 horse-power. Special types of motors, such as dual speed motors, loom motors, spinning frame motors, are also being produced on a limited scale. Electric motors have an almost unlimited field in both industry and agriculture as they provide the motive power for driving all types of machines. In practically all types of factories, ranging from flour mills and oil mills to textile mills and heavy engineering workshops, electric motors are extensively used.

The annual requirements of electric motors were estimated in 1955 for A.C. motors at about 320,000 horse-power, consisting of 187,000 for motors of up to 30 horse-power and 130,000 for fractional motors and motors of 31 horse-power and above. The Planning Commission estimated the total demand for A.C. induction motors of up to 50 horse-power at about 320,000 horse-power by 1955-56 on the assumption that the generation of electricity would increase at the same rate as in 1951 and that industrial activity would keep pace with it. It can, however, reasonably be said that the present demand for electric motors of the A.C. type is 330,000 horse-power. Since figures are not available showing the exact number of electric motors of each range imported or produced, it is not possible to make a precise estimate of demand.

Demand for Motors

The demand for electric motors ultimately depends on industrial development, and with the increasing availability of electric power during the period of the second plan, the demand for motors will also grow rapidly. The volume and pattern of demand will have to keep pace with the growth of various industries, especially those pertaining to the manufacture of capital equipment and machine tools which require motors to be incorporated with them. The Development Council for Heavy Electrical Industries has arrived at the conclusion that the requirements of electric motors of up to 200 horse-power may be of the order of 600,000 horse-power a year by the end of the second plan. The basis of this conclusion seems rather inadequate, as it has already been pointed out by the All-India Manufacturers Organisation that it

will be more reasonable to take 1,000,000 horse-power a year as the target, because the demand for electric motors will increase by about 15 percent each year during the next three years, in view of the increase in the generation of electric power and development of irrigation, better industrial activity, and the tendency to use electric motors for individual drive instead of group drive for industrial machines. On the whole, it seems reasonable to think that the demand estimated by the All-India Manufacturers Organisation is nearer to reality. At the beginning of the first plan, there were ten firms engaged in the regular manufacture of electric motors with a total installed capacity of 150,000 horse-power a year. This capacity, with the addition of two new units, was assessed in 1954 at 263,000 horse-power and the State-wise distribution is shown below:

State	Number of Units	Annual Rated Capacity (H.P.)
West Bengal	5	75,500
Bombay	4	124,000
Madras	2	13,500
Mysore	1	50,000
	12	263,000

By the end of the first plan period, the Government sanctioned schemes for a total additional capacity of 365,700 horse-power. This was done by setting up five new units and allowing further expansion to four of the established manufacturers. Since March 1956, the grant of licences for the expansion of three of the existing firms has been recommended. This will result in a further increase of capacity by about 205,000 horse-power, thus bringing the total installed capacity for electric motors to 833,700 horse-power when the schemes are fully implemented.

Quality of Products

Mention must be made of the heavy electrical equipment factory to be set up in Bhopal in technical collaboration with the Associated Electrical Industries of the U.K. This factory will manufacture, besides other heavy electrical equipment, A.C. industrial motors of 200 horse-power and above with an annual capacity of 50,000 horse-power. Although the factory will be manufacturing motors of 200 horse-power and above, the Government has no objection to allowing the existing firms to manufacture motors of 250 horse-power or a little higher. Thus, overlapping in the range of 200 to 250 horse-power between the private and public sectors will be allowed. Since electric motors is an important capital goods industry, the progress made in implementing the schemes and in maintaining the normal production of the existing firms should be watched carefully and steps should be taken whenever necessary to ensure fulfilment of the capacity target. There are conflicting views about the

quality of indigenous electric motors. Some of the consumers and importers state that the quality is satisfactory, particularly of motors produced by manufacturers who have tie-ups with foreign manufacturers. Some of the consumers, however, complain that manufacturers do not conform to standard specifications and the motors cannot take the full load.

It is often pointed out that the clearance between winding and cover is narrow, which makes it difficult to carry out any inspection or repairs, and the winding is inferior, the insulation resistance is low, and the internal connections are wrong. Another great disadvantage with some of the indigenous manufacturers is that their motors are not suitable for use in chemical factories or places where the humidity is high. However, the critics of indigenous motors have to admit that the quality has improved; but special care is necessary in the manufacture of electric motors which are required for heavy duty or for work where special atmospheric or other conditions prevail. One way of ensuring standard quality would be to provide facilities for type testing as well as testing under actual conditions and for certificates to be issued by the institutions where the motors are tested. This will enable manufacturers to furnish evidence about the quality of their products.

Raw Material Shortage

The main difficulties faced by the industry relate to the shortage of raw materials. The electric motor industry depends to a considerable extent on imported raw materials, particularly copper wire and insulating materials. Among the indigenous raw materials, pig iron and steel are in short supply and the manufacturers experience great difficulty in obtaining them. Requirements of pig iron and ferrous castings for a production target of 600,000 horse-power would be about 7,500 tons and that of electric steel sheets 7,500 tons. The performance of indigenously manufactured ball bearings is not at all satisfactory, but steps have already been taken to improve the quality. Insulating materials have to be imported, while electric steel sheets and insulating paints and varnishes are partly imported and partly available indigenously. The silicon steel sheets now available in the country are not of the required standard and the quantity is small compared with the actual requirement. The electrical industry should take up the manufacture of these special steel sheets in earnestness. Without them, its expansion will have to depend on foreign imports.

The electric motor industry has enjoyed tariff protection for nearly seven years. The second Tariff Board enquiry into the industry was held in 1949 and on the recommendation of the Board protection was given to electric motors of the types actually manufactured in the country i.e., motors of up to 20 horse-power as well as the component parts of such motors. The Tariff Commission enquiry was held in 1955. As a result of this, protection has been granted until 31st December, 1958, and the protective duty of 15 percent *ad valorem* has been levied on imports for squirrel cage induction motor of horse-power above 20 and up to and inclusive of 100, and of slipring motors of horse-power ranging from 1 to 100 inclusive, but excluding flame-proof motors and variable speed commutator motors. A protective duty of 20 percent *ad valorem* has also been levied on component parts of the motors specified above but excluding the control gear for them.

Scope for Development

India has plans to develop the manufacture of cement, sugar mill, tea and jute mill machinery and machinery for the manufacture of large machine tools. These industries require a very large number of motors of various ratings. Besides, there is also likely to be a considerable demand for special purpose motors, such as those required in chemical and fertiliser plants, and in refineries. Although the manufacture of electric motors has developed satisfactorily, there is still a large gap to be bridged and the success of the second plan will depend considerably on the development and progress of this vital industry.

MANUFACTURE OF TELEPHONE AND ELECTRIC CABLES

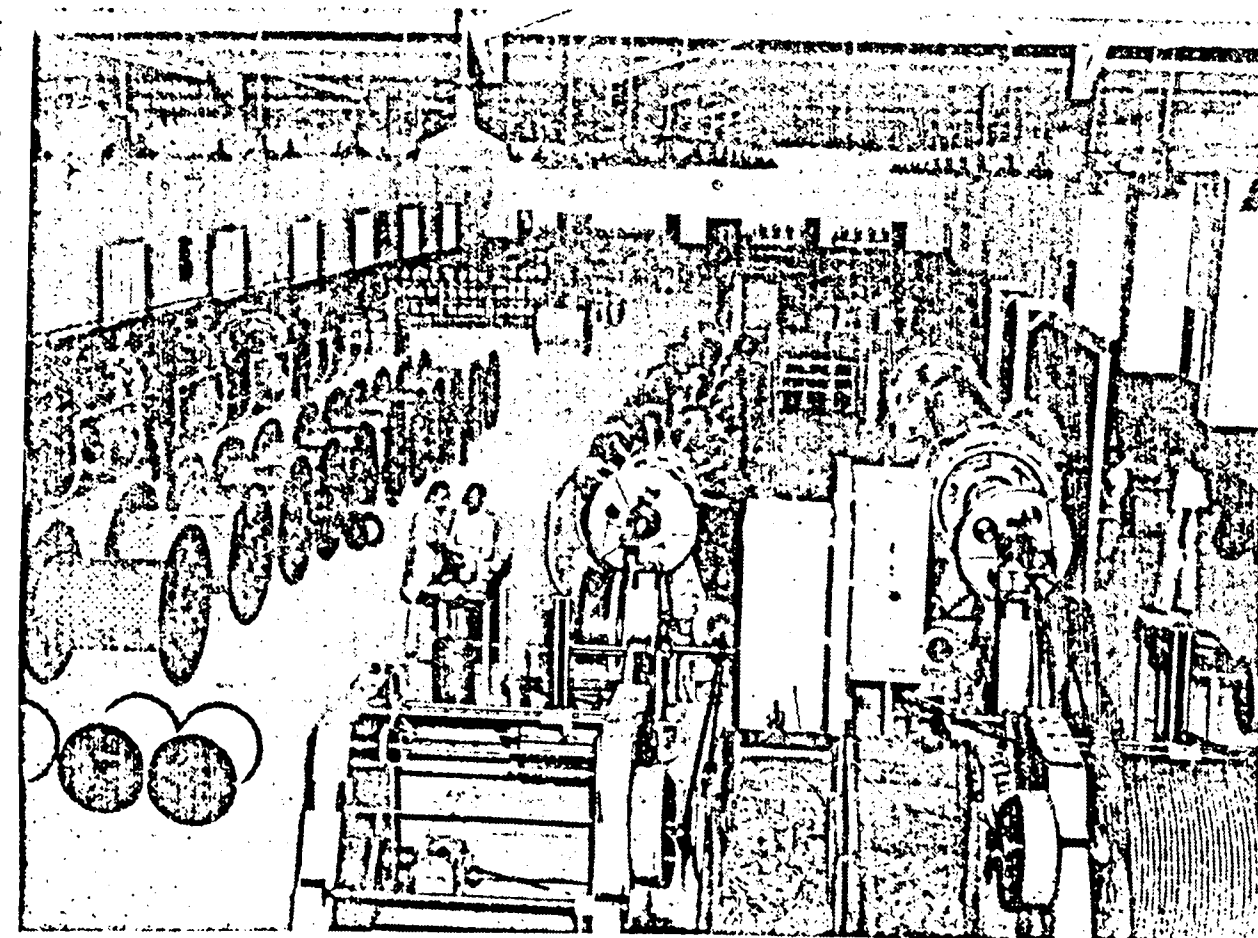
PROGRESS TOWARDS SELF-SUFFICIENCY

• By A CORRESPONDENT •

THE development of internal telecommunications has been accorded a prominent place in the second five year plan. As the subject is almost exclusively the concern of the Posts and Telegraphs Department, the manufacture of telephone cables, which is a vital part of the programme, is being undertaken in the public sector. The foundation of the industry was laid during the first plan period, when the Government sanctioned a scheme to set up a factory in Rupnarainpur, West Bengal, to make telephone cables. Until then, all such cables had to be imported at a cost of about a crore of rupees annually. But as the demand for a wider and more modern network of telephone communications developed, the need was felt not only for larger quantities but also for greater varieties of cables. The establishment of a telephone cable industry in the public sector at an initial cost of Rs. 1.3 crores thus became an investment worth making. The factory, it was hoped, would manufacture dry core telephone cables worth about Rs. 80 lakhs to Rs. 1 crore annually, which would be equivalent to the amount previously being spent on imports. Set up in technical consultation with Standard Telephone and Cables Ltd. of the United Kingdom, it was to be designed to produce annually 470 miles of paper insulated, air spaced, dry core, lead covered unit type subscribers' cables, protected local or exchange area cables, long distance audio-frequency cables and carrier frequency cables.

Installation of Equipment

Installation of the equipment commenced in May 1953 and by February 1954, most of the major components were in position. Preliminary tests on manufacture were carried out in the first part of 1954. By the end of the year, production of the scheduled 100 miles of cables was completed. An advantage was that some of the principal raw materials, such as copper wire, hessian and soft seasoned timber, were available within India, although other materials, such as steel tape, insulating paper and lead, had to be imported. Efforts, however, are being made to produce a certain amount of the lead from domestic sources. Investigations are also in progress for the manufacture of insulating paper and steel tape at home. The manufacturing plant is equipped to produce exchange area cables of any size from two to over 1,800 pairs, though currently, cables only of sizes of ten pairs and upwards are being produced. The



The production shop where unit type cables are stranded by high precision machines

plant is designed to make both armoured and protected cables. But as the demand of the Posts and Telegraphs Department has so far been mainly for armoured cables, the production of this variety is being undertaken.

Steady Progress

During the last two years, steady progress has been made. In 1955-56, production amounted to 525 miles of cables, which exceeded the scheduled target of annual production of 470 miles. In 1956-57, output has improved further to 575 miles. The requirements of the Posts and Telegraphs Department during the next few years have been estimated at 800 miles a year. If to this figure are added the requirements of other Government departments like the railways and Defence, the

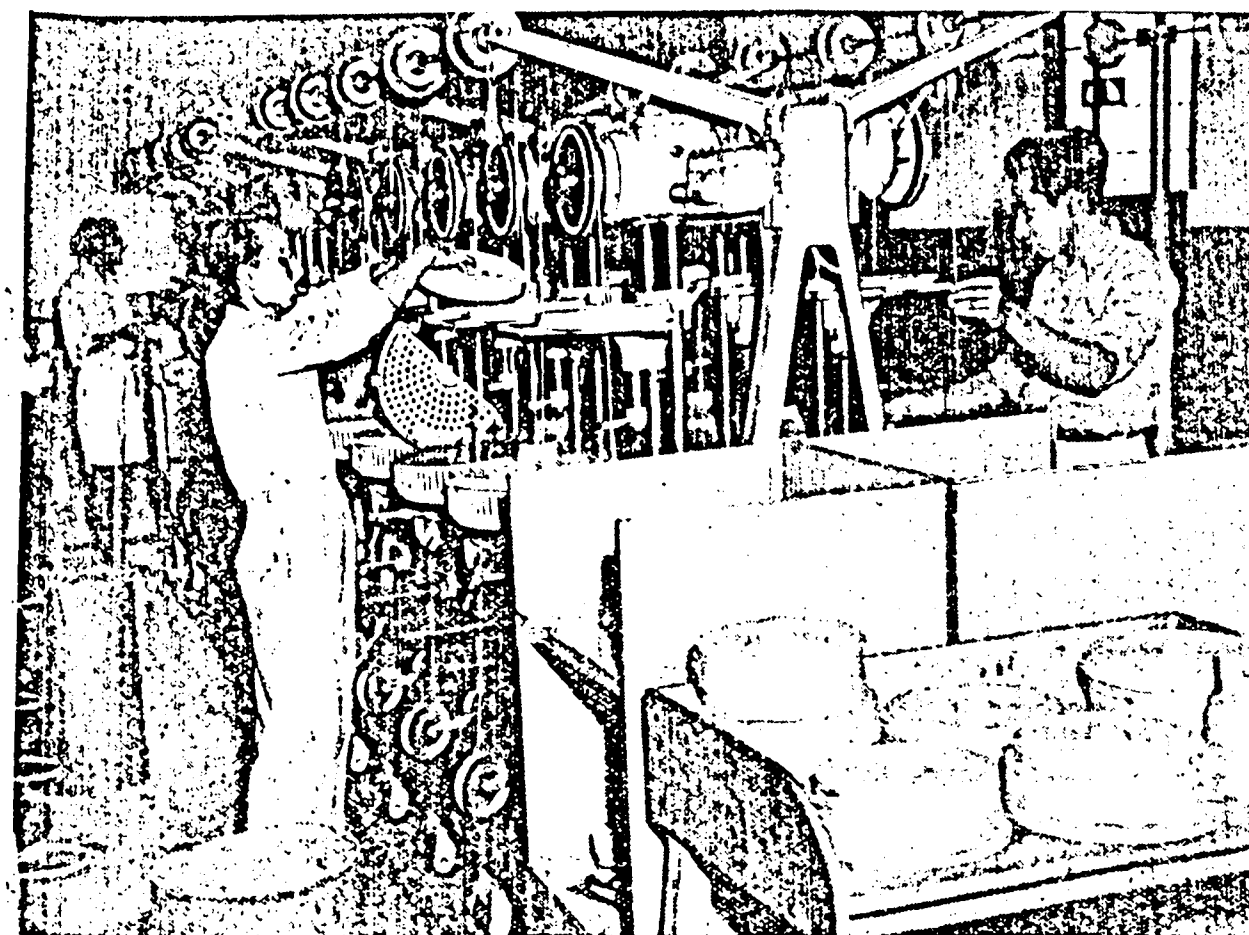
initial demand will be for about 1,000 miles annually. With the existing installed capacity of the plant, it is possible to attain this output if the factory works a double shift. This would not only meet all the indigenous demand but might also leave a surplus for export. In expanding the production of armoured cables, a limiting factor has been the capacity of the armouring shop. This bottleneck will, however, be eliminated when machinery for doubling that capacity, which has already arrived, is set up and goes into production.

During the second five year plan, the Posts and Telegraphs Department's expansion schemes propose linking the major cities by an underground telephone network. This project will require the supply annually of 300 miles of underground co-axial cables to start with. The Hindustan Cables Factory is to undertake their manufacture. Specifications for an economical and modern plant which will be installed for the production of co-axial cables have been formulated in consultation with Standard Telephones and Cables Ltd., the consultant firm for the factory. Indents for plant have been placed. The establishment of the plant, it is estimated, will involve an investment of Rs. 82 lakhs. Of this sum, Rs. 50 lakhs will come from a capital grant by the Government of India, and Rs. 32 lakhs will be found from the company's own resources.

Goal of Self-Sufficiency

On the occasion of the inauguration of the Hindustan Cables Factory in December 1954, Mr. Jagjivan Ram, then Minister for Communications, said: "After the Hindustan Cables Factory goes into full production, India will be self-sufficient in all varieties of telephone cables by 1957-58. The factory will thus contribute in a larger and larger measure to the expansion of telecommunications in India and thus help in the growth of commerce and industry and in the general development of the country".

The priority accorded in the second plan to industrial development and multipurpose irrigation schemes makes it essential that sufficient electric power be generated and supplied. Transmission of power to urban industries and rural areas on the scale proposed will require the development of the industries engaged in the manufacture of electric cables and wires. The second plan provides for the electrification not only of all the large and medium-sized towns, but also of smaller towns with a population of 10,000 and over. Provision



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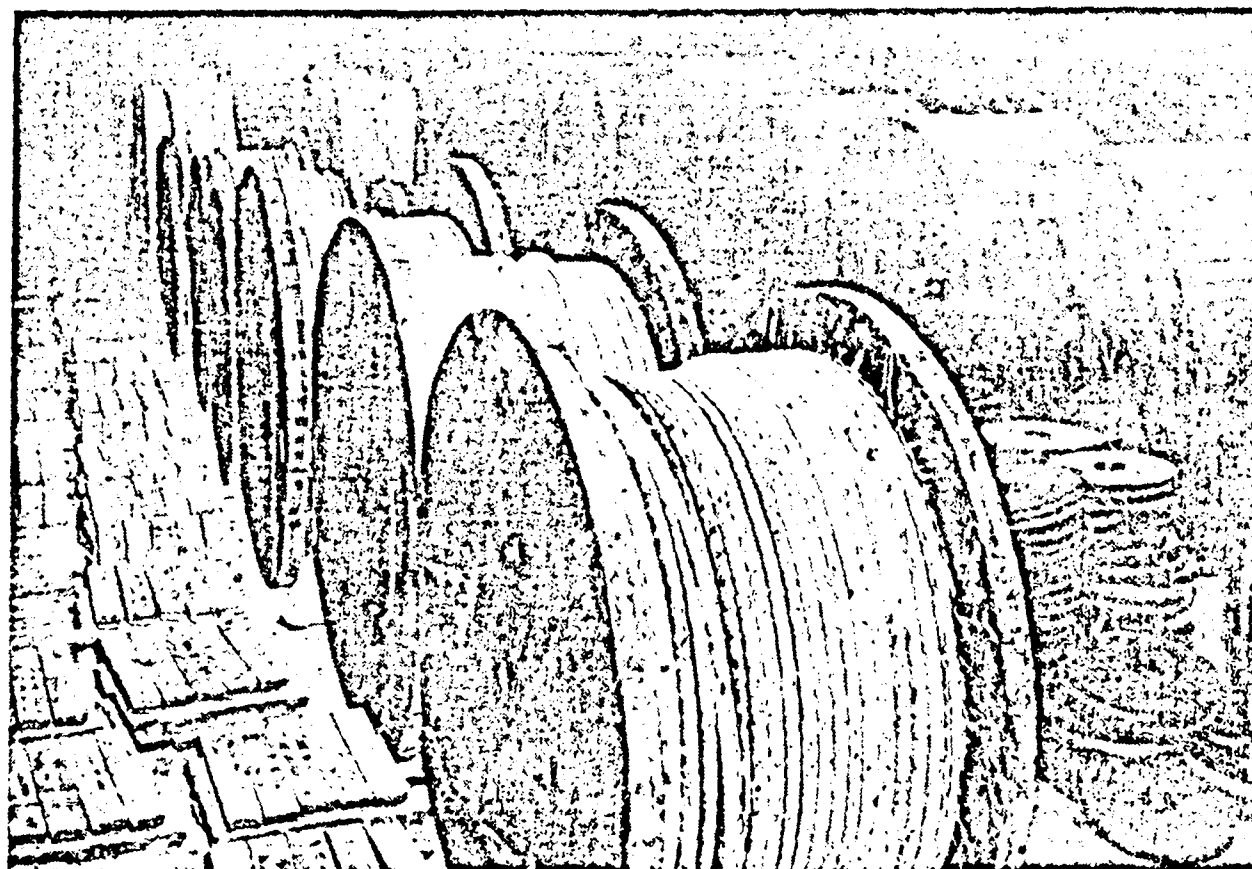
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has been made for the electrification of rural areas, to cover about 10,000 additional villages, though this has to be accomplished in phases. Out of a total outlay of Rs. 427 crores on power programmes in the plan, it is proposed to spend about Rs. 75 crores on rural electrification. Power supply to the smaller towns and villages will help create fresh employment opportunities through small-scale and cottage industries.

This power expansion programme will create the demand for more cables and transmission lines; so provision has been made for expansion of the cable-making industries. Their manufacturing programme includes items ranging from high-tension heavy cables for long-distance power transmission to low-voltage underground mains cables and household wiring cables and flexibles and other ancillary equipment. Before the war, when generation facilities and the demand for power were limited, electric cables, like telephone cables, were

mostly imported. Local manufacture met only part of the requirement. Cables were manufactured in the private sector only, the two units—the Indian Cable Company in Tatanagar and the National Insulated Cable Company of India in Calcutta—sharing the output between them. In the postwar period, two other plants were established—one in Alwaye, Travancore-Cochin, and the other in Bangalore. With the setting up of these new factories, also in the private sector, the country made definite progress towards self-sufficiency.

It was estimated that requirements by the end of the first plan would be 10,000 tons of bare paper-wire conductors, 1,875 tons of winding wires, 105 million yards of rubber insulated and plastic wires and flexibles and 8,000 tons of A.C.S.R. cables. The plan targets of production, which were somewhat higher than estimated requirements, were 2.5 million feet of electric wires, 119 million yards of rubber and plastic insulated cables and flexibles,

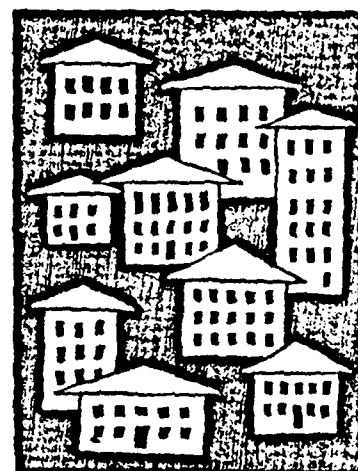
1,100 tons of winding wires and 400 tons of paper insulated power cables and 5,000 tons of A.C.S.R. conductors.

Achievements in the First Plan

Most of the first plan targets have been attained. As a result of the expansion programme implemented during the first plan, particularly by the Indian Cable Company, a new rod mill with an annual installed capacity of 6,700 tons of black copper and aluminium rods went into production in 1953. An additional capacity for the production of about 100 tons of cotton and paper-covered wires and for the production of 3 million yards of plastic insulated cables and flexibles a year has also been established. The expansion programme approved by the Government for A.C.S.R. cables involved the setting up of an installed capacity of about 13,000 to 14,000 tons a year. The production of A.C.S.R. conductors reached a figure of 5,481 tons in 1954-55, exceeding the first plan target of 5,000 tons, which was a direct result of the utilisation of the increased capacity. During 1955, four units with an installed capacity of 10,370 tons produced about 8,000 tons of A.C.S.R. and all-aluminium conductors. During January-September 1956, five units with a capacity of 13,370 tons, it was estimated, produced about 10,000 tons of such conductors.

The second five year plan estimates that the requirements of A.C.S.R. cables, which at present are of the order of 10,000 tons to 12,000 tons a year, will go up by 1961 to 18,000 tons. The production target has been placed at the higher level of 20,400 tons annually. These requirements should be met by increasing indigenous production; for this purpose, a careful analysis of changes in the trends of production and demand is called for. The other categories of electrical wires which have to be manufactured are paper insulated cables (the entire requirements of which are at present being imported), and enamelled copper and paper-covered wires (the bulk of which are also being imported.) A few schemes for the manufacture of these electrical goods have been licensed, but a large gap remains to be bridged.

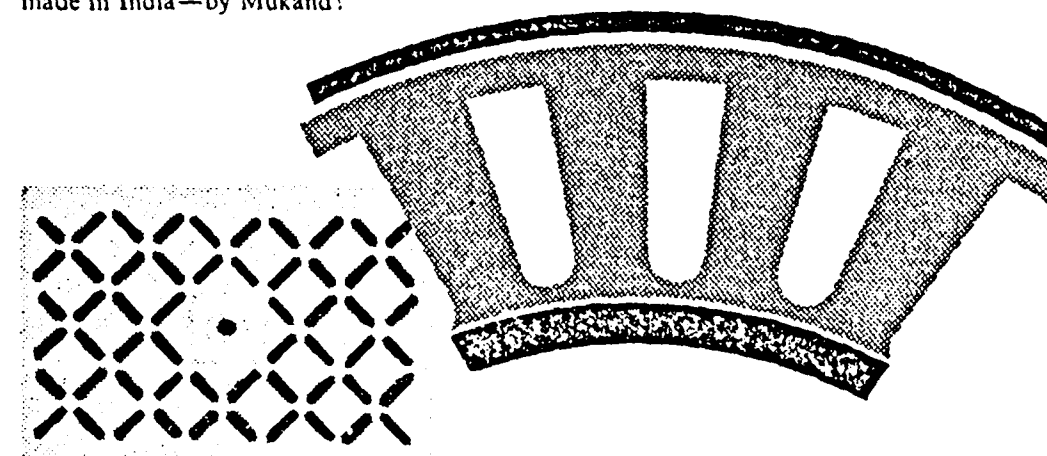
Addressing the fifth meeting of the Development Council for Heavy Electrical Industries, Mr. M. M. Shah, Minister for Heavy Industries, emphasised the point that "the question of meeting our internal demands for all types of electrical equipment is important". The targets should aim not only at internal self-sufficiency, but also at export, for which there is likely to be appreciable scope in neighbouring countries.



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NEED TO INCREASE EXPORTS OF MANGANESE ORE

ROLE OF THE STATE TRADING CORPORATION

By A. N. HAKSAR
Chairman, Shivrajpur Syndicate Ltd.

MANGANESE is among the most important of the materials used by industry. The metallurgy of iron and steel almost completely depends on it, as it is used for the various smelting processes from pig iron to the many different qualities of steel. It is estimated that 13 to 15 lbs of manganese are required for every ton of finished steel. Manganese is a hard metal, and is not used industrially in its pure form. It is used in various forms, as an addition to ferrous metals and alloys during the manufacturing process, in order to remove undesirable impurities and to strengthen both iron and steel. It is commercially available as a metal prepared by reduction with aluminium, or in the form of an alloy known as ferro-manganese, which is prepared in electric furnaces.

India is fortunate in possessing extensive reserves of the mineral. Manganese ore, although it has a high phosphorus and iron content, is mostly hard and lumpy. It is highly suitable for metallurgical purposes. This country is an important producer of certain qualities of hard high grade metallurgical ore. About 95 percent of the manganese ore produced annually is used for metallurgical purposes. The remaining 5 percent (all high grade dioxide ores with a content of over 80 percent MnO₂) is used in the chemical, glass, ceramic and dry battery industries.

Extensive deposits of manganese ore are found in parts of Bihar, Orissa, Madhya Pradesh, Bombay and Rajasthan. The most important deposits in quantity and quality are those situated in Madhya Pradesh. The total reserves in this area alone, as recently estimated, are of the order of 100 million tons. Almost all of India's output is exported, and about 75 percent of the total exports consist of high grade ore containing over 46 percent of manganese. High grade ores are utilised in open hearth furnaces in the manufacture of steel, and in the production of ferro-manganese. Lower grade ores are normally used in blast furnaces with iron ore and coke for the production of pig iron. The high grade dioxide ores are sold at much higher rates than those obtainable for metallurgical ores.

Development of Industry

During and after the second world war, the phenomenal increase in steel production in the United States and, to a lesser extent, on the continent of Europe, gave an impetus to the Indian manganese ore industry. The contributory factors were many and diverse, the most important being the stockpiling programme embarked upon by the U.S. Government during the Korean war. In this period, Indian manganese ore enjoyed the position of a strategic and scarce mineral. There were very few other sources from which this mineral could be procured in sizeable quantities; Russia was generally unwilling to export any of its output.

Among the ferrous-alloy forming metals, pride of place belongs to manganese. Experts have estimated that even if India's iron and steel industry were to be expanded to the fullest extent, there would be no shortage of manganese ore; so the export of surplus ore would still be justified, in fact, would be essential, as the manganese export trade earns valuable foreign exchange. The second five year plan estimates imports, including those of plant and machinery, at Rs. 4,340 crores, and exports at Rs. 2,965 crores, leaving an adverse balance of trade amounting to Rs. 1,375 crores. The trade balance position, because of increased prices and dwindling foreign exchange reserves, is likely to be even more difficult. This emphasises the need to improve our foreign exchange resources through enlarged exports.

The high level of economic activity in the United States, Europe and Japan, the principal consuming areas for manganese ore, was responsible for the bigger demand, and consequently, for the better price which prevailed throughout 1956. The Government of India decided to canalise

manganese ore exports through the Government-sponsored State Trading Corporation. The announcement was made in a Press note on 22nd June, 1956. The trade and industry viewed the decision with serious apprehensions, and their misgivings have been justified. Recently it was reported that the State Trading Corporation is finding it difficult to sell sizeable quantities of ore to foreign buyers. It was argued in justification of the Government's decision to enter the mineral export trade that the mining industry did not have much scope for development along sound lines, so it was necessary for the Government to play a more positive rôle by reorganising the trade in ores on more rational lines to increase exports. Thus the Government decided to canalise exports through the State Trading Corporation. It is pertinent to ask whether a mere change of agency increases exports unless new markets are explored and output is increased. When the idea of State trading was conceived, it was generally understood that the Government would concentrate on expanding India's trade with Communist countries where trading is on a State level; but that generally has not been the case; the S.T.C. has been securing

orders at the expense of the existing trade channels.

The effect the State Trading Corporation will have on the foreign buyer is of great relevance. Should this result in the latter losing confidence in the Indian manganese ore trade, he will turn to other sources of supply, such as Brazil, Chile, Ghana and South Africa. It is reported that out of the total quantity of 196,013 tons of manganese ore imported into the United States in December 1956, Brazil supplied 22 percent and India only 10 percent; the balance came from Ghana, South Africa, Belgian Congo, etcetera. It is also reported that the newly developed manganese mines located in the Amapa district of Brazil, where there are rich deposits, have reserves estimated at 11 million tons. Recently there has been a fall in the demand for Indian manganese ore from the United States. This country must do everything in her power to retain the lucrative U.S. market.

Exploring New Markets

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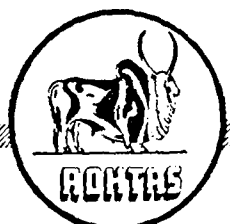
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the pressure on the lignite, particularly the horizontal thrust, is further increased, the lignite is made more dense and less in volume, giving coal. In the case of the Neyveli lignite, the deposition of soil and the movement of the earth's crust seem to have been over vegetal matter growing over water-logged areas. Probably this resulted in artesian aquifers, i.e., water-bearing strata, being found below the lignite, apparently connected to one or more water courses which survive today. In Neyveli, such water-bearing strata consist of uncompacted sand, the water occupying the interstices between the sand particles. These water-bearing strata exert an upward thrust on the lignite, which is kept in check by the weight of the lignite and the overburden above it. There are several such water-bearing strata below the lignite in Neyveli.

Drilling Wells

The occurrence of lignite in and around Neyveli was known previously, but came to prominent notice in the thirties of this century while drilling wells for water supply purposes. The Geological Survey of India carried out investigations and put down a number of bore holes during 1943-46 which revealed the existence of lignite over an area of 23 square miles. In view of the shortage of fuel and power in the State and the difficulties and cost involved in transporting coal from north India, the Government of Madras turned its attention to the development of lignite as a source of supply of power, fuel and raw material for industries in the postwar years, and arranged for further investigations from 1946. A series of bore holes were drilled during 1948-51 and these proved the existence of reserves of lignite, estimated at 2,000 million tons, over a total area of 100 square miles. The most favourable overburden-lignite ratio and the more easily workable deposits, amounting to 200 million tons, occur in an area of about 51 square miles. The thickness of the seam in this area which it is proposed to work first under the project, varies from zero to 89 feet with an average of 55 feet, and occurs at a depth of about 180 feet below the ground level. The artesian water below the lignite exerts an upward thrust of about 6 to 8 tons a square foot.

In the areas which are higher than sea level, like the area it is proposed to work first, as soon as a hole is bored from the surface down to the base of the lignite at about a depth of 235 feet, the artesian water rushes up in the hole to its static level of 60 feet below the ground level. Where the level of the ground surface is nearly equal to or a little less than sea level, the water will flow out of such a bore hole. There are a number of flowing artesian wells put down for irrigation in the area south of the Cuddalore-Neyveli-Vridhachalam railway line and the road. There being no impermeable barrier of sufficient thickness below the lignite bed to withstand the pressure that would be exerted on the base of the lignite on the removal of the overburden, there is a risk of the artesian water heaving upwards, bursting through the lignite seam and flooding the mine, unless its pressure is kept continuously under control from the appropriate stage of the mining operations.

Further investigations were conducted and it became clear that underground working would be quite out of the question. The Madras Government, therefore, undertook the excavation of a pilot quarry with aid from the T.C.M., arranged through the Government of India, to determine the engineering feasibility and economic practicability of open-cast mining. The excavations in the pilot quarry were taken down to about 145 feet below ground level by December 1954, and indicated that open-cast mining would be practicable, but further work had to be stopped pending a detailed study of the ground-water problem.

Project Report

The investigations did not contemplate any specific project, as such, for mining any specific quantity of lignite, and for its utilisation. The Government of India, therefore, in the meantime, arranged, under the Colombo Plan, for the services of Powell Duffryn Technical Services Limited, a firm of consulting engineers, well experienced in the mining of coal, to prepare a definite project report on the economic mining, processing and utilisation of the lignite. The firm presented a report in November 1954, wherein it proposed a number of specific alternative schemes and suggested further investigations to check the thickness of the lignite seam and also to evolve an efficient and thoroughly dependable system of ground-water control. Tests and analyses abroad, in well-known laboratories, of bulk samples of the Neyveli lignite were also suggested.

By then, it was evident that the magnitude and scope of the project were beyond the financial and technical capacity of the State Government. After having arranged to turn the investigation towards a definite scheme, the Central Government took over financial responsibility for it from 1st

January, 1955. As a result of discussions between the Central Government and the State Government, it was decided to adopt one of the specific projects suggested by Powell Duffryn Technical Services Limited, viz., an integrated project for mining 3½ million tons of lignite a year, and for processing and utilising it for the generation of 200 mW of electric power, the production of nitrogenous fertilisers with a nitrogen content of 70,000 tons a year, and briquetting of 714,000 tons of the lignite and its carbonisation to produce 380,000 tons of carbonised briquettes, furnishing smokeless domestic fuel, and a number of valuable by-products, and to investigate this specific project further.

Analyses and Tests

The pilot quarry was excavated a little further and a shaft was sunk with great care to a depth of about 15 feet from the top of the lignite. As the extension of the shaft further down would have been risky, galleries were excavated laterally from the shaft and a bulk sample of 50 tons of lignite was removed and sent to laboratories in Western Germany for detailed analyses and tests. These tests confirmed that the lignite, as mined, has a moisture content of 50 percent, volatiles amounting to 25 percent, 22 percent of fixed carbon and an ash content of only 3 percent, the heating value of the lignite being about 5,500 British thermal units a lb. The quality of the lignite is better than that of German lignite. A series of new bore holes put down at several places in the lignite-bearing area confirmed the previous estimates made of the reserves of lignite. In the meantime, the Government of India, with the concurrence of the Government of Madras, took over administrative responsibility as well for the project, from 15th September, 1955. The part-time chief executive officer of the lignite investigations, who was working under the Government of Madras, became the full-time chief executive of the project under the Government of India.

Before the taxpayer's money could be spent on a venture carrying the risk of flooding of the mine, it was essential to prove that the artesian water pressure could be controlled and the risk made at least negligible, if not eliminated altogether. The drilling of large-diameter pump wells, hitherto not known in this part of the country, was undertaken, pumps fitted therein, and large-scale pumping tests conducted. These were successfully completed at the end of June 1956 and

proved that the pressure surface of the artesian water could be reduced to a safe level below the lignite, by pumping from a carefully designed pattern of wells, most of them round the mine and some within it.

The expert consultants and the Government of India's own experts studied the results of the tests, and were sure that it would be feasible to control the artesian pressure and eliminate the risk. The Government then approved the project as a whole, and shortly afterwards sanctioned the execution of the mining scheme, which is the basic scheme in this integrated project. The mining scheme, by itself, is expected to cost Rs. 16.90 crores, on the basis of a detailed mine plan submitted by Powell Duffryn Technical Services Limited towards the latter half of last year and scrutinised and approved by the Government soon afterwards. The Government, being determined to execute the project quickly, agreed to tenders being called, even before the completion of the pumping tests, for specialised mining machinery with long delivery dates, and for conventional earth-moving machines which could remove a good part of the overburden, pending the arrival of the specialised equipment. On the basis of the tenders received, orders were placed, soon after the conclusion of the pumping tests and the approval of the Government for the project as a whole.

The project provides for the mining of 3½ million tons of lignite a year. About 2½ tons of raw lignite is equivalent in thermal value to a ton of good coal. The annual target of production will, therefore, be equivalent to a little over 1½ million tons of good coal. But raw lignite is bulky and liable to spontaneous combustion. To be transported, it must be briquetted, after bringing the moisture content down to about 15 percent. Raw lignite briquetted would have a heating value of about 9,000 B.Th.U. a lb and the price of the quantity equivalent to one ton of Singareni coal in thermal value would be under Rs. 40. With a rate of production of 3½ million tons a year, the comparatively easily mineable lignite would last for about 57 years. But, with the experience gained in working this part of the lignite reserves, it should not be difficult to win the rest of the deposits also economically.

Installed Capacity

Industrial development in Madras has been retarded largely by the shortage of electric power.

and power is needed for the development of agriculture as well. As the most economic utilisation of lignite is to use it as fuel in boilers close to the mine itself, the generation of electric power is the most important constituent scheme in the integrated project. The installed capacity of the thermal power station will be 200,000 kW. In addition, there will be a back pressure turbine plant in conjunction with other production units. The project report for the lignite-burning thermal station has been prepared by a planning cell of the Central Water and Power Commission, on behalf of the Neyveli Lignite Corporation, and submitted to the Government. Specifications of the plant and equipment needed are being drawn up, and notices inviting tenders for supply and erection will be issued in the near future.

It has been decided that the fertiliser plant in the project should produce the entire quantity of fertilisers, with a nitrogen content of 70,000 tons a year, in the shape of urea only. The urea plant will probably be one of the largest in the world. The planning of the scheme is in progress. The need for providing other fuels has not been lost sight of. The briquetting and carbonising of some of the lignite produced will yield 380,000 tons of carbonised briquettes, 43,000 tons of char dust, 6,400 tons of motor spirit, 51,300 tons of tar and 1,032 tons of phenol. The briquetting and carbonising plant will have to be designed to give the most efficient and economic results in the climatic and other conditions obtaining in Neyveli. It is therefore proposed to conduct pilot experiments in Neyveli itself, with the help of pilot briquetting and carbonising equipment promised under T.C.M. aid.

Pilot Plant

There has been some delay in obtaining the equipment, but the T.C.M. authorities have recently promised to deliver the equipment at site in November 1957. After erection, the pilot plant will be ready by about April 1958 for experiments. On the basis of the experiments, specifications for the equipment for the briquetting and carbonising scheme will be drawn up. A scheme for washing the excellent china clay available close to the lignite, and which will be removed during the mining operations, is also being worked out. The constituent units of the project will thus utilise the entire quantity of raw lignite won annually and convert it into various important products. The carbonised briquettes will be a smokeless fuel.

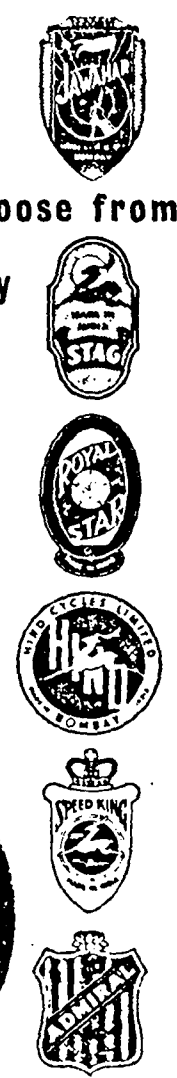
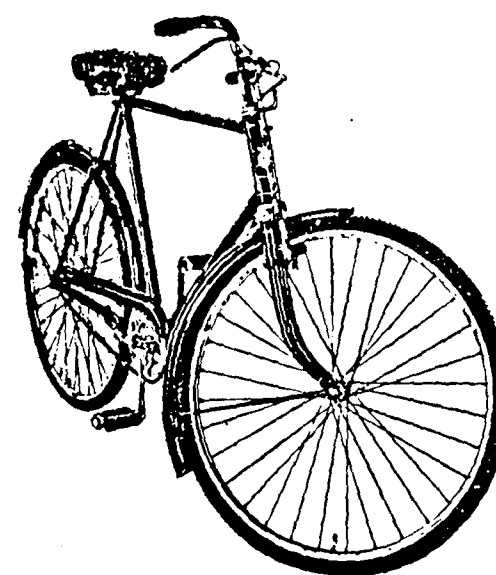
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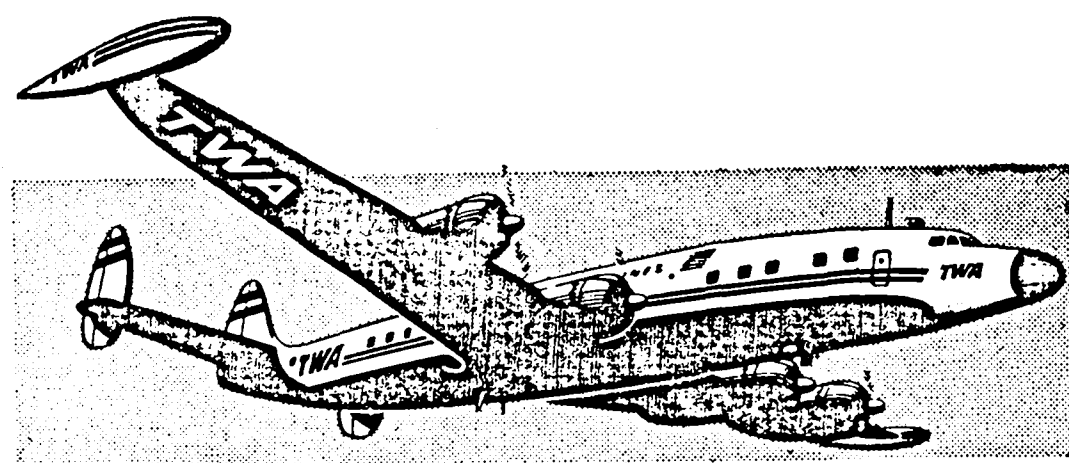
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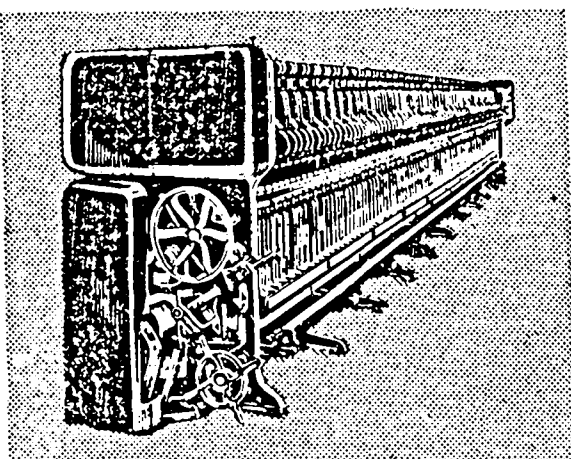
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ideal for domestic consumption in the place of charcoal, and also for industrial purposes. Its use will help arrest the denudation of forests and divert cowdung from the oven to the farm. As production gets well established and is expanded, some of the lignite mined may be briquetted raw and made available for use as industrial fuel instead of coal.

The project is an integrated one, each constituent scheme supplying some essential requirement to another. All the schemes are closely knit and must be taken up and executed according to schedule if the whole idea is to be an economic success. The cost of the entire project will be about Rs. 68 crores and it will take about five years from now to complete. The provision made for it in the second five year plan period is Rs. 52 crores. Including expenditure incurred by the Government of Madras previously, a total expenditure of Rs. 61 crores has been incurred to the end of March 1957 on the investigations, advances for the supply of the specialised mining machinery ordered and on payment for the conventional machinery delivered and preliminary work. The lignite is expected to cost about Rs. 8 or Rs. 9 a ton. In other words, the cost of raw lignite, equivalent to one ton of coal in thermal value, will be only about Rs. 20 to Rs. 22, compared with a cost of Rs. 45 to Rs. 50 a ton of coal delivered in Madras by the all-rail route and of about Rs. 70 to Rs. 80 by the rail-cum-sea route.

Acquisition of Land

The acquisition of about 27,000 acres of land in 22 villages of the Vriddhachalam and Cuddalore taluks, at a cost of nearly Rs. 2 crores, for mining, for the construction and operation of the various production units comprised in the integrated project and for the construction of a township to house about 10,000 people will involve the displacement of a number of people whose homes have been on those lands for generations. It is fully realised what a wrench it will be for the owners of the lands and houses which will be acquired, to be turned out of their lands and homes. The project has therefore undertaken the rehabilitation of the displaced persons in about 11,650 acres of reserve forest areas, given by the Government of Madras, free of cost. The scrub-jungles in those areas are being cleared and the areas will be made suitable for cultivation and human habitation. Under the specific scheme drawn up for rehabilitation, persons dispossessed of their lands will, in addition to the compensation admissible, get free of cost, an area equivalent in extent to the lands taken over from them, subject to a maximum of two acres. House sites and sites for schools, community centres and other amenities will be provided free of cost. Free transport will be provided for the people affected for the movement of themselves and their personal effects to the new colonies.

At the end of last year, in order to enable the project to operate as any other commercial venture, on the right business lines, avoiding the red tape necessarily attendant on departmental management, the Government created a private limited company under the title of "The Neyveli Lignite Corporation (Private) Limited" and transferred the assets and liabilities of the old lignite investigations and the management and control of the project to the company. The Corporation is a 100 percent Government concern, but functions on modern business lines, subject of course to certain limitations, essential to ensure control by Parliament.

Earth-moving Operations

Practically all the items of conventional earth-moving equipment have arrived at the site and it is now possible to start earth-moving operations. The specialised mining machinery will start arriving from the middle of 1958 and the first small continuous bucket-wheel excavator, after erection at site, is expected to go into operation in October 1958. One more small and two large bucket-wheel excavators will follow, and as they become available for operation, the conventional items of earth-moving equipment, which cannot operate efficiently at great depths and which by that time will have come to the end of their useful lives, will be gradually withdrawn.

In the meantime, the conveyor belt system for the transport of the lignite to the production units will have arrived and will be utilised to transport the overburden excavated from the first mine cut. Tenders for some additional items of mining equipment with short-dated delivery will be invited shortly. On the basis of the results of the large-scale pumping tests completed last year, a definite scheme for ground-water control has been drawn up, as an integral part of the mining scheme. Forty-eight thousand gallons of water from the artesian aquifers will have to be pumped out a minute, from 48 wells, to maintain the pressure surface of the aquifers at a safe level below the lignite in the mine, the dimensions of which at any

time will be about 6,000 feet long and 1,200 feet wide. Large quantities of water will be needed for the boiler feed and for cooling purposes in the large thermal power station and for use in the other production units, including the clay washing plant.

Water Supply

The needs of the township with about 10,000 houses and a number of offices, markets, a hospital, etcetera, will also have to be supplied. All these requirements will be met from the water pumped out, and any surplus will be made available for irrigation. As a matter of fact, the project, and particularly the large thermal power station, could not have been thought of without abundant supplies of water. The water which is a problem for mining is an essential requirement for the other schemes. Experiments are to be made with different types of drilling equipment, well-screens and methods of construction of pump wells, and based on the results, orders will be placed for the equipment needed to control the pressure surface of the artesian water. Such control will be necessary only after the excavations have reached a critical depth, which will be some time in 1958.

Arrangements have been made with the supplies of the bucket-wheel excavators, and through the good offices of the West German Government, for sending key personnel to Germany, early in August next, for training in the design, operation and maintenance of the more important and complicated items of specialised machinery. Other personnel will be trained in Neyveli itself by the personnel will be trained in Neyveli itself by the supplying firms. The lignite seam in the first cut is likely to be exposed in 1960 and by the end of that year, the quantity required for the first unit of the thermal station will become steadily available. The full production stage of the mine will be reached in 1961. Powell Duffryn Technical Services Limited have been appointed as consultants for the mining scheme. Appropriate synchronisation and co-ordination of the planning and execution of the other constituent schemes will be dealt with by the Neyveli Lignite Corporation itself.

The integrated lignite project is not a panacea for all the ills of the under-developed Madras State, nor will the industrial development of the State be completed by the execution of the project. All that the project will do is to help to remedy to some extent the shortage of electric power, fuel and fertilisers, and hold out a promise of further

industrial progress in the State as a whole and, in fact, the neighbouring States as well, provided that the energy supplied by the project and the elements of major industry established there are matched by human energy and industry, both in Neyveli and elsewhere. A good part of the power which will be generated in Neyveli will be utilised for the component schemes of the integrated project and only about 80,000 kW of power continuous, or 13,000 kW at a 60 percent load factor, is likely to be made available to the Madras State Electricity Grid. Even with this additional amount of power, the demand for power expected in 1964-65 cannot be met, unless additional generating capacity is installed in new hydroelectric units, and also later in Neyveli, in thermal units, which should be quite feasible.

New Industrial Units

With the additional quantities of power and fuels that would be made available from Neyveli, a number of new industrial units could be set up all over the State, to utilise the mineral and other resources available in the State. Some of the units might be established in convenient locations to utilise, incidentally, the products and by-products of the integrated lignite project. Tests and experiments in Germany on bulk samples of Neyveli lignite suggest that the production of a suitable coke, for use in low-shaft furnaces, might be feasible. By mining larger quantities of lignite, a part of the extra production might possibly be converted into lignite coke, by a special process of high temperature carbonisation.

Further investigations must, of course, be carried out in the matter and if they are successful, an iron and steel industry would become a reality in the Salem district, for the utilisation of the excellent iron ores in the district in low-shaft furnaces. Another part of the extra production of lignite could be utilised for expanding low temperature carbonisation, to produce additional quantities of tar. With the production of a total of 100,000 tons of tar, an economic unit could be set up in Neyveli itself, for the hydrogenation of tar to yield synthetic liquid fuels. The requisite gas for the hydrogenation process could be found by increasing the capacity of the gasifiers in the fertiliser plant. The tar could also be used to produce various insecticides and other chemicals and pharmaceuticals. The char resulting from carbonisation could be utilised for the production of activated carbon, carbon electrodes, carbon bricks, heat exchangers, etcetera.

These products, in conjunction with the increased quantities of power in the State, would assist materially in the development of the electrochemical industry. Experiments in Karaikudi indicate that carbide could be produced from the char. The phenol available as a by-product could be used for the manufacture of plastics, hard-boards and also in the plywood industry. The employment of the Fischer-Tropsch process for the production of synthetic fuels is also a possibility. The excellent china and ball clay which it is proposed to wash in a clay washing plant will be available for the production not only of crockery and other domestic ware, sanitary ware, pipes and refractories and Fuller's earth, but also high tension and low tension insulators and parts of electrical equipment. The montan-wax that could be extracted as a by-product could be used in explosives and for insulation in electrical equipment and, in conjunction with the production of ceramics, the manufacture of various electrical fittings, involving the use of ceramic ware, could be set up. Cement factories could be set up to utilise by-products in Neyveli and other raw materials from the adjoining district of Tiruchirappalli. The fertilisers produced in Neyveli, by yielding better crops and new varieties of crops, would facilitate the establishment of a number of agro-industries. The raw and carbonised lignite briquettes, coke and other fuels, char, clay, fertilisers and other products could be utilised in neighbouring States as well, at places within easy and economic distances from Neyveli—e.g., the Bhadravati Iron and Steel Works and other industrial units in Mysore State and units in Andhra and Kerala.

An Important Project

In short, the integrated Neyveli lignite project is not one which will serve Madras State alone, but is a project of national importance. It holds out the promise of considerable assistance in the conservation of coal, and particularly metallurgical coal, for more important uses elsewhere, in the electrification of railways, which besides effecting a saving in the use of coal would also reduce unnecessary and uneconomic transport movements involved in the carriage of coal, and in the advanced industrial and agricultural development of the State and neighbouring areas. It would facilitate agricultural development, help save trees and forest produce from unnecessary destruction, and provide electric power and fuel for a host of industries. Its products could also be utilised to start a number of new industries in several parts of the State and elsewhere.

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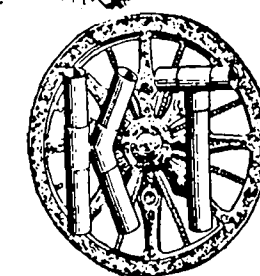
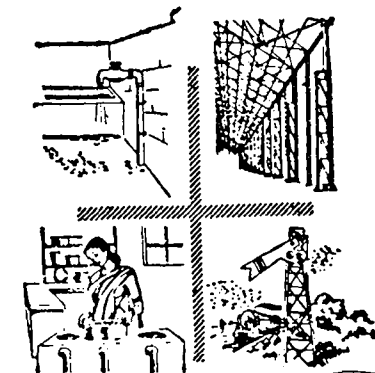
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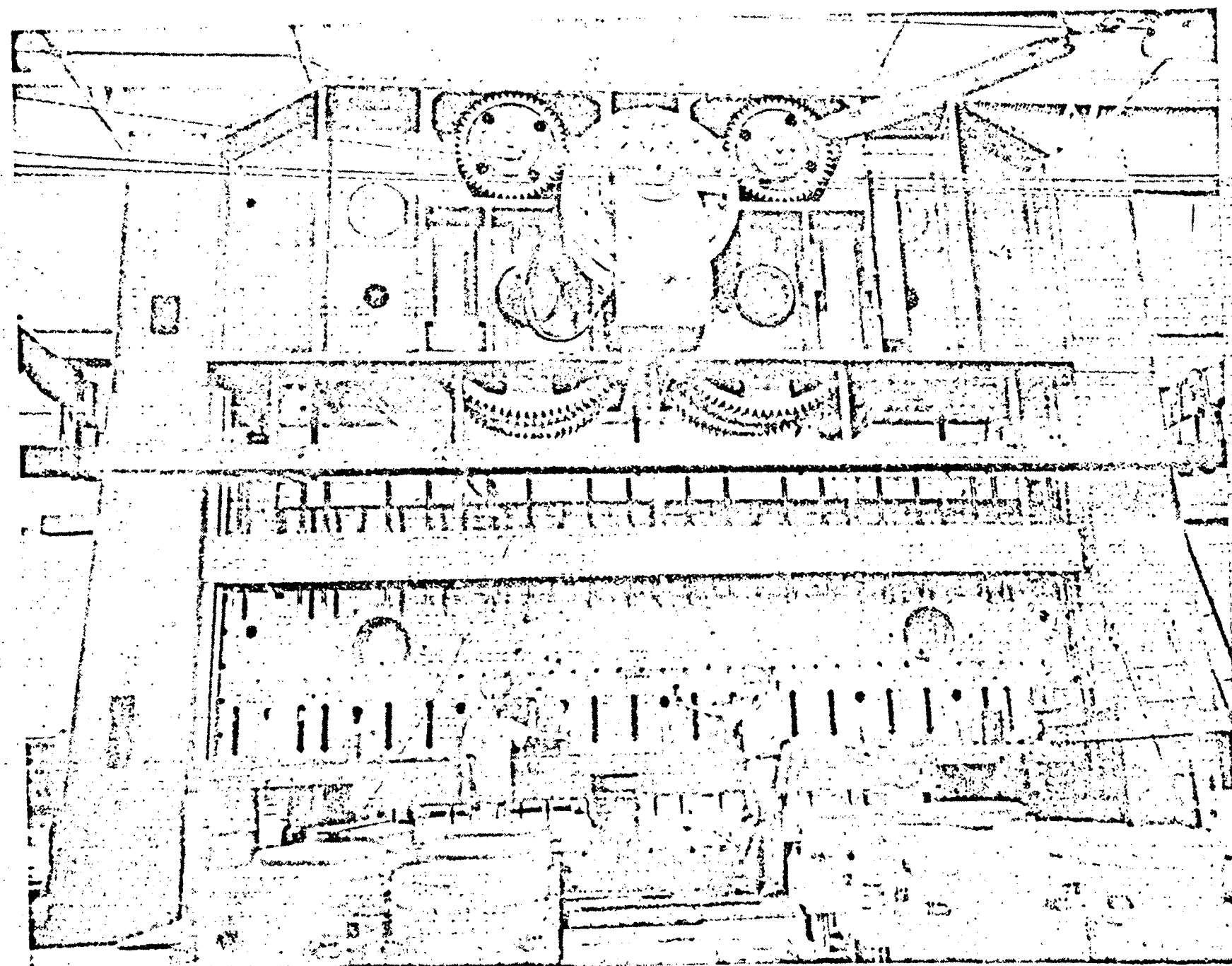


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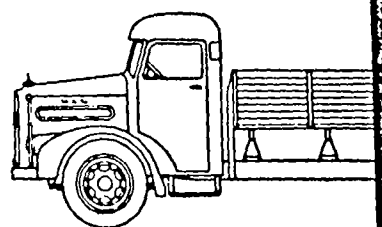
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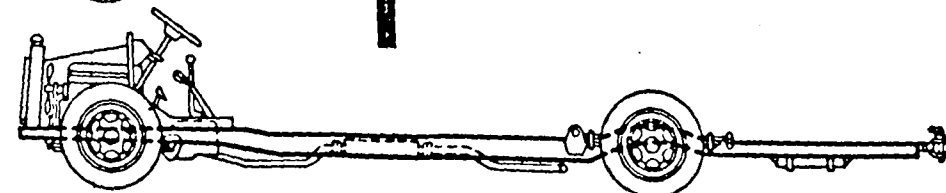


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BIG SCOPE FOR EXPANSION IN PAPER MANUFACTURE

ANXIETY ABOUT RAW MATERIAL SUPPLIES

• By A CORRESPONDENT •

ON any assessment of its prospects, the paper industry seems to offer great promise for the future. It has already expanded considerably and more expansion projects are now in hand. In the programmes of industrial development relating to the second five year plan, the planners describe the prospects for this industry as follows: "The growth of demand for paper is closely related to the programme of development envisaged in the field of education and the rise in the standard of living and literacy and the rise in the standard of living and literacy is expected as a result of the implementation of the second plan. The growth of industrial production also has a considerable influence on the requirements of both paper and paper-board." During the first five year plan, consumption of paper and paper-board increased, on an average, by about 8 percent a year. A more rapid rate of increase is expected during the second plan in industrial production, literacy and the general standard of living. So the demand for paper and paper-board, it is estimated, will show a progressive annual increase of 10 percent. On this basis, the demand by 1960-61 has been estimated at about 350,000 tons. The existing production capacity in the industry is a little above 200,000 tons, while actual consumption exceeds this figure by nearly 40,000 tons. The Government has so far licensed the establishment of 22 more units; 21 units already exist.

New Mills

The Government hopes that the setting up of new mills and the expansion of the existing units will raise production capacity to 540,000 tons by the end of the second plan. More new schemes are being considered, and, if approved, they will add 14,000 tons to output capacity. The programme of expansion is bold and involves an investment of Rs. 54 crores. It has the full backing of the industry, and many units have already gone ahead with their expansion plans. During the first plan, the industry expanded considerably. The number of units manufacturing paper and paper-board rose from 17 to 19 between 1950-51 and 1955-56, their annual rated capacity increasing from 136,600 tons to 211,000 tons. Actual production rose from 114,000 tons to 200,000 tons. Thus, against a rise in total demand of 40 percent over the five year period, production increased by a larger proportion. The output of strawboard and other boards also went up. While the rated capacity rose only to 58,500 tons from 49,500 tons, actual production increased markedly to 52,600 tons from 22,000 tons. This shows that demand has expanded considerably over the period. There was also an increase in the number of mills from 18 to 20.

Almost all the mills manufacturing paper and paper-board, strawboard and other boards, participated in this expansion and modernisation programme. The modernisation programme of the Titagur Paper Mills has raised its capacity to 42,000 tons from 38,000 tons. Rohtas Industries have raised theirs to 29,000 tons from 11,000 tons. Of the smaller units, Sirpur has expanded its capacity to 15,000 tons from 8,000 tons, Shree Gopal to 14,000 tons from 11,000 tons. Some of them have further expansion plans during the current plan period.

TOTAL SUPPLY OF PAPER

Year	Production	Imports	Consumption (Production plus imports)	As estimated in the Plan
1951-52	135.0	33.0	168.0	175.0
1952-53	137.0	39.0	176.0	
1953-54	137.0	42.0	179.0	
1954-55	169.0	38.0	207.0	
1955-56 (Nine months, April to December)	140.0	37.0	177.0	
1955-56 (Estimated)	200.0	38.0	238.0	200.0

In the development of the paper industry, it has been the aim, during the first plan as well as the second, that the country should be self-sufficient in all varieties of paper, except perhaps a few special types. The paper industry has so far fulfilled the planners' expectations. The production of printing and writing paper, which are the varieties in most demand, went up to 125,000 tons from 72,150 tons at the beginning of the first plan period. The output of paper-board rose to 34,000 tons from 20,821 tons. That of special varieties almost doubled to 6,000 tons and wrapping papers showed a 100 percent increase. During this period, the industry for the first time produced certain special varieties of paper and paper-board. These were cigarette tissues, coated boards, art and cromo paper, sensitised cheque paper and cellulose film. The production of transparent paper by Travancore Rayons increased appreciably. Paper-makers adjusted their programme to meet the demands of industrial consumers, such as the match, cigarette, packing and coated abrasive industries. In manufacturing these varieties, it is stated that they have made satisfactory progress. Except for certain special qualities, particularly kraft, which are yet to be indigenously produced, other varieties of paper are being made in sufficient quantities. An export market has developed in cigarette paper.

Printing and Wrapping Paper

But where the industry has lagged behind is in the production of cheap printing and cheap wrapping papers. These are in considerable demand. The former is used for publishing children's books, school and college texts, religious literature, almanacs, etcetera, and the latter, as the name implies, for wrapping purposes. The ordinary printing paper as well as the wrapping paper produced in the country are both considered costly and the excise duty on the former makes it more so. Until the import of newsprint was restricted a few years ago, newsprint was often used as a substitute for ordinary printing paper. Now consumers have been forced to use locally-produced cheap printing paper, and their oft-taken might perhaps have been less than their needs. So it should pay the industry to make a special effort for producing ordinary printing paper at a cheaper price. Similar is the case with wrapping paper. The local product is considerably higher in price than the old newspapers imported for wrapping purposes. The consumer, therefore, turns to the latter to meet his demand. This may be another field for the industry to capture a lucrative market by producing the goods at a low cost.

While it is desirable to cut costs and improve quality, there are many things the Government will have to do to enable the industry to fulfil these tasks. The problem that deserves the first priority is that of sufficient raw material supply. Now that the industry is developing rapidly, this problem

is causing some anxiety. The availability of basic raw materials may not have played much part in the growth of this industry in the earlier decades of the century. The modern paper industry grew first in Bengal and this is still the largest single centre of production, although the raw materials such as sabai grass or bamboo have to be mostly brought from outside. But Bengal provides some compensating factors which offset this disadvantage—for instance, electricity; and in the earlier days coal; and the huge market for the finished product. With the increasing use of bamboo as the basic raw material, which provides pulp for finer and superior varieties of paper, and the production of hydroelectricity in the various parts of the country, the industry has spread to practically all parts now. The table shows the distribution of the industry in different parts at present.

DISTRIBUTION OF THE PAPER INDUSTRY AS ON 1ST APRIL, 1956

States	Number of Units	Annual rated capacity (on the basis of 300 working days) (Tons)
West Bengal	4	66,100
Bihar	1	29,000
Orissa	1	36,000
Uttar Pradesh	2	9,500
Punjab and PEPSU	1	15,000
Bombay	4	11,900
Madras	1	600
Madhya Pradesh	1	8,000
Andhra	1	2,000
Hyderabad	1	15,000
Mysore	2	11,000
Travancore-Cochin	1	6,000

Recently, the Government of India appointed an ad hoc committee under the chairmanship of the Inspector-General of Forests, Government of India, to examine the sources of cellulosic materials such as bamboo, fir, spruce, bagasse, sabai and other grasses. It is, however, felt by the industry that there is no dearth of bamboo and grass forests from which it could find its raw materials. But the absence of a centrally-controlled and co-ordinated forest policy, it feels, is at the root of its raw material difficulties. Some time ago, the Planning Commission had suggested the following measures to ensure an adequate supply of raw materials:

1. Reservation of specific forest areas for the paper industry and grant of long-term leases for working such areas.
2. A rational method of price fixing on an all-India basis to enable the industry to obtain a regular supply of bamboo and grass at reasonable prices. To safeguard the interests of State Governments, arrangements might be made for the supply of such raw materials to the industry on the basis of a basic price, and a premium closely related to the selling price of the manufactured product or the profit margin.
3. Development of roads in forest areas for facilitating transport.
4. Careful regulation, or even total banning, of the export of cloth cuttings, hosiery cuttings, hessian and jute cuttings and waste paper.

State Governments

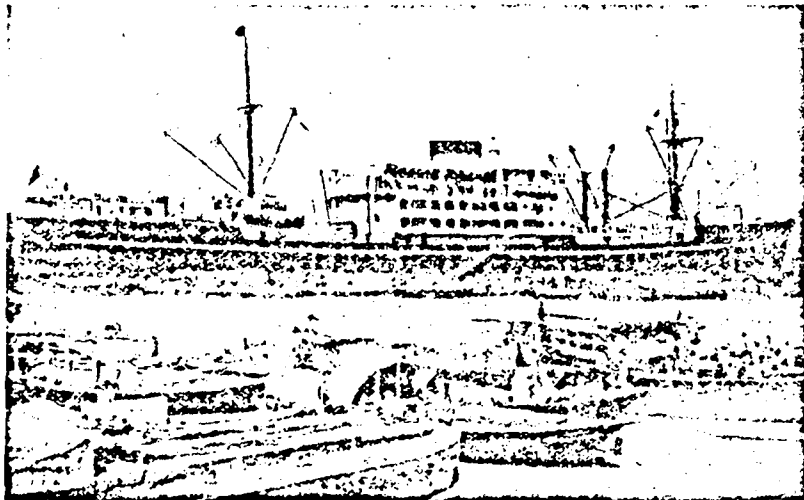
Almost invariably, the State Governments concerned have come in the way of implementing these recommendations. They refuse to give long-term leases of bamboo or sabai grass forests to the mills because they feel they would be losing the revenue which they derive through annual auctions. This is a short-sighted attitude, because of which the industry had felt a little unsure about

PLAN TARGETS FOR PAPER INDUSTRY

	1955-56	1960-61	
	Annual rated capacity (Thousand tons)	Production (Thousand tons (Estimated)	Annual rated capacity (Thousand tons)
	210.0	200.0	450.0
Paper and paper-board	30.0	4.20	60.0
Newsprint			
Strawboard and other boards (excluding fibre-board)	59.3	32.0	59.3
			35.0 to 40.0

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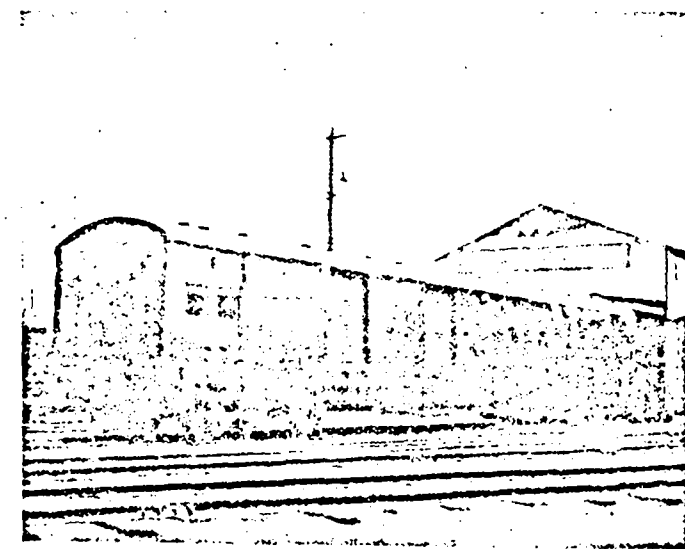
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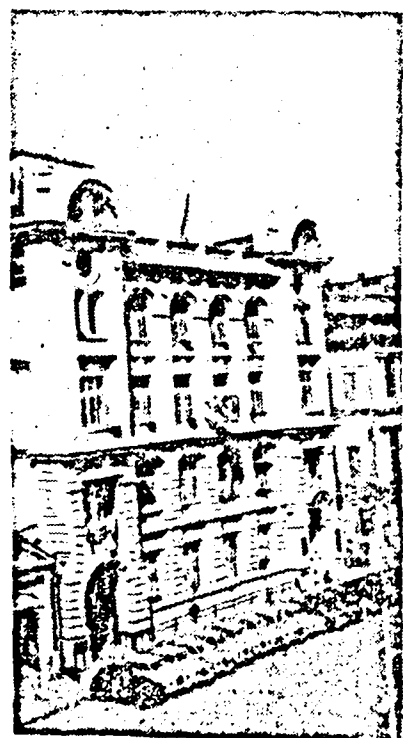
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its production plans. It is time the Central Government took a hand in the matter and took out of the States' control all vitally important industrial raw material resources. Mr. Manubhai M. Shah, Union Minister for Industries, seems to think that a shortage of raw material is likely to develop in the future, if intensive efforts to develop the cultivation of bamboo, eucalyptus, wattle and other woods are not made in the meanwhile. He estimates the current consumption of bamboo by the industry at 30,000 tons annually. This rate is likely to be doubled by the end of the current plan. The present resources of bamboo, he estimates, are of the order of 1.8 million tons on the basis of a felling cycle of four years. This, he says, has to be doubled as early as possible. One source of raw material which could be utilised for the industry is bagasse from the sugar industry. On a dry basis, at least 3.75 million tons of bagasse could be produced from the existing 143 sugar mills and the 57 new ones recently licensed. This bagasse is at present being burned away. Low-grade coal could easily replace bagasse as fuel. The Government has invited some foreign experts to look into this matter, and suggest ways of utilising bagasse as a cellulosic raw material.

Chemical pulp will soon be manufactured in Assam. It is proposed to undertake its production at the rate of 100 tons a day, i.e., 36,000 tons a year to be used for paper-making. Two proposals for rayon grade pulp plants with a total capacity of 50,000 tons a year are being considered. With these projects materialising, it is hoped that requirements of rayon-grade pulp for the next five years will be satisfactorily secured.

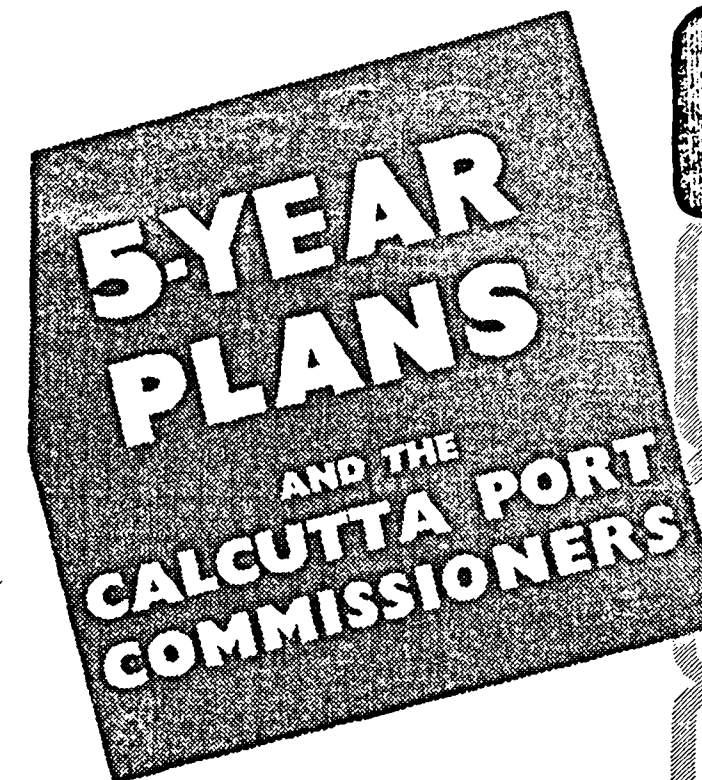
Transport Shortage

Shortage of transport poses another difficulty. Apart from adding to costs, it hampers production. As a way out, the Government has suggested that more pulp plants should be established near raw material sources. The plants could convert all cellulosic raw materials into pulp. This would reduce transport expenses and avoid difficulties the industry now has to face. The suggestion is worth serious consideration. Already some paper mills have installed the finest pulp and paper-making plants to process bamboos. The number could be increased in the light of the suggestions which have been made. Finally, the Government's fiscal policy should be more helpful. It is said that the high price of ordinary printing paper, the demand for which could be much more than the existing production capacity can provide, has actually discouraged its consumption, and at present supply exceeds demand. If the Government extends its excise levies to other varieties of paper or enhances the levy on ordinary printing paper, then hopes of further expansion of paper-making capacity will suffer—and with them the main means of spreading mass education.

Newsprint Manufacture

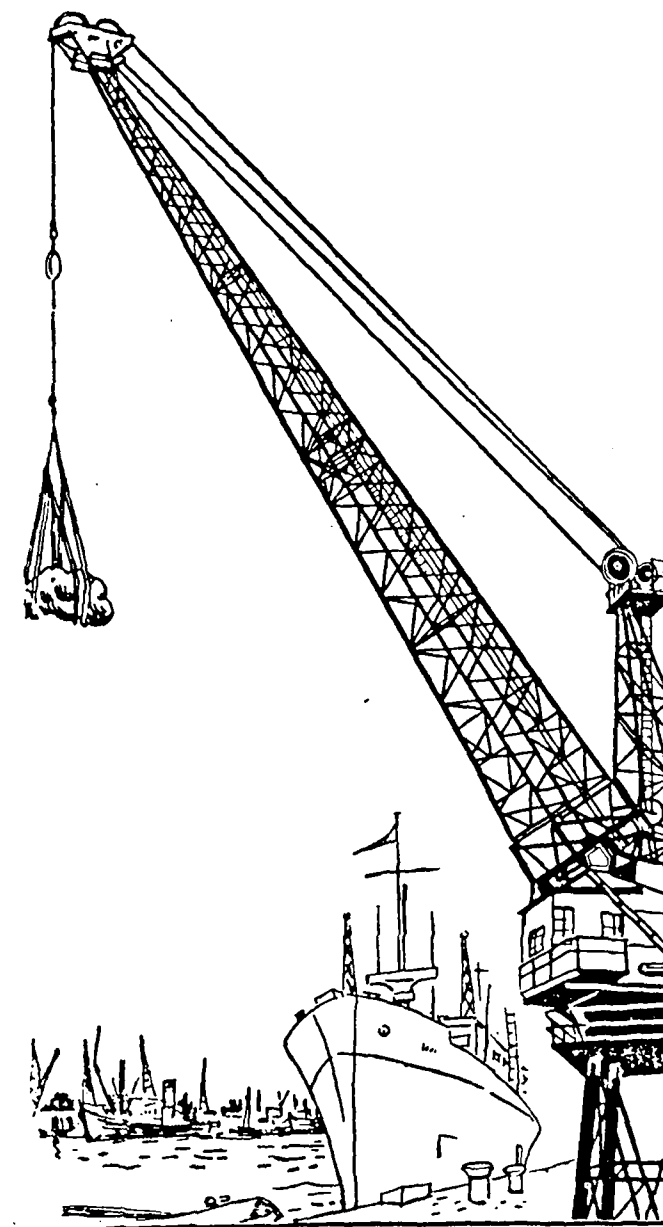
The least developed sector of the paper industry is the manufacture of newsprint. Consumption needs were estimated by the Planning Commission at 100,000 tons in 1955-56. Now it estimates that the demand will rise to 120,000 tons by 1961. Imports of newsprint were 75,000 tons in 1955-56, 79,000 tons in 1954-55 and 70,000 tons in 1953-54. In 1952-53, they were 54,000 tons; and in 1951-52, the country imported 50,000 tons. This shows a rising trend, and although imports might not be higher in the next few years, it will be not on account of less demand from newspapers, but because of the foreign exchange difficulties. With literacy spreading in the country, the demand for newspapers, particularly Indian language newspapers, might actually increase. So the Planning Commission's estimates of 120,000 tons as the consumption requirement in 1961 does not seem to be an over-estimate. A large proportion of the demand probably remains unsatisfied, and should be met by increasing indigenous production.

India did not produce any newsprint of her own until 1956, and the quantity produced in that year was only 4,200 tons from the Nepa paper mills. The Nepa mills will have to be enabled to utilise their entire capacity. The difficulty perhaps will lie in importing the raw materials which are needed. At present, imported chemical pulp is used, but as the section for manufacturing this pulp has been completed, it should be in a position to use both indigenously-produced mechanical and chemical pulp, one from bamboo and the other from subar grass. The Government is taking steps to put up another newsprint plant in Andhra Pradesh with a capacity equal to that of the Nepa Mills. It is expected that the new factory will go into production by the end of the current plan. Clearly, there is a need for more newsprint factories. Their establishment, it is said, is being considered by the Government.



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Ever increasing volume of sea-borne trade and development work under the Five-Year Plans are the keynotes of the present position of the Port of Calcutta. In tackling the present and the future problems the Port authorities are fully alive to the responsibilities involved in the welfare of its numerous workers. It is also obvious that the active participation of the Port workers towards the success of the Plans and to cope with increased volume of work, is vitally needed to nurse the roots of our expanding national economy.

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THE USE OF PAINTS IN HEAVY INDUSTRIES

DEMAND EXPANDS AND DIVERSIFIES

• By G. H. GATES-REED •

IT could open as a fairy story: for Once Upon a Time, and not so very long ago at that, India was basically a nation without either a heavy or a light industry of any consequence or yet the need for them. Her wealth lay in the relatively simple processing of nature's abundance: tea, cotton, jute, rubber, hides, gums, etcetera, for which equipment was more easily and economically imported than made here. Then, presto, suddenly—in history a decade stands surely for suddenness—through the abracadabra of an almost bloodless Industrial Revolution, and the assertion, the begrudging recognition, of previously barely acknowledged evolutionary influences, India discovers herself facing the world as an industrial power of the future with an almost unassessable potential of wealth, natural and productive, which may require only the swiftness of another decade to make manifest. In addition, the old wealth remains and is being better exploited, plantation products (tea, coffee, rubber), jute and cotton products, hides, vegetable oils and lacs, etcetera, continue to hold their lead as foreign currency earners and so play their essential part in the internal economy. But now, a new, at present internal wealth essential to economic independence and from which one feels new export markets will eventually develop, grows with encouraging speed and virility, through the establishment of new heavy and light industrial units as well as in the expansion of those already functioning.

Growth in Industrial Potential

The story of this growth in industrial potential has been told through the pages of this special issue with particular reference to heavy industry. The inference that one cannot economically encourage heavy industry without the parallel growth of light industries is correct. It is equally true, and the point of this rather long preamble is that if industrial independence is the objective, as it is, then the paint industry, quoted as being in the £10 million turnover group, must also grow in unison with the country's industrial expansion. This point is dramatically brought out by the production statistics of a few of India's newer industries given in columns 2 and 3.

Every one of these products requires finishes for protective and decorative purposes based on a wide range of formulations produced by the paint industry and not previously made in India. The point might also be made here that important quantities of paint products are required for the new buildings housing these industries and for the maintenance of the equipment in them.

Immediate Link

It is a simple arithmetical computation to establish just how much paint is required by any one or all of the above industries—a demand for paint products in total that is quite astonishingly large and, the essence of this point, of course, a demand not made on the Indian paint industry prior to the Industrial Revolution. And these are obvious: only a few of India's new light and heavy industries registering annually increasing demands for paint products. Others are the fan, radio, machine tool, power pump, cable and wire industries, all users of a wide and varied range of paints. The users of a wide and varied range of paints. The obvious, but it is there: for instance, finished steel must be protected by paints in its unexploited state and again after it has been used for constructional and manufacturing purposes. The increase in the production of finished steel between 1948 and 1956, from 853,815 tons to 1,315,800 tons, conveys, therefore, a very considerable increase in paint requirements, as does that of semi-finished steel, 1950, 1,142,400 tons, 1956, 1,404,800 tons.

Few industries have a greater service to perform over as wide a field of industrial activity and development as has the paint industry, particularly since the Centre's decision to disallow paint imports in the future; in fact, very little is being imported today. It is as well, therefore, that there is possibly no better organised, flourishing or up-to-date light industry in India than the paint industry. It is fortunate that it has a sound historical background, having been established as far back as 1890. Equally fortunate is the fact that the leading firms of the industry have had, and still have, connections with overseas organisations, so that today and throughout the years of industrial change in the West, the Indian paint industry

is and has been in touch with the latest technical advances.

Until recent years, because industry's demands have been very limited and met by imports, it has not been necessary to produce indigenous paints to industrial formulations; concentration in the past was on the rather simpler construction and marine paints based, to a very large extent, on Indian raw materials. These links with overseas organisations have, however, encouraged the technical arm of the Indian paint industry to anticipate changed demands, by keeping up to date with technical "know-how" and planning well ahead, so as to be able to introduce these new formulations when the need arose, as has in fact been done. For example, only in recent years have cellulose based paints been manufactured in India. Today annual production is in the region of 500,000 gallons, against an installed capacity of 800,000 gallons.

Automobile Manufacture

The setting up of an indigenous automobile industry was the motivating influence behind this step. The important point is, however, that the paint industry was ahead of the automobile industry and is in fact today suffering somewhat from an excess of enthusiasm by having, several years

after installation, a capacity to manufacture cellulose paints considerably in excess of present requirements. Other specialised finishes made in India for the first time in recent years include a multitude of stoving enamels, protective and decorative, for the products of the many new light industries (lighting fittings, cycles, hospital equipment); crinkle, wrinkle, polychromatic and similar finishes (office equipment, typewriters, instruments); for the electrical industry a very highly specialised range of insulating varnishes and compounds, chlorubber and epikote based finishes for the chemical industry. And on both the domestic and industrial fronts, India is in step with the rest of the world through the introduction of emulsion paints. These are only a few of the problems taken on and solved by the paint industry in the service of general industrial expansion.

True, at the same time, great changes have taken place in the paint industries of the West immediately prior to and following the last world war, mainly as a result of the development of the use of synthetic resins and plasticisers. Again, however, we can revert to the point that our own paint industry has been keeping pace with these developments and has been relating them to the requirements of and the special conditions pertain-

PRODUCTION STATISTICS FOR SELECTED INDUSTRIES					
Automobiles	1942-43	Nil	Units	1955-56	31,000
Cycles	1942-43	50,000	Units	1955-56	615,100
Diesel Engines	1950	4,596	Units	1955-56	11,931
Electric Motors	1946	45,880	H.P.	1956	347,000
Fans	1943	180,000	Units	1956	338,900
Power Transformers	1946	38,982	kVA	1956	901,000
Sewing Machines	1946	6,120	Units	1955	101,412

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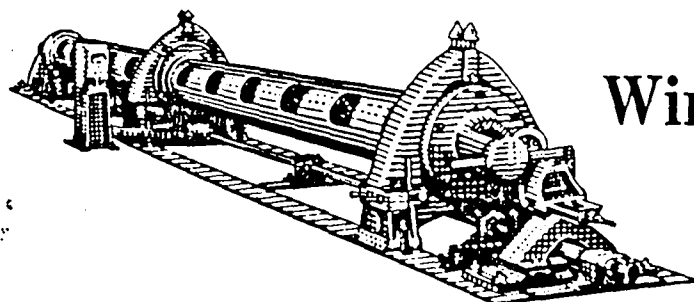
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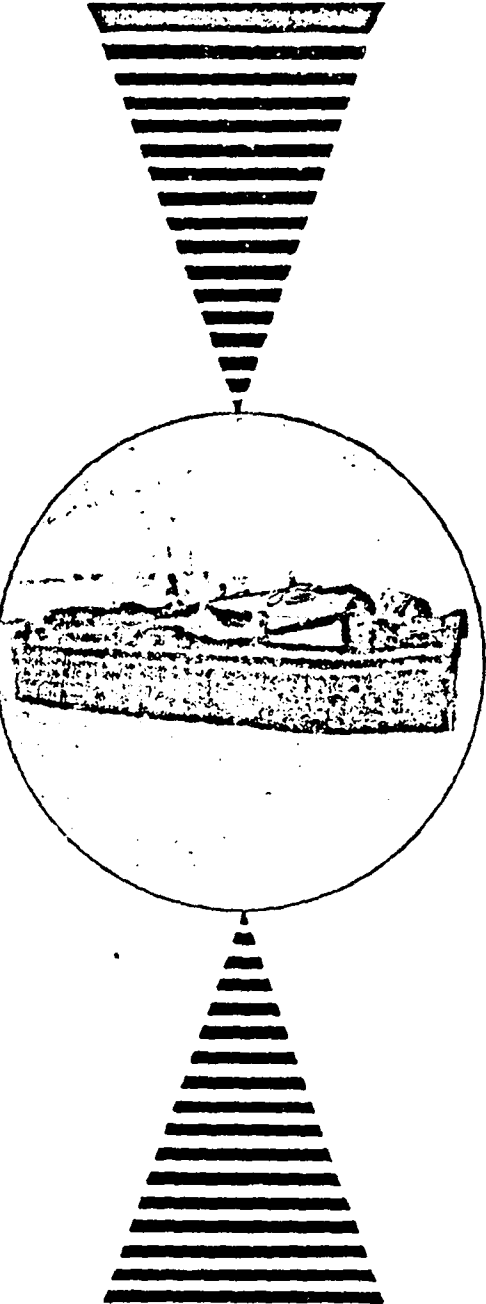
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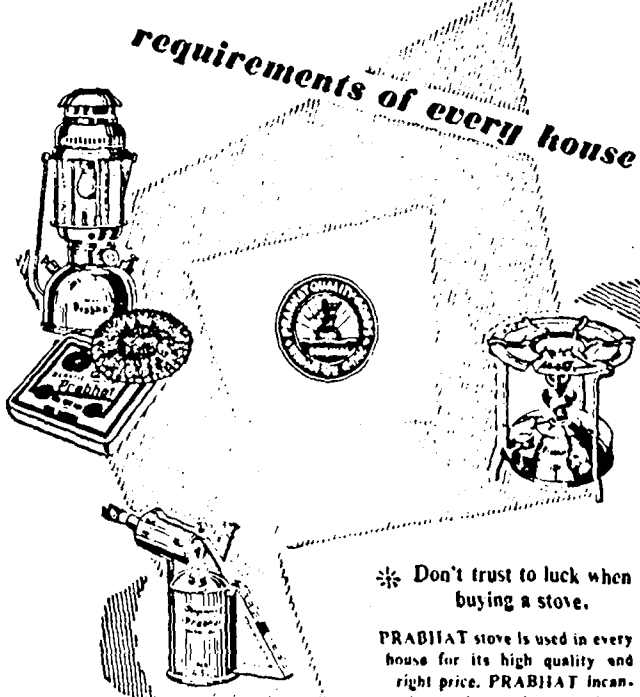
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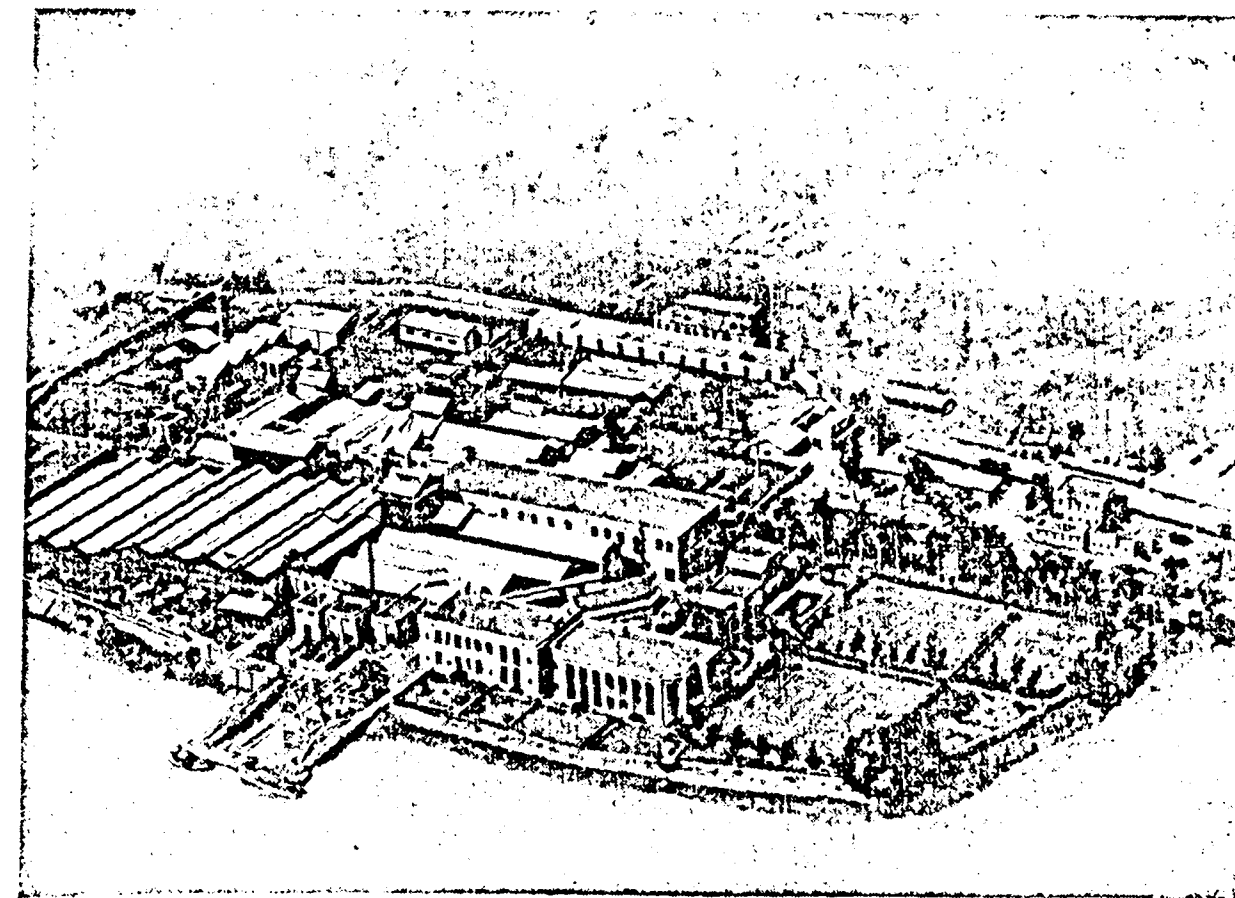
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ing to their usage in India. To digress slightly, here, in order to emphasise the importance of the changes going on throughout the world paint industry it is significant that the figure of 350,000 metric tons of synthetic resins used by the surface coating industry of the United States in the manufacture of paints during 1955 represents almost 14 percent of the total weight of paints produced in that country and 30 percent of the industry's total raw material costs.

In 1913, when synthetics were in their infancy, only 4,500 metric tons of such resins were used in the United States. In the U.K., synthetic resins and plastic materials (excluding cellulosic plastics) accounted for 20 percent of the 1956 output. This change in approach to materials used in paint manufacture is reflected in the fact that in the United States the 1955 annual average of 2.4 lbs of vegetable oils used to a gallon of paint has fallen over the last 25 years to 1.3 lbs a gallon. Where India is concerned, the significant point is that she is a leading producer and exporter of the vegetable oils used by the paint industry, several of which are also edible oils (linseed, mustard). However, the change to synthetics in India has been gradual, and in any case, it has been accompanied by an increase in the demand for paints of all types, including the good, old-fashioned vegetable-oil-based paints. As far as the paint industry goes, the change has set in and it is keeping time with general paint-making trends.

This changeover is an integral part of the general transition to an industrial economy. The modern paint manufacturer has to supply industry with products offering all the qualities of the old custom-built (natural material based) formulations, durability, texture, gloss, etcetera, plus that essential quality which has inspired the need to search for new formulations and raw materials as industrial mass production methods have developed—super-rapid drying as a key requirement. For too long industry had suffered bottlenecks in the paint shops of its flow-production lines. An automobile custom-finished with original coach-makers' paints would take days to complete because of the application methods and slow drying times of the many coats applied—an impossible situation in a modern automobile factory, as is



An aerial view of one of India's leading paint factories

obvious. Cellulose and synthetic based paints, assisted by mechanical application methods, elaborate spraying equipment, drying ovens, etcetera, have reduced the job to a matter of hours and the time saved reflects an equally important saving in labour charges. A similar story could be told of the growth of all mass production units.

India's younger industries have much to learn about product finishing, the most important lesson being that it is not a job that can be forgotten in

the planning stages nor cheaply undertaken, muddled through with in the manufacturing process. It is an essential part of production and an essential production cost. As a result, apart from formulations and manufacturing the necessary paint finishes, the industry has had to expand considerably its technical sales services often to the extent of advising about paint application equipment and assisting in its local pre-fabrication. At this stage of slowly developing demand, these



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services are extremely costly in relation to immediate sales but an essential service to industry.

The inter-relationship between the Government's five year plans and the establishment of heavy industry by both the Government and the private sector, is an acknowledged and obvious one. Every new building erected requires paint protection for the steel, wood and other materials used in its construction whether it be a power station at a new dam site or a completely new city, such as Chandigarh. Many of these coatings will be to the new paint formulations (emulsion and synthetic based), for the modern qualities of rapid drying and ease of application, utilising the minimum number of coats to obtain maximum effectiveness, apply to construction work also these days. Other special paints, particularly in the case of the chemical and refining industries (the Sindri fertiliser factory and the Trombay and Visakhapatnam enterprises) have been supplied. Chemical resistant and high temperature heat resistant paints have been manufactured in India for the first time over recent years to meet the requirement of these and similar projects. And the factories of the old established industries which may not need paints for their finished products (coal, jute, cotton goods) will do so for their building extensions and modernisation.

Railway Equipment

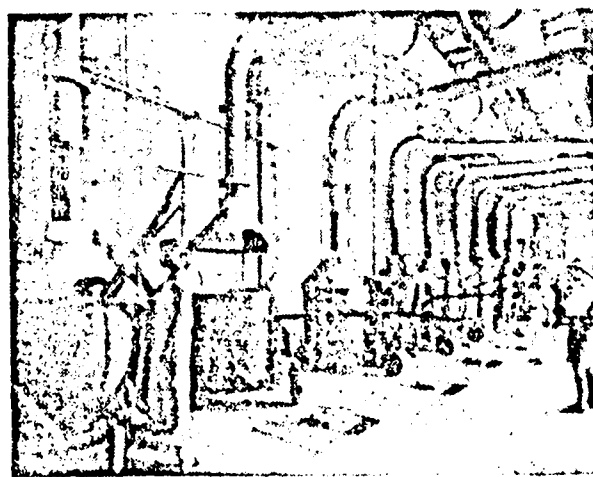
India now has her own locomotive and boiler factories, and has taken up on a large scale the construction of railway rolling stock, coaches and wagons. The strains to which paints on railway equipment are subjected, in a country of such varied and stringent climatic conditions, are extremely heavy and if re-paint programmes are to be kept to a minimum, then only quality paints will prove economic in the end. The shipping industry is expanding. Marine finishes of a high quality have been a speciality of the Indian paint industry since its inception—in fact, the oldest paint factory (Shalimar Paints) developed out of the paint department of a leading marine engineering firm, so that in this direction the paint industry will be on top of the job. Other new and expanding industries calling for paints are the agricultural equipment industry, road roller fac-

ories, the aircraft industry and of course the Services' requirements are supplied indigenously.

The overall picture has been adequately summed up by Ernest T. Trigg, U.S. Government adviser on paint requirements during the war, in his book *The Story of Paint in America* when he wrote: "The basic and primary purpose of the products of this industry is to protect, preserve and prolong the life of the materials and products over which they are applied. Without the protection of these products, the great achievements of modern building and construction would be impossible. Steel bridges are kept safe and sound for transportation by the use of paint. As a matter of fact, in the whole scheme of modern science and engineering, there is no permanence, stability or even safety without the protection afforded by paint products. Every structure, practically every mechanical or electrical engineering product—the tools of trade, the instruments of science, the tools and equipment of the farmer, and the implements of war—must be partially or wholly coated or they will soon become useless".

Close Relationship

There is thus a close relationship between the evolution of Government projects, heavy industry and light industry, and the paint industry. It is fortunate, therefore, that the indigenous paint industry is able to cope with requirements, provided the Government is realistic in its approach to the demand for basic materials. It is one of the enigmas of economic planning that in aiming at industrial independence, which means the restriction of imports of ready-made goods to encourage their fabrication at home, in so many cases India will still have to import the raw materials to manufacture those goods on her own soil. This is true of the paint industry, with particular reference to the ingredients of modern industrial finishes, as has been emphasised throughout this article. Eventually, India's own chemical industry may be able to cope—for most of the requirements are by-products of the chemical industry—but, in the meantime, if the Government and industry are to be well served by paint manufacturers, then this very important factor must always be borne in mind by all in authority. The constant need is for regular, not spasmodic, supplies of basic materials of consistent quality to enable an indi-



A battery of varnish kettles

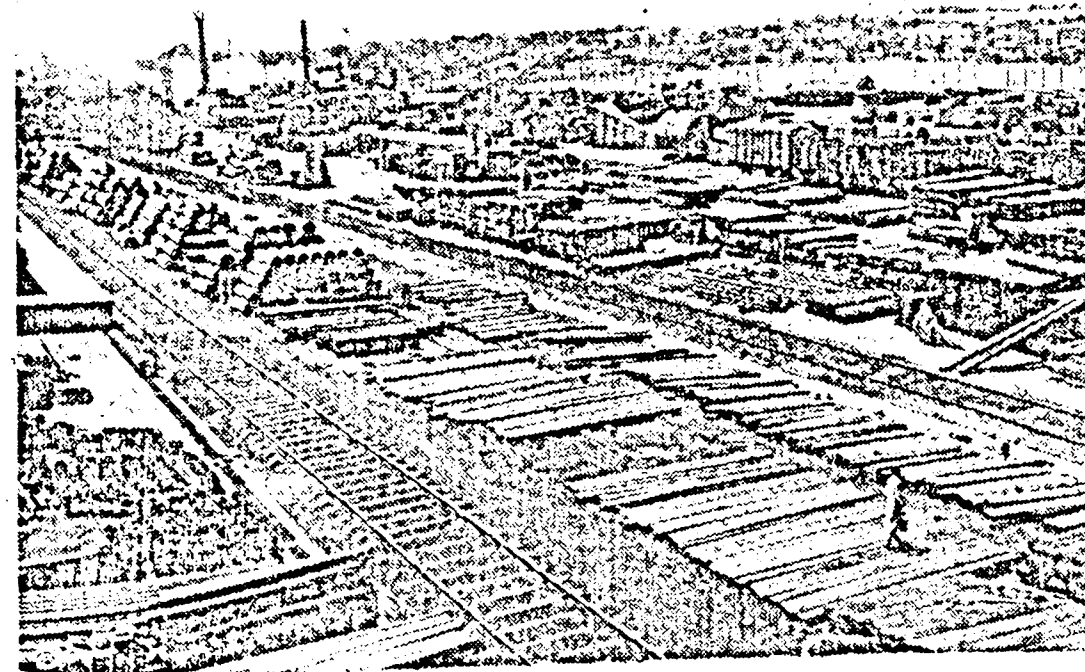
genous industry that is capable in all other respects of delivering the goods—to do so.

Production Capacity

The paint industry has a background of over 50 years' experience, and among the larger units, is well equipped in the matter of installed capacity, standard of machinery and technical facilities, to be able to cope with the increasing and varied demands being made upon it. Targets of capacity and production for 1955-56 for ready-mixed paint, varnishes and enamels, on a single-shift basis, were 70,000 tons and 60,000 tons, respectively. Although there are 150 or 200 units manufacturing paints and varnishes throughout India, the main production is concentrated in 50 major units. According to the census of 1953, Rs. 4.18 crores have been invested in 46 of the industry's units. Of these factories, 18 are situated in West Bengal and 16 in Bombay. Seven units are manufacturing nitro-cellulose lacquers and ancillaries. Approximately 5,000 persons are employed in the industry, exclusive of thousands indirectly connected, such as painters, mistries and those employed in the paint bazaar. It is an industry with a tradition behind it, the ability to serve today and to be able to look and work forward with confidence.

(The photographs accompanying this article are published by courtesy of the Shalimar Paint, Colour and Varnish Company).

THE HINDU SURVEY OF INDIAN INDUSTRY - SECTION II



electrification may be held over, demand of 40,000 tons, a new quarry is being opened up at Gomuridih near Rajanpur. Another vital raw material for the steel industry is manganese, low grades of which are used in the blast furnaces for the manufacture of pig iron. Processed manganese — ferro-manganese — is needed, however, for the manufacture of steel. Ferro-manganese has hitherto been made in a blast furnace at Jamshedpur, a process which yielded a comparatively high phosphorus content. Technical studies indicated that the only way to produce a first grade product was by the electric method of smelting. This has now become possible because power is plentifully available from the Hirakud Project. A plant for the manufacture of ferro-manganese is now nearing completion at Joda which is about 100 miles from Itanagar and the same distance from Jamshedpur. Initially this Tata plant will have a capacity of 30,000 tons, going up ultimately to 100,000 tons as necessary. It is also proposed to take up manufacture of other ferro-alloys like ferro-silicon, ferro-chrome and ferro-phosphorus at Joda when circumstances permit. The main equipment for the present plant—two rotating hearth furnaces—is being supplied from Norway. One of the furnaces is expected to go into operation in January, 1958, and the other a few weeks later. Present estimates indicate that this plant will fully cover the requirements of ferro-manganese at Jamshedpur and leave a surplus of 10,000 tons for sale.

COAL

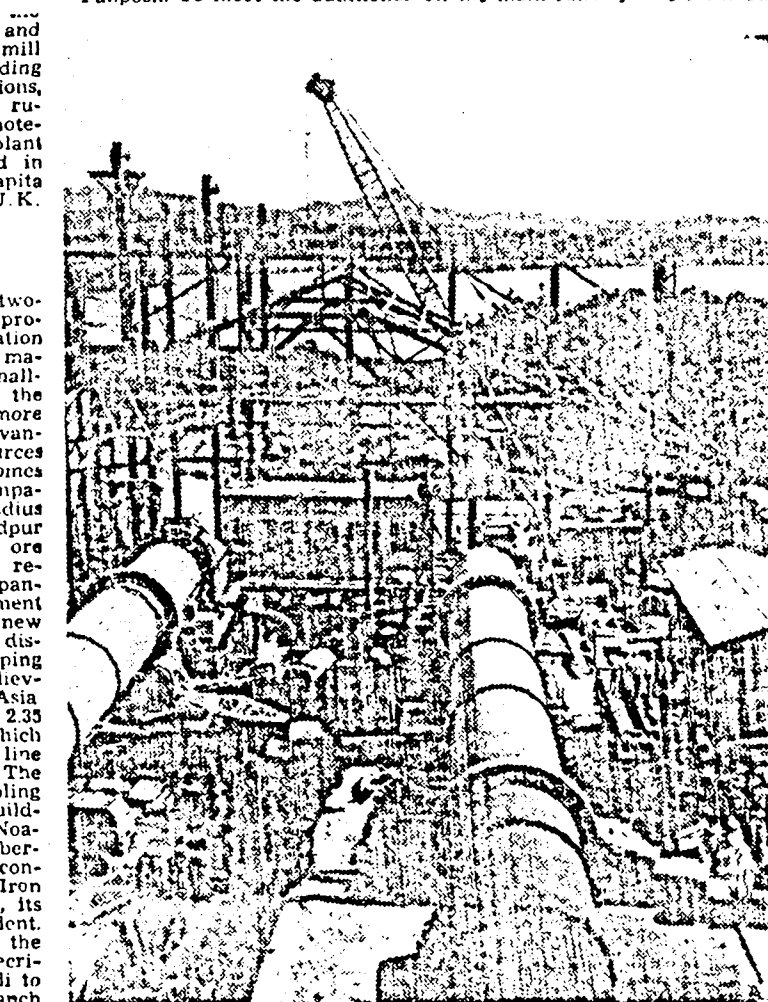
The expanded plant will need some three million tons of coal of which approximately a million tons will have to be purchased from the market, the balance being met by the Company's own collieries in the Jharia and Bokaro fields. The State is setting up a washery at Bhojudih to wash the market coal for supply to Jamshedpur. For a variety of reasons the setting up of the washery was greatly delayed with the result that adequate supply of washed coal is now uncertain. If Jamshedpur has to use raw coal, it will reduce the efficiency of the blast furnaces. At the same time, the greater bulk of raw coal would add to the congestion on the coal lines. Apart from relying on Bhojudih, Tata Steel is making a large outlay on a section at its Jamadoba washery, which will handle coal from the Company's other mines in the area.

The country's reserves of coking coal are very limited. It is imperative, therefore, that the steps initiated by Government for the conservation of metallurgical coal for restricting its use should fully implemented. It is for this reason that the establishment of such plants must have priority.

Tata Steel built the first two washeries in the country at Jamadoba and Bokaro which have done useful pioneering work on the preparation of Indian coals for the steel industry. Investigations are now in progress for the beneficiation of middlings, a grade coal with 30 to 35 per cent ash content, which is separated from the process of washing. Recent tests carried out in Germany have proved the feasibility of recovering good low ash coals from these middlings. If the process is successful, the beneficiation of middlings will help to economise the use of coking coal.

A million tons of lime stone will be required against the present 500,000 tons. The bulk of the demand will be met by Bird and Company's quarries at Birmira and while the balance will come from the Company's property at Tibari.

Dolomite is another fluxing material required in the steel melting shops. The present requirements of 30,000 tons a year are met from the Company's quarry at Panposh. To meet the additional



Two new rotary kilns for calcining are being installed in TISCO's Works.

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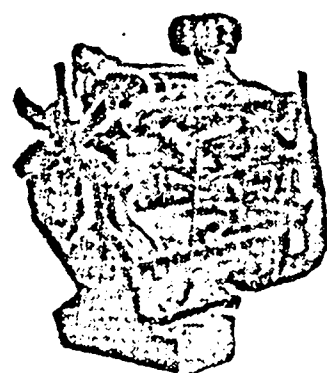
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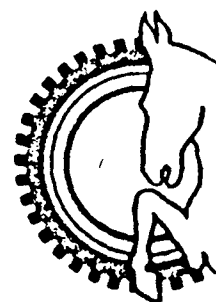


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will, using ore fines, fluxes
from the blast furnaces, and coke
breeze, produce a briquetted sinter
burden. Both coke breeze and
ore fines were hitherto not utilised
in the blast furnaces because
of their fine size, fluxes, dust, too,
was also unusable. This process
will thus find an economic use for
waste products and also improve
the efficiency of the blast furnaces.

The five existing blast furnaces
are rated to produce 4,200 tons of
hot metal per day whereas a two
million ton output will require
5,300 tons per day. This shortfall
will be more than met by a 28
hearth blast furnace, equipped for
high top pressure operation with
a rated capacity of 1,550 tons per
day. Using 40 per cent sinter bur-
den, the production per day is ex-
pected to rise to about 1,800/1,900
tons. The smallest of the present
blast furnaces will be retained as
a stand-by for use when any of
the other furnaces is down for
re-lining.

NEW STEEL MELTING SHOP

Molten iron from the blast fur-
nace will go to two steel melting
shops one of which will be en-
tirely new. This will have seven
200-ton open-hearth furnaces, fired
by liquid fuel, with an annual
capacity of 128 million tons. When
in full operation, this shop will
produce steel by the blow and
scrap process—which combines
the high production rate of the
duplex method and the several
metallurgical advantages of the
straight open-hearth process.
Three furnaces in the shop are
now in operation, and four will be
completed by the spring of 1955.
It might be mentioned here that
this new shop formed part of
M.E.P. and it was to have five
165-ton furnaces. With the in-
tegration of the two programmes,
the capacity of these furnaces has
been enlarged to 200 tons, and
two more 200-ton furnaces are be-
ing added. Provision has also been
made for the installation of an
eighth furnace should the need
arise.

The steel ingots from the new
steel melting shop will travel to
a stripper yard and from there to
a new 46" Blooming Mill. Bet-
ween this new mill and the exist-
ing one, the total primary rolling
capacity will be about three mil-
lion tons. From the Blooming
Mill, blooms will travel to either
the Sheet Bar and Billet Mill or
the Medium and Light Structural
Mill, both new. All the three new
rolling mills are being obtained
from West Germany while the
soaking pits, electric cranes and
other auxiliary equipment are
coming from the United States.

Work on this project has made
very good headway despite trans-
port difficulties, congestion at the
Calcutta docks and limited struc-
tural fabrication facilities. The
problem of unloading something
like 30,000 tons of plant and
equipment has been partly solved
by obtaining the use of the Cal-
cutta Electric Supply Corpora-
tion's jetty at Mulapore. To over-
come the shortage of heavy wa-
gons, Tata Steel has purchased
from West Germany and the U.K.
24 decoy well wagons with a ca-
pacity of 50 to 120 tons. The Suez
crisis, resulting in tremendous
shortage of shipping space, has
put back schedules, but every effort
is being made to gain lost time.

WORLD BANK AID

As mentioned earlier, the total
capital expenditure envisaged by
Tata Steel during the Second Plan
period is roughly Rs. 120 crores.
Finance of this magnitude was
not easy to find, particularly as
the low retention prices prior to
1955 made it impossible to build
up large reserves. In this context,
it may be pointed out that 80 per
cent of American steel expansion
between 1943 and 1951 was finan-
ced from retained earnings. For-
tunately a price increase was
granted in 1955 on the express
condition that additional earnings
would be utilised solely for ex-
pansion. This will provide some
Rs. 20 crores. Another Rs. 13.5
crores is being raised from share-
holders through the issue of fresh
equity capital at a premium. Fi-
nally, the World Bank has grant-
ed a loan of 75 million dollars,
which has recently been supple-
mented by the loan of a further
32 millions, of which 14.5 million
dollars were contributed by nine
private banks in the United States.
These arrangements, together
with the special advance from
Government of Rs. 10 crores ob-
tained for the earlier expansion
programme, bank borrowings and
retained earnings, will enable the
Company to meet the financial re-
quirements of expansion.

The expansion now under way
will help largely to solve the in-
tractable problem of a labour sur-
plus which the steel works have
carried for a number of years.
There is every reason, therefore,
for confidence that the expanded
plant will be able to achieve a
substantial rise in efficiency and
economy, and thus, increase its
opportunities to serve the coun-
try.

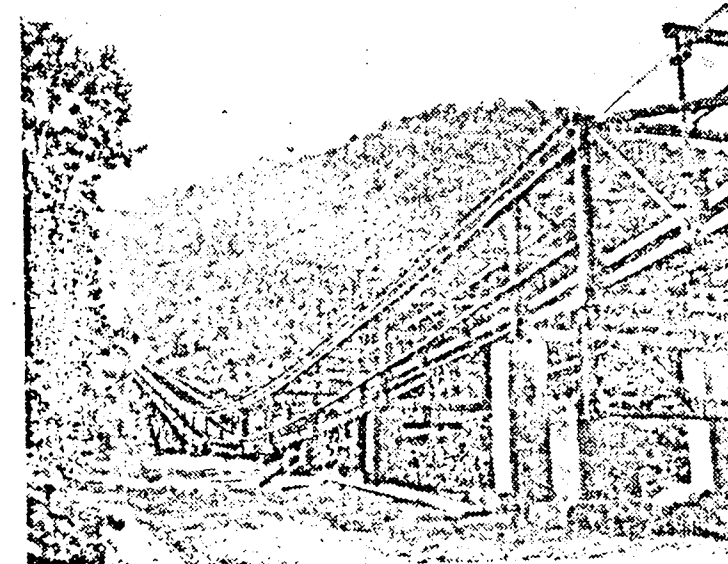
IISCO EXPANSION TAKES SHAPE

By R. K. Ghoshal

Publicity Officer, Indian Iron & Steel Co., Ltd.

IN line with the Union Govern-
ment's plans for the expan-
sion of the iron and steel indus-
try in the country during the
next few decades, the Indian
Iron & Steel Co., Ltd. have under-
way a comprehensive and inte-
grated expansion scheme for
increasing production at both
their Burnpur and Kulti Works.
The present overall scheme—
which is a 2-tier arrangement
comprising what are convenient-
ly called (a) the 1953 Extensions,
and (b) the 1955 Extensions (un-
der the new blast furnaces and

a 300-ton steel-making furnace
are expected to be ready by the
end of 1957. The second coke oven
battery and the blast furnace are
expected to function about the end
of 1958, by which time the new
open-hearth melting shop may also
be ready. A bye-product plant
for the new batteries, a sulphuric
acid plant and important exten-
sions to the Bessemer Converter
and the steel-melting plants are
some of the other important items
covered by IISCO's 1953 pro-
gramme.



New Conveyor Plant for IISCO's Ore Mines at Gua.

der taken at the request of the
Union Government as part of the
Second Five-Year Plan) envisage
production of 1.3 million tons of
pig iron and 1 million tons of
steel ingots which again will
yield 800,000 tons of finished steel.
The 1953 Extensions suffered an
initial delay of 19 months owing
to various causes such as the
temporary closure of the Suez
Canal and dock strikes in the
U.K. and the U.S.A., etc. Much of
the leeway has, however, been
made up by dint of efficient plan-
ning and by strenuous efforts on
the part of all concerned.

The major components in the
IISCO's 1953 Extension program-
me (which is expected to be com-
pleted by the end of 1953) include
two new coke oven batteries, two
new blast furnaces and major
extensions to the iron ore mines,
the steel melting shops and the
boiler and power houses at Burn-
pur. The first of the two new
coke oven batteries (the No. 8
Battery) at Burnpur was lighted
up by Sir Buren Moskerjee on
November 6, 1957. This Battery
comprises 78 ovens, each of
which has a daily carbonising
capacity of 22.2 tons of dry coal,
representing a total daily input
capacity of 1,735 tons and an out-
put quantum of 1,300 tons of
blast furnace coke per day.

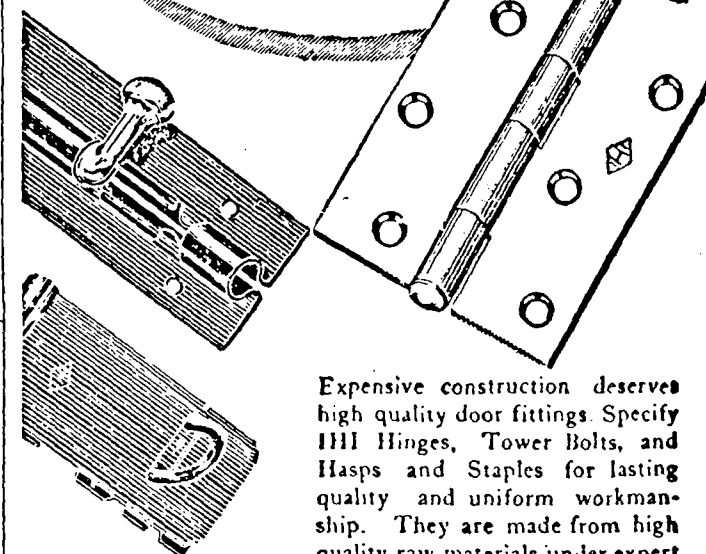
The coke produced by the No. 8
Battery recently lighted up and
the No. 9 Battery when completed
will meet the requirements of
the two new blast furnaces, each
of which is rated to produce 1,200
tons of pig iron per day now be-
ing erected at Burnpur. The first

STEEL PRODUCTS

Production of crude steel in the
European Coal and Steel Commu-
nity, the United Kingdom, the
United States and Japan in 1956
is estimated at 193 million tons,
i.e., about 21 per cent more than
in 1955. This advance was due to
larger output in the Community
(by 8 per cent), in the United
Kingdom (by 4 per cent) and in
Japan (by 13 per cent). Since in
the United States there was a 2
per cent decline due to the strike
in the middle of 1956. Each of these
rates of increase was lower than
in 1955.

Trade in steel products of the Com-
munity in 1956 continued to grow,
as far as exchanges with the third
countries are concerned. Steel ex-
ports to outside destinations rose
in the first three quarters of 1956
by 174 per cent over the corres-
ponding period in 1955 on account
mainly of finished steel and im-
ports (which are, of course, rela-
tively much smaller) by 51 per
cent, mainly on account of semi-
finished goods and pig iron. There
was, by contrast, a fall by nearly
9 per cent in exchanges among
Community countries themselves
almost entirely accounted for by
semi-finished steel products,
whereas pig iron and finished steel
products were traded in about the
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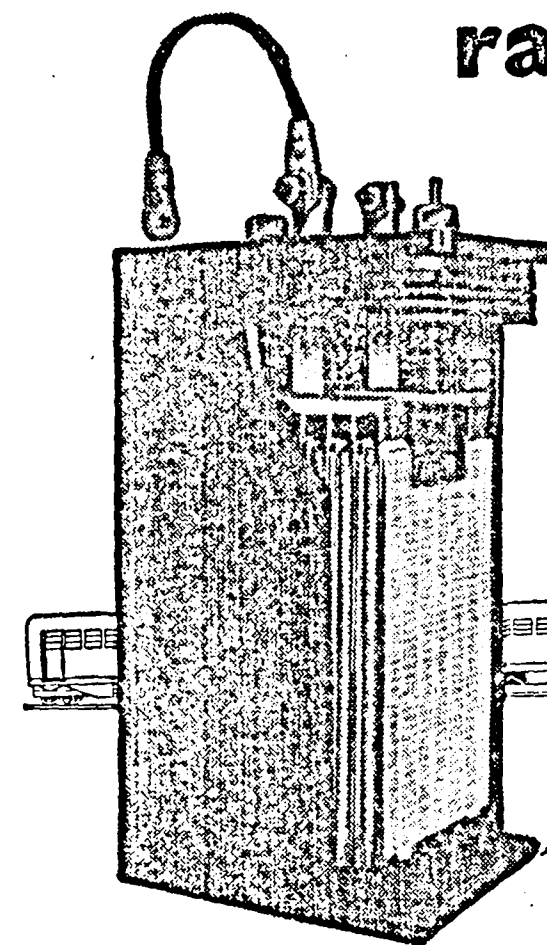


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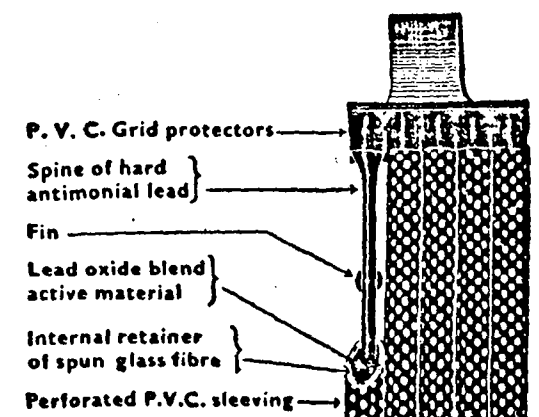
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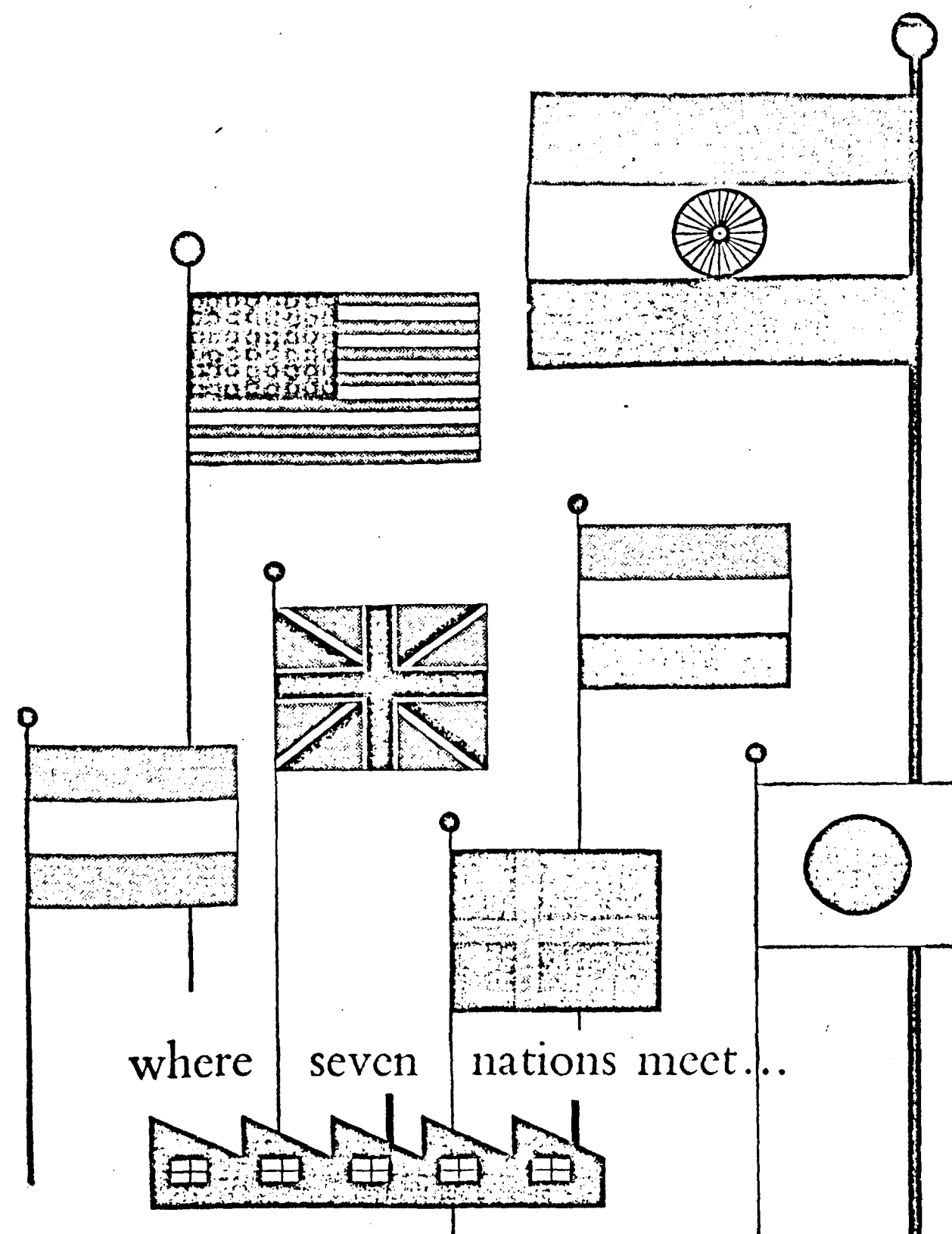
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TAXATION HURTS COTTON MILLS

By G. D. Somani, M.P.

THE Cotton Textile Mill industry of India holds a key position in the country's economy. In addition to bearing the major responsibility for clothing the domestic population and earning more than Rs. 60 crores worth of valuable foreign exchange annually it is the nation's biggest organised enterprise from which the Central and State Governments derive well over over Rs. 150 crores a year by way of taxes and levies. Moreover it is the biggest employer of industrial labour, with a wage bill amounting to Rs. 100 crores per annum. A large section of the country's farming population, the numerous communities of weavers, the thriving class of traders in cotton, yarn and cloth, the vast transport services and a host of others depend upon the industry for their sustenance and prosperity.

It is, therefore, in the best interest of the country that care should be taken to ensure the continued stability and progress of the industry. There would perhaps have been no need to recall this obvious fact if the industry had not been suffering a setback in its fortunes during the past 15 months. Although it is an exaggeration to say that the cotton mills have been riding on the crest of prosperity since the last World War, it is mostly true that they were able to achieve a large measure of stability with the launching of the First Five-Year Plan.

FIRST PLAN TARGET EXCEEDED

The conditions were favourable for a steady rise in the demand for cloth. The mill sector, which had been assigned the task of raising its output to 4,700 million yards of cloth per annum by the end of the First Plan (31st March 1950) was able to exceed this target long before the prescribed period and yet the total production of all the three branches of the industry—namely, the mills, the handlooms and the decentralised power-looms, was found to be inadequate to meet domestic needs and the country's export commitments.

The following table shows the population of India, the production of cloth in the mill and other sectors, its availability for civil requirements and the net surplus/deficit during the period 1952-56.

TREND OF PRODUCTION					
Year	Population (Millions)	Mill-made cloth (Million yds.)	Handloom & Powerloom cloth (Million yds.)	Availability for civil requirements* (In million yards)	Per capita availability (yards)
1952	365	4,598	1,313	5,275	14.4
1953	369	4,878	1,421	5,566	15.0
1954	373	4,908	1,561	5,586	15.0
1955	377	5,094	1,753	5,951	15.8
1956	381	5,206	1,787	6,275	16.3

*These figures have been arrived at after deducting imports and exports.

In all probability, the demand for cloth would have gone on increasing if in the latter half of last year the economy of the country had not received a setback. Apart from the fact that from the very outset of its career the Second Plan was beset with the problem of inadequate external resources for financing the ambitious industrial projects, there arose a serious deficiency of consumer goods. With commendable foresight the Planning Commission had urged long before the scarcity conditions had made their appearance, that the country should be well-stocked with food and cloth as the demand for them would rise with the growth in the purchasing power of the people. Bad monsoons and inadequate supplies of cloth caused scarcity in both these essential consumer goods, thereby depriving the economy of the most effective safeguard against inflationary pressures.

In an under-developed country like India, food prices exercise a profound influence on family budgets. Dearer food seriously curtails the buying power of the people and forces them to make drastic reductions in other items of expenditure even if they realise the essential consumer articles like

current year unsold cloth has been accumulating with mills month after month.

(In boxes of 1,500 yds.)	
January	274,590
February	227,486
March	300,228
April	292,134
May	261,908
June	287,277
July	319,062
August	338,563
September	336,114
October	391,003

The mills, which are in the unenviable position of the load under a barrow, are often advised to reduce prices as an inducement to the consumer to buy more cloth. The prices have, in fact, been already reduced to the extent possible. With the exception of a few small companies, a large number of them have been bearing the entire burden of the additional expense representing an average increase of 14.8 per cent over that of December 1955, besides reducing prices by about 5 per cent over those of September 1955. To day the prices of many varieties of piecegoods are lower than those that ruled in December 1955 and the industry would certainly have no hesitation in scaling them down further if its present cost structure could permit such reduction. Unfortunately, the prices of every article that goes into the production of cloth and yarn, have risen sharply. The following figures illustrate now the prices of cotton and the wage bill, which together exert a decisive influence on the cost structure of the industry, leave an extremely limited scope for reducing prices.

Price per Candy of 84 lbs				
Type of	1956		1957	
Cotton	April	Sept	April	Sept
Janilla	740	775	730	815
Kalag	725	770	770	785
Swat	1,065	1,020	1,071	1,071

(Continued on page 58)

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POPULARITY OF RAYON FABRICS

By A. R. Ramanathan

Chairman, The Travancore Rayons Limited.

WHAT is Rayon? That is what our per capita consumption is about 10 years ago. But, to-day, 4.4 million. The per capita consumption of rayon in this country is very much lower than that of other advanced countries. Even if we eliminate the most prosperous countries like England, France, U.S.A., our per capita consumption of rayon is lower when compared to other semi-developed countries too. The successful implementation of the Plan may result in higher consumption and per capita consumption is likely to go up in the coming years. Apart from the home market, export of rayon fabrics assumes a very important aspect of our country's economy. India can easily stand world competition in the international market with the quality of the yarn she produces and earn for herself the much needed foreign exchange which we are short of today.

With the keen desire to increase the variety of rayon fabrics, the latest development which has been achieved both in the U.S.A. and Europe is known as "spun dyed" or "dope dyed" rayon yarn. In this process, the chosen colour is either mixed with the viscose solution in large dye stuff before chemical reaction takes place from the conversion of liquid viscose near the spinning machine into continuous filament yarn. The desired colour effect can be very successfully transmitted to the yarn in any depth of shade which is absolutely guaranteed for fast colour and medium lustre. With the wide range of colours that will be available in the market, the weaving industry will have a ready made raw material in any shade, eliminating the attendant complicated process of dyeing the yarn. The development has revolutionised the use of rayon yarn in the U.S.A. and U.K. and this has also been successfully manufactured in the factories in India and the spun dyed yarn should be available for the weaving industry before long.

A POST-WAR INDUSTRY

Since World War II, rayon, a relatively new entrant to the textile world, has assumed an outstanding position, second only to that of cotton. The rayon industry in this country is one of the major post-war industries. Although substantial quantities of art silk fabrics were being manufactured in this country, for quite some time, the necessary yarn required were imported from foreign countries. The weaving industry was thus entirely dependent for the raw material from outside sources with consequent uncertainties of supply. Thus, immediately after World War II, much attention was focussed on production of the much needed fibre in this country. That was the year 1930, when the first factory for producing this synthetic fibre was started in Travancore.

From 1930, by systematic development of the industry, to-day, India is able to produce about 20 million pounds of rayon yarn per year, in the popular variety of 150 and 120 deniers. The estimated production of this country is set at 60 million pounds per year, which was the target fixed by the Planning Commission for the Second Five-Year Plan. Though this target fixed by the Commission may be on the lower side, the question of reaching a higher production will engage the attention of the authorities through the Development Council, which has now been formed for the purpose of fixing the demand during the Plan period.

In India, the partition of the country had deprived us of the best cotton-growing areas, and we had to have recourse to a substitute. Our policy of progressive industrialisation gave sufficient impetus to the Rayon industry and the progress made by it has been estimated that the domestic capacity of the weaving industry to produce rayon fabrics is in the neighbourhood of 570 million yards per annum. The actual production of artificial silk fabrics has been relatively small as compared with the capacity of the weaving industry. The under utilisation of the capacity of the power looms in this country needs close examination, since due to the increasing production of rayon yarn, any inadequate supplies will not arise in the coming future. In addition to the power loom industries, there are also about 75,000 handlooms. The production from handlooms is estimated at 6 million yards per annum.

LOW PER CAPITA CONSUMPTION

With our increasing population, a higher per capita consumption and a keen desire to raise the living standards of the common man, there has always been a ready market for rayon fabrics in India. The estimated production of 570 million yards, both from power looms and handlooms per year, could easily be consumed in this country. With this production of 570 million yards, which means

Industry largely depends upon the development of the weaving industry to keep pace not only with the advance of science, but also with the advances made by weaving techniques of other countries. The progress made by the weaving industry for research has been quite encouraging and within a short time, when the difficulties are overcome, the future of rayon in this country will be bright.

The use of rayon is varied in Europe and U.S.A., and it has been developed so high that two-thirds of the dresses worn by American women are made wholly or partly from rayon yarn. Rayon is the backbone of the great American ready-to-wear industry—dresses, underwear, hosiery, linings, and numerous other items of women's and children's clothing. In combination with wool and cotton, rayon staple has brought into being whole ranges of new woollen and worsted type fabrics; flannels, blankets, etc. To modern homes, rayon has brought excellent home furnishing material to meet a variety of tastes and needs. In India, the uses are different. Rayon is used for sarees, blouse pieces, ribbons, silk threads, and underweaves, etc. The variety of colours and shades and the popular designs with which the weavers have been able to produce the inexpensive rayon have attracted the attention of the majority of the women in this country for their clothing needs, with the result they are able to clothe themselves having the satisfaction of the luxury of silk but not as expensive. With the high prices of pure silk, rayon is able to come as a very welcome substitute for people who would like to clothe themselves with the change of fashion every day but at the same time spending perhaps about one-fourth or one-fifth of the price of natural silk. Rayon being water absorbent is more suited for clothing in tropics.

(Continued on next page)

SUPPLY POSITION OF YARN

The supply position of yarn remains very satisfactory and the prices have been maintaining a steady level. This should not be attributed to any excessive production or import, but it may be due to the balanced way in which the rayon has been distributed and also partly due to the financial stringency which has prevented the market from going high in spite of temporary shortages. In addition, various associations in this country have been making bulk purchases of rayon yarn from other countries which will go a long way in maintaining a steady flow of raw material and at the same time maintaining a balanced price.

Like all other countries, India also is fixing up standards for the manufacture of rayon yarn and has set up a Standards Committee. This Standards Committee has met a number of times, taking advice from the experts in the industry, and have now formulated a standard which, I might say, have been fixed on the rigid conditions set up by the United States of America and the United Kingdom. By the rayon industries manufacturing yarn according to the strict limitations fixed by the Standards Committee, the ultimate user, that is, the weaving industry will be able to produce fabrics second to none and thereby maintain the quality set up by the International Standards.

FORMATION OF RAYON CO-OPS. SUGGESTED

At the moment rayon weaving industry in India are not very well organised and in view of a good many small units being uneconomical in operation, it would be advisable for these small units to come under the aegis of a co-operative society. It may be possible for the proprietors of these small units to get the advice of experts for technical assistance and employ economical purchasing and selling arrangements. For some years past, though the capacity of the industry was large, yet in view of comparatively poorer quality of fabrics, the demand was not what it should be. But with the fixing up of the standards for rayon yarn, in applying the latest technique in the weaving industry, the Indian rayon manufacturers should in the coming years produce as fine a quality as compared to the other countries. It is hardly necessary to mention that the progress of the rayon spinning

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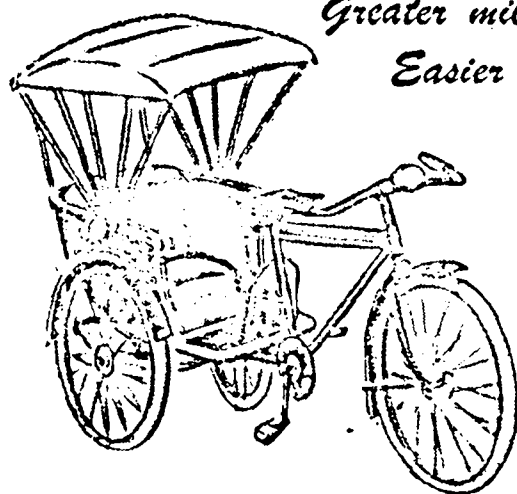
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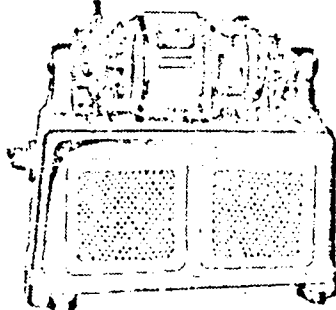
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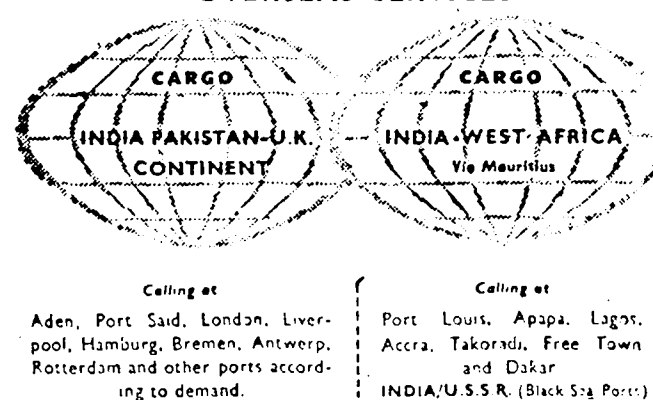
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TAXATION HURTS COTTON MILLS

(Continued from page 55)

dearness allowance, as the following figures relating to the Bombay cotton mills bear out:

August 1956	Rs. 70-8-0
October 1956	Rs. 69-4-0
August 1957	Rs. 76-11-0
October 1957	Rs. 76-7-0

The Bombay mills have thus to foot an additional wage bill of over Rs. 1.65 crores per annum.

It is, of course, true that the problem of old stocks can be solved by reducing the volume of production, but any such suggestion is no better than a counsel of despotism. It is certainly opposed to the Government's policy of encouraging higher production and employment and is out of place in the second year of the Second Plan by the end of which India is expected to take a really big stride forward towards material prosperity. Moreover, the standard of clothing reached in the country is not such as to warrant a reduction in consumption. Indeed, we are confronted with the paradox of poverty in the midst of plenty, for, although India is the world's second biggest producer of cotton textiles, the per capita consumption in the country is among the lowest. What is more, the common man is not likely to enthuse over the Government's efforts to raise his standard of living unless means are afforded to him to buy more food cloth.

But, while the plea for reducing cloth production is inappropriate, the mills cannot be expected to maintain the present level of output if the demand for cloth remains low and stagnant. Sooner or later, and in the prevailing conditions rather sooner than later, the wheels of the industry will have to slow down. In fact, quite a few mills have already reduced the number of shifts and, as a result, their labour force. But even this undesirable device cannot be employed on an extensive scale, partly because it is wrong to throw large numbers of workers out of employment and partly because the mills are required to pay heavy compensation for retrenching-unwanted labour. Thus, the industry is caught between the devil and the deep sea.

All these considerations reinforce the industry's plea for a drastic reduction in the excise duty. There is indeed no valid justification for keeping its incidence so heavy, especially when the object is not to swell the revenues of the Government. Moreover, there is no longer any need to curb consumption when there is such a surplus of cloth in the country and when the level of production is so high. Nor are the mills making large profits to enable the Government to claim a share from them. It is true that the Government is in desperate need of funds for financing the Second Plan and that the excise on cloth constitutes a big revenue. But it will be impossible to collect large sums of money from the industry if its stability and prosperity are undermined through a serious decline in its turnover.

Recently, the excise duty on medium cloth has been slightly reduced. But at the same time additional excise duties have been imposed on account of the centralisation of sales tax. While there may be some relief, the large yield of revenue accruing to the Government has given rise to new fears. It is also felt that the duties of other varieties of cloth should be reduced.

The Government should have no second thoughts on such a vital question. It should not hesitate to scale down the excises suitably as such a course of action will not only be popular, but will also be in accord with its own pledges given last year.

POPULARITY OF RAYON FABRICS

(Continued from previous page)

pical countries like ours, when compared to nylon and other synthetic fibres which are water repellent. The rayon industry in India has played a very commendable role in increasing the economy of our country. Had it been possible to develop this industry earlier, India could have conserved a substantial portion of her current earnings and external credits and thereby augmented foreign resources of our country. So, the source of material around a brave spirit of enterprise inspiring the personnel, with ordered co-ordination of man and machine, the future of the industry in this country is full of promise.

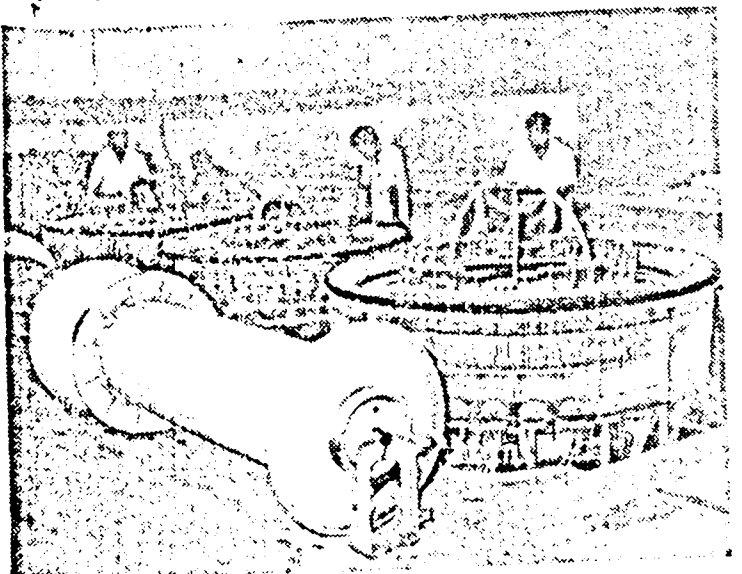
RECENT TROUBLES OF JUTE INDUSTRY

By D. N. Jalan

Director, McLeod & Co., Ltd.

THE Indian jute industry, which is even now earning for the country large sums in foreign exchange, has had to pass through difficult times since the partition. There is no doubt that the various units in the industry have made serious efforts to adjust themselves to the new conditions and push ahead with the modernisation programme. But some unexpected developments or other has had its unsettling effect and it has so happened that, on account of a peculiar conspiracy of adverse developments, the jute industry as a whole has had to work at a loss for some time.

The main reasons for the rather unsatisfactory performance of this important export industry have to be found in increasing competition from Pakistan, Japan and other countries and the large sums that have had to be paid to retrenched labour by way of compensation, gratuities, etc. The dependence for raw material supplies on a certain extent, on East Pakistan has also made for interrupted working or higher costs of production. There is naturally anxiety to know whether the jute mills would ever be able to experience the prosperous conditions of earlier days.



Circular room at work in New Central Jute Mill, manufacturing sacking cloth.

years and whether it will be possible at all for this industry to utilise its capacity fully not to speak of further expansion. It must be said that the anxiety in this regard has to a great extent been allayed when important units have been reporting heavy losses with the modernisation of mills which has been undertaken by many units. It is possible to take the view that the industry has left its worst difficulties behind and that it can look for better conditions in the coming years.

In the course of a brief article it is not possible to provide the complete background. But it is necessary to point out here that, consequently on the creation of Pakistan, large areas were taken over by the new State and that one of the main tasks of the Indian Government was to bring about appreciable increases in the yield of jute. Not only that, attention has had to be paid to the cultivation of even now. East Pakistan is providing the Indian jute mills with a good portion of their requirements of the higher grades of golden fibre.

COMPETITION FROM PAKISTAN

The availability of cheap and better quality jute has naturally been advantageous for the industry in Pakistan which has been rising fast in recent years. Even though the installed capacity of about 10,000 looms is only about 1/4th capacity of the Indian industry, the Pakistan mills have been able to increase the exports significantly in the past year. It is estimated that the total exports were 80,000 tons, an increase of 50 per cent over 1955 and constituted 1/10th of our own exports. This achievement has been possible besides providing the requirements of the home market for about 70,000 tons. It need not be pointed out that this trade is lost to India for ever.

It is perhaps a blessing in disguise that part of the exports were taken up by S. Africa with which country we are not on trading terms. Even so, it is feared that more than 50,000 tons of Pakistan manufactures are being sent to North America. In the absence of any corresponding increase in the world consumption, production arising out of additional capacity has not been made it difficult for India to particularly to market her output.

Other countries like Japan, Burma and Thailand are also having plans for erecting their own mills. In the Middle East also there are similar plans. The only satisfactory feature of an otherwise dismal situation is the absence of keen competition from the mills in Dundee and on the Continent.

The Indian industry should therefore be said to be faced with a challenge which threatens even its existence. Fortunately, this challenge has been taken up in right earnest and in the right spirit. As the various members of the industry have been working in close co-operation and consultation, the different problems as they arise have been satisfactorily tackled. If the various measures that have been adopted in the past few years have not yielded the desired results, it is not because of ineffectiveness but because of the unprosperous conditions of earlier days.

of smaller mills, circular looms have been advantageous while back cloth for carpet is in great demand and a larger number of wide looms are being installed.

The economies in the working of high-speed spinning machinery have been established, besides the fact that it has been considered advisable to instal only half the number of high-speed machines than what is required for eight hours' working. The machinery thus installed is to be run on a multiple-shift basis to supply the required yarn to the weaving scale.

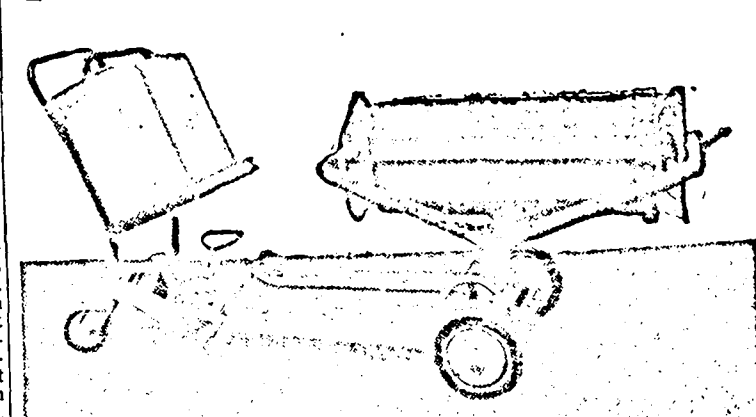
Given a proper approach to the various problems the numerous difficulties can be easily got over. It is true that the Second Plan does not envisage any significant expansion of the industry's capacity. This, however, does not suggest that the industry will not be playing its important role in the development of the economy.

The export of jute manufactures will continue to fetch large sums in foreign exchange while an increasing internal demand will be satisfied. My optimism regarding the better future for the industry is based on its highly organised state and great tradition for active co-operation and consultation. With the sympathetic understanding of the problems by the Central and State Governments it is only to be expected that this important industry will be able to regain some of its former glory and that the investors will not have any reason for great complaint.

PROTECTION TO SHEET GLASS INDUSTRY

THE Government of India's resolution on the Tariff Commission's report (1957) on continuing protection to the sheet glass industry has been published in a Gazette of India Extraordinary. The Government has accepted the Commission's main recommendation that protection to the industry should be continued for a period of three years after December 31, 1957 and that the present rate of protective duty, namely, 70 per cent ad valorem be continued throughout the period of protection. The Government has also taken note of certain ancillary recommendations made by the Commission for assistance to the industry.

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REGULATION OF POWER SUPPLY INDUSTRY

By K. G. Milne

Chairman, Ahmedabad Electricity Co., Ltd.

THE problems inherent in the regulation of a dynamic industry like Electric Supply have a tendency to persist and they never suffer by retelling. The pattern of regulation of the industry was set in 1948 by the then Constituent Assembly (Legislative) enacting the Electricity (Supply) Act which has for its object, among other things, "taking of measures conducive to the electrical development of India". These measures included the formation of a financial code affecting licensees and intended to enable them "to raise funds in the market necessary for the proper continuity of their public duties".

It is to be pointed out that a licensee working under a franchise granted pursuant to the Indian Electricity Act, 1910, cannot, by himself, decide the optimum limit of his capacity and whether or not to supply A in preference to B. The business being a public utility, supply of energy must always be "on tap", and this postulate allows availability of power, backed by adequate distribution facilities should always be a jump ahead of demand. This special characteristic of the electric supply industry makes it a chief candidate for finance in the capital market.

At the end of 1954, the private sector of the electric supply industry had an investment of the order of Rs. 100 crores and during the Second Five-Year Plan period, the industry is poised to expand further involving an additional investment of Rs. 75 crores. Upon the success or failure of regulation governing the industry will depend the extent of success it will have in raising the needed capital.

FINANCIAL CODE

The financial code mentioned earlier is set out in the Sixth Schedule and the Table appended to the Seventh Schedule to the Electricity (Supply) Act, 1948. The working of the Schedule after some years have passed, the necessity for revisions in law and important changes have since been brought about by an amending Act of Parliament at the end of 1956.

From the investors' point of view, the crux of the amending law has been to redefine the basis of the return to the investor in the industry which now has been fixed at the Reserve Bank Rate plus a fixed return of 2 per cent against a fixed return of 1 per cent earlier. A greater stability would have been engendered if the industry had been benefited under the Bank rate had been higher, but the important thing is that a formula has been prescribed which attempts at automatic adjustment of the return with the money market.

OUTSTANDING PROBLEMS

Another effect of the amendments in the Electricity (Supply) Act brought about by the 1956 Amendment Act is that a number of uncertain points which were sources of dispute between the licensees and the regulating authorities have been clarified at the same time introducing a measure of incentive. The opportunity provided by the passing of the amending Act however failed to produce a solution to the long outstanding problem of permitting the industry to make provision for meeting its deferred tax liability.

The concept of accelerated depreciation has come to be accepted as an instrument enabling the industry generally to provide a source of finance for expansion. This means that the product of the industry concerned should be priced in such a way that the earnings result in sufficient revenues for the dividend requirements as well as to cover the amount of tax deferred. The latter can then be placed in a reserve (and in the process become available for development) when there is due course when the tax liability, postponed earlier, rises.

While this procedure is generally followed in the unregulated segment of industry, our electric supply industry is devoid of this resource because the law says that the rate structure is to be so adjusted as not to result in earnings beyond what it defines as a "reasonable return", plus a small margin. In contrast, the Electricity (Supply) Act only permits the reckoning of the assessable tax in a year. In other words tax relief accruing in any

year are to be passed on to the benefit of the present consumer and so nothing is left for deferred tax reserves at all.

The point which arises with some force is why the electric supply industry should be discriminated against by introducing the concept of accelerated depreciation as a means of reducing the taxable profits (and consequently the tax payable) in the early life of an asset. Parliament intended that funds should be provided for accelerated industrial development generally. But here we see that perhaps the most worthy industry is actually denied this benefit.

The incidence of deferred tax affects existing undertakings most acutely. The accumulated liability faced by such undertakings is the low cost of depreciation is very serious, and if they are forced to accumulate further tax liability without being able to create a reserve to cushion the later tax impact, their position will be assailed.

The problem of deferred tax and how best to meet it received consideration at the hands of the Taxation Enquiry Commission in

1953/54 when the Commission made the following businesslike recommendations:

"The Electricity (Supply) Act, 1948, contains detailed provisions regulating the maintenance of accounts by electricity undertakings, and the basis on which they can charge consumers for the current consumed. One of the provisions is that depreciation is to be charged either on a straight basis or on a composite interest basis, so that, by the end of the estimated life of the asset, the cost of depreciation is accumulated. Another is that the charge to the consumer has to be prudently adjusted so as to leave to the undertaking only a clear profit of 10 per cent of the capital plus income from investments."

"This gives rise to various difficulties. In the first place, the Electricity (Supply) Act does not provide for initial and additional depreciation. Consequently, the book profits would exceed the actual profits, and the position would be the reverse in later years. The charge to the consumer has to be adjusted with reference to the book profits."

ELECTRIFICATION OF RAILWAYS

By M. B. Sarangapani

ONE of the ambitions of boyhood is a career as an engine driver which is a sincere tribute to an invention that transformed human life. Its survival even in an age of push-button control testifies to its low cost, dependability, ruggedness and simplicity of construction and it will be difficult to state that it will become obsolete in the foreseeable future in many parts of the world in many highly industrialised countries, however, it is yielding ground to electric traction.

The main objections to the steam locomotive are: (1) Smoke and dirt. (2) Low efficiency. (3) Difficulties in turning round especially in clearing platforms particularly when dealing with suburban traffic. (4) Requirement of a fuel not locally available. (5) Comparatively low capacity to move traffic, and (6) Trouble in gradients. These are examined below.

To the romantically inclined, a locomotive without a billowing column of smoke may be a contradiction in terms but elimination of dirt and smoke is a problem of growing importance and cannot be ignored as a consideration. Undoubtedly the efficiency of a steam locomotive is low though it has steadily improved by comparison with other prime movers in power houses will not be complete unless the not insignificant loss of power in the connection of transmission and distribution systems is also reckoned. Due regard must also be paid to the fact that the steam locomotive represents a dispersed system of power possessing an inherent flexibility and that in an electric railway adequate standby capacity must be provided at various points against any breakdown paralysing the system. Efficiency in the final analysis boils down to money and the larger standing charges on an electric railway tend to swamp the low thermal efficiency of a steam locomotive. The superiority of the multiple-unit type of coaches and electric railways in clearing suburban traffic is unmatched and carves out an area of transport where no other system is acceptable but the advantage cannot be claimed to any degree for the electric locomotive. In regions with good potentialities of water power or power from fuels like low calorific coal, or lignite, electric traction becomes inevitable but a sine qua non is the adequacy of low-cost power. There is no gainsaying the quicker movement of traffic in electric railways but the advantage is derived partly at least by better signalling systems, and double tracks which render a comparison, *ceteris paribus*, difficult. The superiority of electric traction in mountainous regions is distinct.

It will be evident that the replacement of steam locomotives is justified in urban and suburban areas. In mountainous terrain, in

regions distant from collieries and in those parts of the country where cheap power is available from hydro-electric projects or fuels of poor calorific value.

The successful completion of the Ujjain project in South India will provide a source of cheap electric power and the electrification of the Madras-Villupuram main line will result in the saving of a large expenditure on coal and in the utilisation of the transport tied up in moving coal for general purposes. Similarly in the coal fields areas, coal of low calorific value is used to generate power in the Bekara thermal power station and the electrification of the railways will, in effect, utilise the low calorific fuel which is unsuitable for locomotive-boiler-firing.

It will be appropriate to describe briefly certain systems of electric traction in use. The main systems are D.C. (1500 V or 3000 V), three phase AC, single phase 16-2/3 cycle or 25 cycle AC, and single phase High voltage AC. In all cases, a bulk supply of extra high voltage 3 phase AC power is made available to various substations in the railway.

In the D.C. system, the high voltage 3-phase AC power fed to a number of sub-stations on the route is converted into 3,000 or 1,500 volt DC which is applied to the trolley-wire. As Horse Power is proportional to voltage and current and as the voltage is not high, a large current is drawn by the motor which demands a large sized trolley-wire to carry the current, and close spacing of the sub-stations to reduce voltage drop. Consequently leads to a higher cost in respect of fixed equipment. These, however, do not override the advantages of the system in dealing with urban and suburban traffic. The unique characteristics of the DC series motor which has a high starting torque and which regulates its speed with the load can be fully utilised in the system and multiple-unit trains provide a degree of flexibility and turn round not available with any other system. Even for main line traffic, the DC system has the margin of advantage of other systems is considerable as the increase in cost of fixed equipment in the DC system is counter-balanced by economy in running equipment.

In the Valenciennes-Thronville line, details of which are given later, where the AC High voltage single phase system has been adopted, there are six sub-stations in 22 1/2 miles of line and 103 mobile sub-stations in the locomotives. The DC system on the same stretch with 25 or even 50 sub-stations with A.C.S.R. catenary wires can offer an economical alternative especially as the adoption of Villupuram, Calcutta-Mumtaz Serai, Bhuvanagiri-Tatpuri sections attempts to utilise the economies

"The result is that, in the earlier years, the tax saved is compulsorily passed on to the consumer, while in later years the tax liability is higher than that on the book profits, but no reserves would have been accumulated to meet the liability."

"We consider that the best way out of the difficulty would be to allow the concerns to put into reserve the extra surplus that they get as a tax relief on account of the initial and extra depreciation allowances. We recommend that the Electricity (Supply) Act be amended so as to permit the creation of such a reserve."

A more immediate problem from the investors' point of view—and which also arises out of differing rates of depreciation as between the Income Tax Act and the Electricity (Supply) Act—is the denial of grossing up of dividends in the shareholders' hands. An expanding electric supply undertaking may in a year be faced with nil income-tax assessment, nil depreciation on assets coming into that year. Nevertheless, it will well earn a profit under the Electricity (Supply) Act with its even scale of depreciation and declare a dividend. This "profit" however, does not qualify for refund of the difference between the rate of corporation tax which the electric supply company would have paid and the personal rate of tax

applied to the shareholder. This tax complication has tended greatly to depress equity values in the electric supply industry. A possible solution to the "grossing up" difficulty has also been suggested by the Taxation Enquiry Commission, but both this recommendation and the one dealing with Deferred Tax have remained without action so far.

SPREADING OF BURDEN

The mechanics of providing for deferred tax are not something vague. The tax deferred is capable of computation, and the solution for the company is for provision to be made as far as possible from year to year. So, too, it does not stand to reason that the individual shareholders should be penalised in the matter of grossing up when the situation is faced with one of tax deferred beyond his control. It must be emphasised that the effect of the Income Tax Act and the Electricity (Supply) Act will not affect the ultimate quantum of depreciation deduction in respect of an asset, but only the timing, and it must assuage the stability of a basic income of its units are liable to increase there are still many gaps which have to be filled. The construction of heavy electric equipment and telecommunication instruments call for special skill and large outlay. The technical know-how particularly has been difficult to be obtained.

It is gratifying, therefore, to note that the active Indo-British co-operation and the help of French consultants, new types of equipment will be produced in a large way in the public sector.

While the progress recorded might not have been up to expectations in particular directions and there are unexpected difficulties have turned up, the fact remains that, in a few years from now, it will be possible to obtain from indigenous sources equipment in terms of generators, high voltage transformers, rectifiers, special types of telecommunication instruments, etc. This will be in no small measure due to the active collaboration with foreign interests.

TELE-COMMUNICATION & HEAVY ELECTRICAL MACHINERY

From Our Special Correspondent

IT is only in the last decade that important progress has been made in the manufacture of electrical goods of various types. In the pre-war period, there was only a large-sized unit for producing cables and that, too, mostly for purposes of house-wiring. After independence, however, the range of manufactures has been considerably widened. Indian firms in collaboration with foreign interests are producing their own, and subsidiaries of foreign companies operating in this country have greatly expanded their capacity. But while the output of cables, electric motors, transformers, fans, domestic appliances, etc., has increased an appreciable amount, there are still many gaps which have to be filled. The construction of heavy electric equipment and telecommunication instruments call for special skill and large outlay. The technical know-how particularly has been difficult to be obtained.

It is gratifying, therefore, to note that the active Indo-British co-operation and the help of French consultants, new types of equipment will be produced in a large way in the public sector. While the progress recorded might not have been up to expectations in particular directions and there are unexpected difficulties have turned up, the fact remains that, in a few years from now, it will be possible to obtain from indigenous sources equipment in terms of generators, high voltage transformers, rectifiers, special types of telecommunication instruments, etc. This will be in no small measure due to the active collaboration with foreign interests.

HEAVY ELECTRIC EQUIPMENT

The heavy electrical equipment project in Bhopal envisages the manufacture of heavy electrical equipment of all types required for generation and utilisation of electric power, for which the country has so far depended almost entirely on imports from foreign countries. This project has been begun in collaboration with the Associated Electrical Industries Limited, U.K. Subsidary consultants are the English Electric Company Limited, Electric generators of the limited type driven by steam up to 50,000 KVA capacity, synchronous condensers up to 15,000 KVA capacity, diesel generators, motor, industrial control gear, surge diverters and water turbines are expected to be produced. The total capital expenditure for establishing the factory with all its auxiliary requirements is Rs. 1,000 crores and the target output of the factory on full production is 125 crores annually. Subsequently, with an additional capital expenditure of Rs. 5 crores, the factory will be able to produce approximately Rs. 5 crores in working capital, the target output is expected to increase to Rs. 2,187 crores annually.

In view of the foreign exchange shortage the project has been divided into stages. But it is comforting all the same that a good beginning will be made in a highly specialised field.

Already, some work is going on at the Madhya Pradesh Government will be supplying water and electric power for the factory and the township. Another salient feature about this project is the emphasis on the technical know-how. A well planned programme to train about 9,000 men over a period of eight years from the starting of the factory has been envisaged. A training school with its own workshop is proposed to be set up about two years after the completion of the factory. The training school will employ about 900 boys per year. 40 graduate engineers have been sent out for training. The factory is expected to go into production in 1960 and attain its full production of the first phase in 1968.

BHARAT ELECTRONICS

Bharat Electronics Private Ltd. St. Bangalore was started in 1954 to meet the requirements of the Government and other Government departments like the Army, Navy, Air Force, Civil Aviation, etc., which maintain communi-

cation services. The capital involved is of the order of Rs. 10 crores and it has been fully subscribed by the Government of India. The technical consultants for this venture are the famous French firm, Generale de Telephonie Sans Fil, France. The production programme of this factory includes the manufacture of complete range of electronic equipment except domestic radio receivers, resistors, capacitors, relays, piezo-electric units, electronic tubes and semi-conductor devices. At present, general purpose communication receivers are being manufactured. Almost all the mechanical components are made in the factory itself and practically all the electronic and electronic components are imported. When the coil winding and transformer shop is ready, the factory will make all coils and transformers. Production of 400 watt transmitters will be shortly begun. Design work for various other components is being completed. Production has been embarked upon after exhaustive tests by the Army. The annual value of output, when full production is commenced, will be approximately Rs. 4 crores. In the field of component manufacture, production of electronic tubes will be plant is also expected to go into production shortly.

Meticulous care is being taken in testing the products flowing out of the factory. The roughness of the products in the field operations. The products are, therefore, standardised after various special tests, for technical precision and durability.

Special emphasis has been laid on the training of technical personnel. Persons with a diploma in radio engineering and an imported both theoretical and practical training under the guidance of French technicians. Technical training for 60 mechanics (fitters, tool makers and machinists) and 60 radio mechanics. The training period is 12 months. The trainees are put to useful productive work in the sense the articles they make are used in the factory. It has been estimated that the cost of training an individual worker is approximately Rs. 1,000 including allowance, boarding and lodging.

HINDUSTAN CABLES

This factory situated in Ruyana, Rajasthan, came into production in the latter half of 1954. The present annual production of underground armoured telephony cables is 500 miles valued at Rs. 1 crore. Now that the demands are higher at 1,000 miles per year, the factory is expected to be its 405 miles and the target output of the factory on full production is 125 crores annually. Subsequently, with an additional capital expenditure of Rs. 5 crores, the factory will be able to produce approximately Rs. 5 crores in working capital, the target output is expected to increase to Rs. 2,187 crores annually.

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March 1950, the factory is now well established in its line. The paid-up capital is Rs. 4 crores which has been fully subscribed. Over 90% of the shares is held by the Central Government, 7 1/2% by the Government of Mysore and the balance by the Automatic Telephone and Electric Company Limited.

At present, telephones, transmitters, dials, protectors, fuse mountings, relays, ranks, unisector racks are manufactured in Bangalore. Production during 1956-57 has been estimated at 49,850 telephones, 31,400 automatic exchange lines, 62 signal channels, 24 channels, 12 channels.

EXPANSION PLANS

The expansion programme envisaged in the Second Five Year Plan involves a capital expenditure of Rs. 218 lakhs. The manufacturing capacity is expected to increase to 65,000 telephone instruments and 45,000 exchange lines per year.

THE Export Promotion Committee which submitted its report recently has suggested that the increasing competition for jute goods in the world market on account of the emergence of jute goods, can be countered in three ways, namely, (a) by reducing the cost of production of the ordinary types of jute goods, (b) by increasingly concentrating on the production of specialised fabrics of jute, such as narrow fabrics, hosiery, tufted carpets, and (c) by finding new uses to which jute fibre can be put.

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The problem of deferred tax and how best to meet it received consideration at the hands of the Taxation Enquiry Commission in 1953/54 when the Commission made the following businesslike recommendations:

"The Electricity (Supply) Act, 1948, contains detailed provisions regulating the maintenance of accounts and the basis on which they can charge consumers for the current consumed. One of the provisions is that depreciation is to be charged either on a straight basis or on a compound interest basis. So that, by the end of the estimated life of the asset, the cost is accumulated. Another is that the charge to the consumer has to be periodically adjusted so as to leave to the undertaking only a clear profit of 10 per cent of the capital plus income from investments."

"This gives rise to various difficulties. In the first place, the Electricity (Supply) Act does not provide for initial and additional depreciation. Consequently, the book profits would exceed the actual profits. The position would be the reverse in later years. The problem of deferred tax and how best to meet it received consideration at the hands of the Taxation Enquiry Commission in 1953/54 when the Commission made the following businesslike recommendations:

ELECTRIFICATION OF RAILWAYS

By M. B. Sarangapani

ONE of the ambitions of boyhood is a career as an engine driver which is a sincere tribute to an invention that transformed human life. Its survival even in an age of push-button control testifies to its low cost, dependability, ruggedness and simplicity of construction and it will be difficult to state that it will become obsolete in the foreseeable future in many of the world's many highly industrialised countries. However, it is yielding ground to electric traction.

The main objections to the steam locomotive are: (1) Smoke, and dirt. (2) Low efficiency. (3) Difficulties in turning round especially in clearing platforms particularly when dealing with suburban trains. (4) Requirement of a fuel not locally available. (5) Comparatively low capacity to move traffic, and (6) Trouble in gradients. These are examined below.

To the romantically inclined, a locomotive without a billowing column of smoke may be a contradiction in terms but elimination of dirt and smoke is a problem of growing importance and it is not to be ignored as a consideration. Undoubtedly the efficiency of a steam locomotive is low though it has steadily improved in the comparison with other prime movers in power houses will not be complete unless the not insignificant loss of power in the connection of transmission and distribution systems is also reckoned. Due regard must also be paid to the fact that the steam locomotive represents a dispersed system of power possessing an inherent flexibility and that in an electric railway adequate standby capacity must be provided at various points against any breakdown paralysing the system. Efficiency in the final analysis boils down to money and the larger standing charges of an electric railway tend to swamp the low thermal efficiency of a steam locomotive. The superiority of the multiple-unit type of coaches in electric railways in clearing suburban traffic is unmatched and carves out an area of transport where no other system is acceptable but the advantage cannot be claimed to any degree for the electric locomotive. In regions with good potentialities of water power or power from fuels like low calorific coal, or lignite, electric traction becomes inevitable but a sine qua non is adequate supply of low-cost power. There is no gaining saving the quicker movement of traffic in electric railways but the advantage is derived partly at least by better signalling systems, and double tracks which render a comparison, *ceteris paribus*, difficult. The superiority of electric traction in mountainous regions is distinct.

It will be evident that the replacement of steam locomotives is justified in urban and suburban areas. In mountainous terrain, in

A.C. AND D.C. SYSTEMS

It will be appropriate to describe briefly certain systems of electric traction in use. The main systems are D.C. (1500 V or 3000 V), three phase A.C. single phase 16-2/3 cycle or 25 cycle A.C. and single phase High voltage A.C. In all cases, a bulk supply of extra high voltage 3 phase A.C. power is made available to various sub-stations in the railway.

In the D.C. system the high voltage 3-phase A.C. power fed to a number of sub-stations on the route is converted into 3,000 or 1,500 volt D.C. which is applied to the trolley-wire. As Horse Power is proportional to voltage and current and as the voltage is not high, a large current is drawn by the motor, which demands a large sized trolley-wire to carry the current, and close spacing of the sub-station to reduce voltage drop and consequently leads to a higher cost in respect of fixed equipment. These, however, do not override the advantages of the system in dealing with urban and suburban traffic. The unique characteristics of the D.C. series motor which has a high starting torque and which regulates its speed with the load can be fully utilised in the system and multiple-unit trains provide a degree of flexibility and turn round not available with any other system. Even for main line traffic, the margin of the advantage of other systems is not considerable as the increase in cost of fixed equipment in the D.C. system is counter-balanced by economy in running equipment.

In the Valenciennes-Thronville line, details of which are given later, where the A.C. High voltage single phase system has been adopted, there are six sub-stations in 22 1/2 miles of line and 103 mobile sub-stations in the locomotives. The D.C. system on the same stretch with 25 or even 50 sub-stations with A.C. catenary wires can offer an economical alternative especially as the cost of locomotives and copper wire will not be unduly high on account of the steep fall in copper prices.

"The result is that, in the earlier years, the tax saved is compulsorily passed on to the consumer, while in later years the tax liability is higher than that on the book profits, but no reserves would have been accumulated to meet the liability."

"We consider that the best way out of the difficulty would be to allow the concerns to put into reserve the extra surplus that they get as a tax relief on account of the initial and extra depreciation allowances. We recommend that the Electricity (Supply) Act be amended so as to permit the creation of such a reserve."

A more immediate problem from the investors' point of view—and which also arises out of differing rates of depreciation as between the Income Tax Act and the Electricity (Supply) Act—is the denial of grossing up of dividends in the hands of the shareholder. An expanding electric supply undertaking may in a year be faced with nil income-tax assessment, depreciation on assets coming into that year. Nevertheless, it may well earn a profit under the Electricity (Supply) Act with its even scale of depreciation and declare a dividend. This "profit" having not borne tax, the result is the dividend in the hands of the shareholder does not qualify for refund of the difference between the rate of corporation tax which the electric supply company would have paid and the personal rate of tax of to-day and those of to-morrow.

SPREADING OF BURDEN

The mechanics of providing for deferred tax are not something vague. The tax deferred is capable of computation, and the solution for the company is for provision to be made as far as possible from year to year. So, too, it does not stand to reason that the individual shareholders should be penalised in the manner of grossing up when the situation is faced with one of tax deferred beyond his control. It must be emphasised that the effect of the Income Tax Act and the Electricity (Supply) Act will not affect the ultimate quantum of depreciation deduction in respect of an asset, but only the timing, and it must assuage the stability of a basic industry if its units are liable to increase there are still many gaps which have to be filled. The construction of heavy electric equipment and telecommunication instruments call for special skill and large outlay. The technical know-how particularly has been difficult to be obtained.

It is gratifying, therefore, to note that, with the active Indo-British co-operation and the help of French consultants, new types of equipment will be developed in a large way in the public sector. While the progress recorded might not have been up to expectations in particular directions and some unexpected difficulties have turned up, the fact remains that, in a few years from now, it will be possible to obtain a more continuous sources of equipment in terms of generators, high voltage transformers, rectifiers, special types of telecommunication equipment, etc. This will be in no small measure due to the active collaboration with foreign interests.

TELE-COMMUNICATION & HEAVY ELECTRICAL MACHINERY

From Our Special Correspondent

IT is only in the last decade that important progress has been made in the manufacture of electrical goods of various types. In the pre-war period, there were only a large-sized unit for producing cables and that, too, mostly for purposes of house-wiring. After independence, however, the range of manufactures has been considerably widened. Indian firms, in collaboration with foreign interests and on their own, and subsidiaries of foreign companies operating in this country have greatly expanded their capacity. But while the output of cables, electric motors, transformers, fans, domestic appliances etc., has recorded an appreciable increase there are still many gaps which have to be filled. The construction of heavy electric equipment and telecommunication instruments call for special skill and large outlay. The technical know-how particularly has been difficult to be obtained.

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HEAVY ELECTRIC EQUIPMENT

The heavy electrical equipment project in Bhopal envisages the manufacture of heavy electrical equipment of all types required for generation and utilisation of electric power, for which the country has so far depended almost entirely on imports from foreign countries. This project has been begun in collaboration with the Associated Electrical Industries Limited, U.K. Subsidiary consultants are the English Electric Company Limited, Electric generators of the wide range driven type upto 50,000 KVA capacity, synchronous condensers upto 15,000 KVA capacity, diesel generators motor, diesel motors, crane motors, rectifiers, power transformers of voltages ranging from 33,000 volts upwards, rectifier transformers, power coils, high voltage switch gear, industrial control gear, surge diverters and water turbines are expected to be produced. The total capital expenditure for establishing the factory with all its auxiliary requirements for the first phase is expected to be Rs. 40.5 crores and the target out-turn from the factory on full production basis is expected to be Rs. 125 crores annually. Subsequently, with an additional capital expenditure of Rs. 5 crores on machine tools and an increase of approximately Rs. 5 crores in working capital, the target out-turn is expected to increase to Rs. 21.87 crores annually.

In view of the foreign exchange shortage the project has to be phased in stages. But it is comforting all the same that a good beginning will be made in a highly specialised field. Already, some work is going on at the site. The Madhya Pradesh Government will be supplying water and electric power for the factory and the township.

Another salient feature about this project is the emphasis on technical know-how. A well planned programme to train about 9,000 men over a period of eight years from the starting of the factory has been envisaged. A training school with its own workshop is proposed to be set up about two years in advance of the completion of the factory. The training school will employ about 900 boys per year and will receive both theoretical as well as practical training over a period of 18 months. In the first few years the school will train 49 graduates. The students will also be admitted and trained for the supervision posts. Already, 49 graduates have been sent out for training. The factory is expected to go into production in 1960 and attain its full production of the first phase in 1968.

BHARAT ELECTRONICS

Bharat Electronics Private Ltd. at Bangalore was started in 1954 to meet the requirements of the Defence Services and other Government departments like the Army, Navy, Air Force, Civil Aviation and such others which maintain communi-

cation services. The capital involved is of the order of Rs. 10 crores and it has been fully subscribed by the Government of India. The technical consultants for this venture are the famous French firm, Generale de Telegraphie Sans Fil, France.

The production programme of this factory includes the manufacture of complete range of electronic equipment except domestic radio receivers, resistors, capacitors, piezo-electric elements, relays, electronic tubes and semi-conductor devices. At present, general purpose communication receivers are being manufactured. Almost all the mechanical components are made in the factory itself and practically all the electronic and electronic components are imported. When the coil winding and transformer shop is ready, the factory will make all coils and transformers. Production of 400 watt transmitters will be shortly begun. Design work for various other components is being completed. Upon after exhaustive tests by the Army, the annual value of output, when full production is commenced, will be approximately Rs. 4 crores. In the field of component manufacture, production of electronic tubes will be begun now. The crystal plant is also expected to go into production shortly.

Meticulous care is being taken in testing the products flowing out of the factory. The products in field operations. The products are, therefore, standardised after various special tests, for technical precision and durability.

Special emphasis has been laid on the training of technical personnel. Persons with a diploma in radio engineering and some practical training under the guidance of French technicians. Technical training is provided for 60 mechanics (fitters, tool makers and machinists). The training period is 12 to 18 months during which the trainees are put to useful productive work in the sense the articles they make are subsequently used in the factory. It has been estimated that the cost of training an individual worker is about Rs. 1,000 including allowance, boarding and lodging.

HINDUSTAN CABLES

This factory situated in Rayanapur, Madras, came into production in the latter half of 1954. The present annual production of the factory is valued at Rs. 1 crore. Now that the demands are higher at 1,000 miles per year, the factory is expected to be its additional machinery, very short-ly. The cost of the expansion programme is about Rs. 7.5 lakhs. It is expected that the entire Indian demand for cables for export plus available for export.

The total capital outlay is of the order of Rs. 1.1 crore. The technical consultants are the British firm of Standard Telephones and Cables Limited. A scheme for production of co-axial trunk cables has been finalised. The advantage of co-axial cables over ordinary cables is that a single co-axial cable can provide 900 channels. Orders have been placed for additional plant required for the manufacture. The estimated cost of the plant is Rs. 27 lakhs. This is expected to go into production in April 1958.

When this new project is completed, the factory will supply 300 miles of co-axial cables per year in addition to the cables for the Post and Telegraph Department. Major cities like Bombay, Calcutta and Delhi will be inter-linked by underground co-axial cables. The insulating paper used for wrapping the cables will be manufactured by an Indian paper mill. The factory will also produce a variety of other telecommunication equipment. The requirements of steel, tin and copper wire, hessian and seasoned soft timber are already being supplied internally.

This factory is situated in Bangalore, entered into a 15 years' agreement with the Government of India for the supply of telecommunication equipment. The factory is expected to go into production in 1960 and attain its full production of the first phase in 1968.

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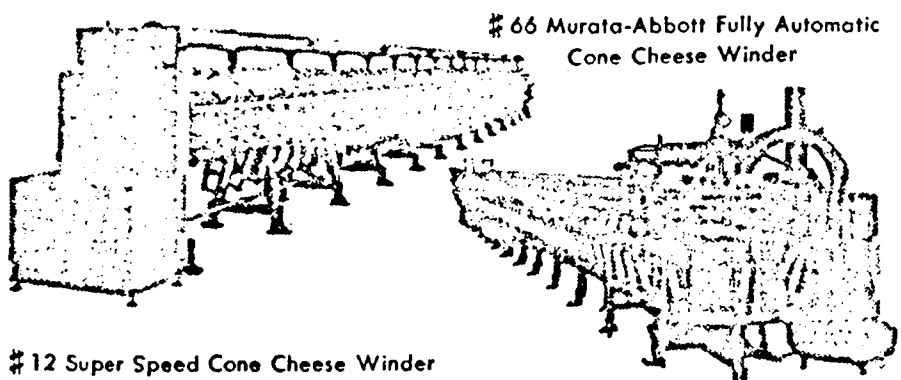
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PRODUCTION OF CABLES

By T. S. Sitapati

WE are in permanent revolution, and the biggest revolution of all is the technological or scientific revolution. We in India are trying to build up a new ability to raise the living standards of our people. . . . said Mr. Nehru, Prime Minister, while addressing the twelfth session of the All-India Newspaper Editors' Conference at New Delhi recently. It is gratifying to record that in this 'revolution' the electrical industry has been playing a prominent part and the progress that has been made during the last two decades is phenomenal. The progress was accelerated during the time of the Second World War, which in spite of its evils, had been responsible for the growth of many industries in India. Until the war, the country was depending upon imports for the bulk of the electrical goods we needed and there was no difficulty in getting them abroad. The war, however, made things scarce, and imports became impossible. At that time of grave crisis, the then Government had to stimulate the industry to assist the growth of capacity for many of the goods needed to prosecute the war, but it redounds to their credit that once they decided on a policy of actively assisting industrialization, they implemented the same with the utmost vigour and determination. Thus, the electrical industry grew from infancy to childhood during World War II and as a result of it, the cessation of hostilities enabled the further development of these industries, since goods were still scarce and unobtainable. The other beneficent consequence of our units had and has been any damage. Besides, the Government of Independence gave a new spurt and now we have a well-known industry catering to the needs of the country in several types of electrical stores.

In the transmission and distribution of electricity cables and wires are as vital as the nervous system to the human body. Power is dependent on all types of cables and wires, ranging from heavy overhead conductors for long distance power transmission to low voltage underground cables and household or industrial wiring cables and flexible cables. The development of the cable industry conditions the progress or the ambitious power development programme of the Government and the nation.

ROLE IN WAR PERIOD

Perhaps, it was in this industry that war played such a significant role in its development, that its progress may be attributed to the war emergency. It was only one unit in Tata and it could not satisfy all demands for cables. The war made it impossible to import these vital stores and hence another big unit was established in 1942 which commenced production in Shimoga after. Both these units now come to stay as leaders in the field. Since Independence, many new units, big and small, have been licensed and some of them have come into production. More than 20 units now in existence and in the offing and with the sanctioned expansion plans, it is said that the cable industry is well-established at the present time to take care of the demand under the Second Plan.

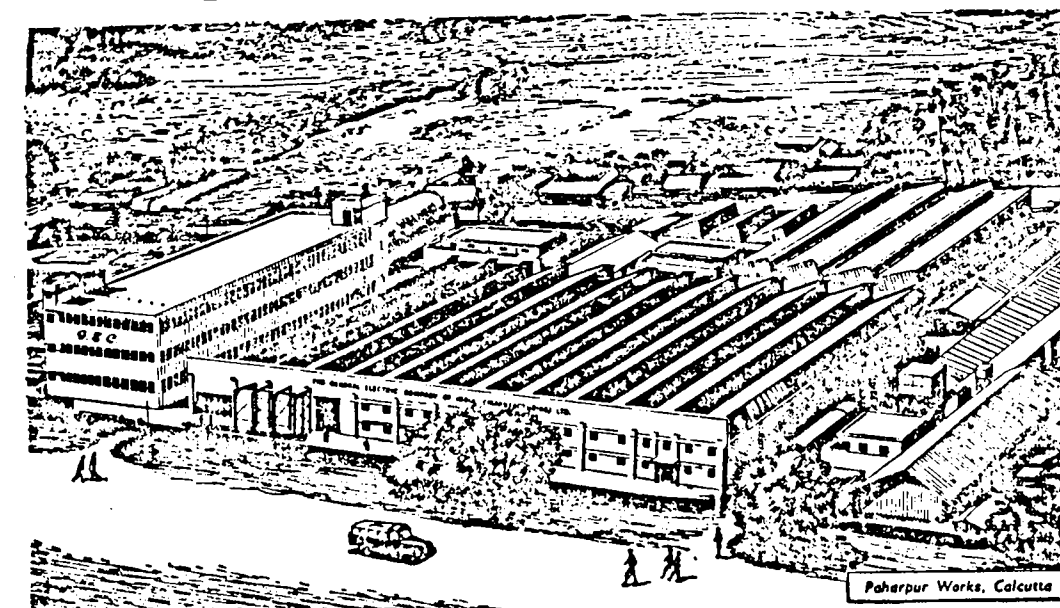
The main types of wires and cables which are in regular manufacture in the country are: (1) Bare and reinforced conductors for power transmission and distribution like bare copper conductors, steel reinforced aluminium conductors, copperweld conductors, (2) Electrical Winding and Stripping Wires and Strips such as Cotton, Silk, Rayon or Enamel (3) Domestic or Industrial Installation Cables such as Rubber or Plastic (4) Power Cables and Flexibles (5) Power Cables for underground laying (6) Telecommunication Cables.

There are, of course, innumerable types and sizes of each of these classifications, many of which are either being manufactured at present or the industry is planning for the same. In the Indian Railways, in particular, it may be mentioned that the Indian Railways intend to convert several stretches of the electric traction system to electric traction in the first stage of electric

trification of the Eastern Railway from Howrah to Burdwan and the Tarakeswar Branch, all the copper conductors, with the exception of grooved contact wire, were supplied by the indigenous industry. For the further stages even the grooved contact wire will be made in India by an unit which has been licensed for the purpose. This step alone will save considerable amount of foreign exchange every year. Similarly, in regard to enamel-covered copper wires, there was only one unit manufacturing the same some three years back. Now several units have come up, all employing a synthetic-base enamel and producing high quality enamelled wires.

The present annual rated capacity of the industry is 17,800 tons of bare copper conductors, 13,370 tons of A.C.S.R. (i.e. Aluminium Conductor Steel Reinforced) and 173 million yards of Rubber and plastic Insulated Cables and Flexibles, 744 tons of Winding Wires and 754 miles of Paper Insulated Paper Cables. The future trend in demand will depend largely on various factors like, the rate of generation of electricity, completion of various multi-purpose projects, industrial and housing expansion schemes, etc. The industry is alive to its increasing responsibility and has already been planning not only to produce more but also produce new items with an eye on quality.

The main branches of the electrical industry have thus been keeping pace with the general development of the country. In this, the part played by the Central Government has been considerable. The policy of import restrictions initially followed for the sake of conserving foreign exchange and the measures of assistance extended by the Tariff Commission, from time to time, to the indigenous industries have paid good dividends to the country in the form of greater self-sufficiency, conservation of foreign currency, and above all, increase in employment and amenities to labour. Another commendable attitude of

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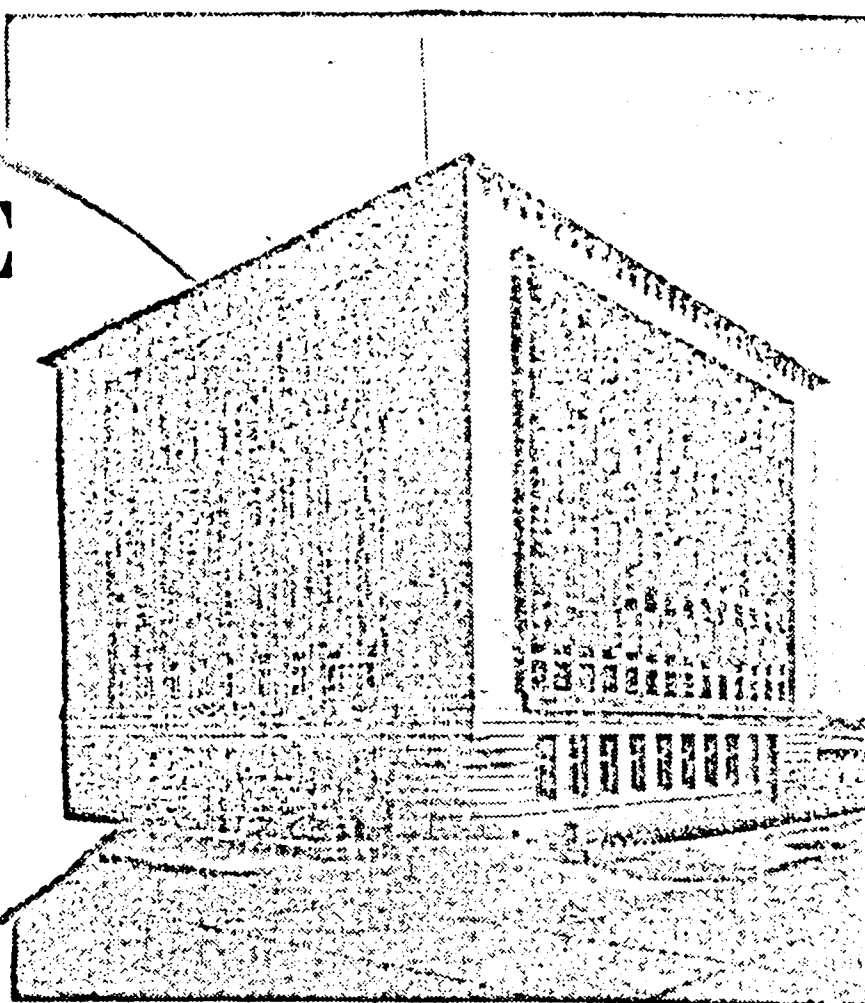
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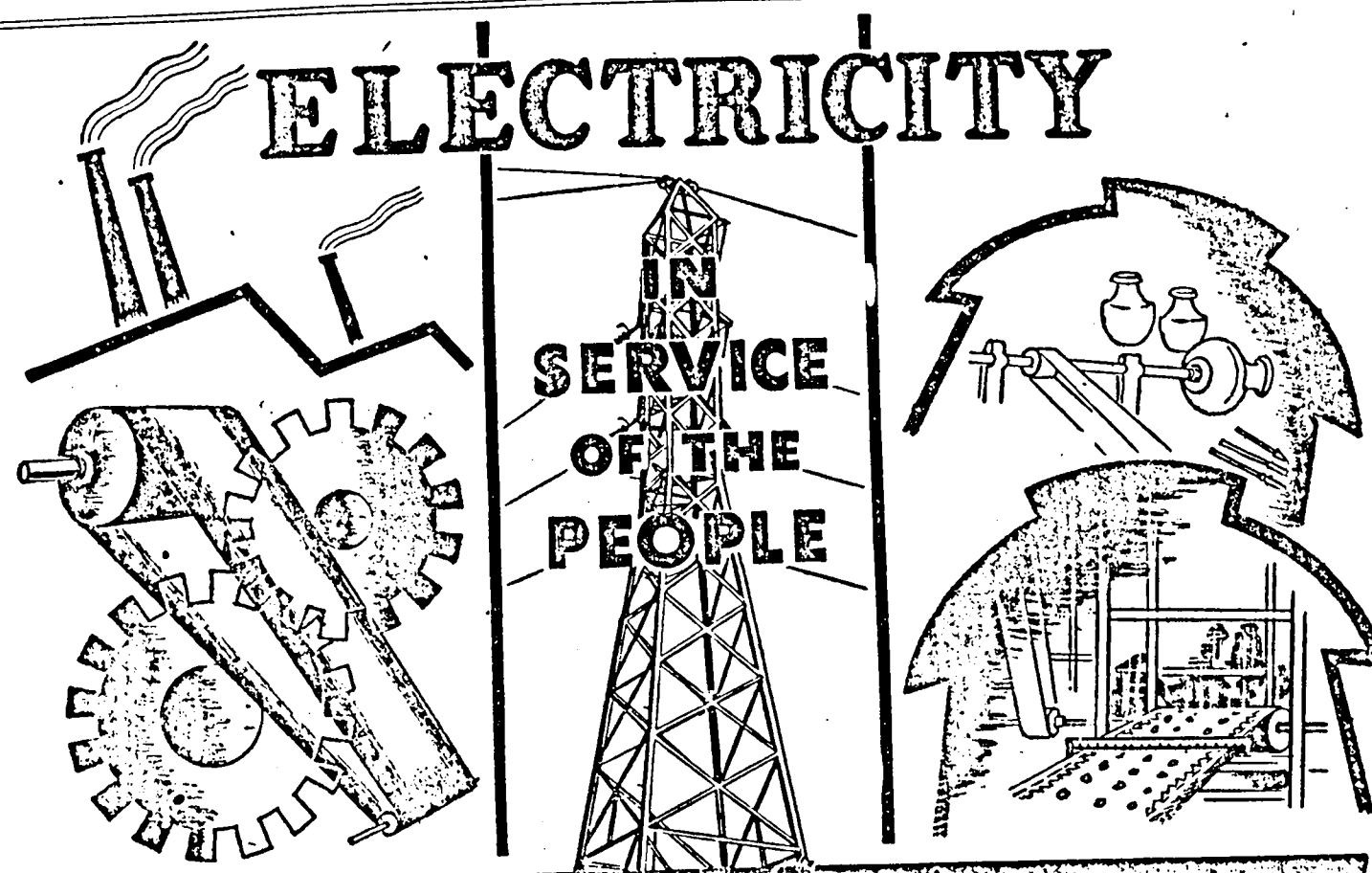
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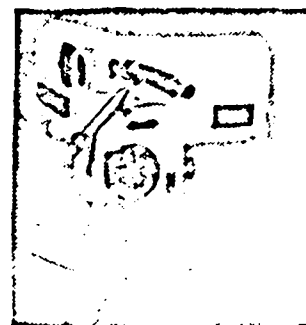
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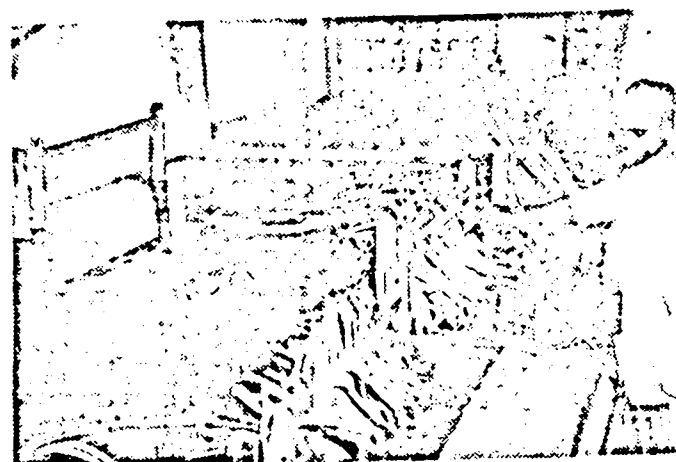
the Government in following a still to be imported from abro-
progressive Stores Purchase po- as the production of high co-
licy with a marked preference ductivity aluminium is not ac-
for indigenous products and help- quate in India. Various sch-
ful terms of payment, will also are under execution for augm-
go a long way in stabilising the ting the production of aluminium
industry. in India. It is, therefore, rea-
sonable to expect that the bulk
the requirements of high con-
ductivity aluminium for the elect-
rical industry will be avail-
able in the near future.

HEAVY ELECTRICAL MACHINERY

In its march of progress, In- from indigenous sources in
dia has to reduce its dependence next few years. While India
on foreign countries for heavy fortunately placed in respect
electrical plant and machinery, raw materi-
The Government decided to like rubber, textiles and chemi-
launch on this project under the the industry is still obliged to a
Public Sector. Accordingly, a port a few items like insulat-
State-owned unit has been form- paper, P.V.C. compound etc.
ed with an approximate invest- their ability to make India se-
ment of Rs. 25 crores and work sufficient to the utmost extent
is proceeding for establishing the regard to raw materials, it n-
factory in Bhopal. In line with be expected that the public
the Government's declared policy the private sector will formul-
of co-existence between the public schemes over a period for the n-
and the private sectors, and in n-
reconstruction of the strength and use-
fulness of the existing units in
the private sector backed by
years of toil and experience the
Government have given an assu-
rance that the Heavy Electrical
Project will exclude from its ma-
nufacturing programme such
ranges of electrical goods as are
already being manufactured in
the country in adequate quanti-
ties. The Heavy Electricals will
undertake the manufacture of
hydraulic and steam turbines of
transformers or cables or
generators transformers of 33
tors or storage batteries.

TECHNICAL KNOW-HOW

This survey will not be p-
lete without a refer-
ence to the technical collabora-
tion of the Heavy Electrical
Project will exclude from its ma-
nufacturing programme such
ranges of electrical goods as are
already being manufactured in
the country in adequate quanti-
ties. The Heavy Electricals will
undertake the manufacture of
hydraulic and steam turbines of
transformers or cables or
generators transformers of 33
tors or storage batteries.



Rubber insulated cores of cables are kept immersed in w-
tanks for at least 12 hours in the NCCO factory and subje-
ct to electrical tests as per specifications.

KV and above, current and poten- such arrangements with
tial transformers, Static Capa- manufacturers in the U.K.,
itors, A.C./D.C. Circuit Breakers, and on the Continent. The n-
Switchboard and Control Equip- of such agreements has ben-
ment, D.C. Generators and Exci- boon to India as it is possible
tors, Welding Generators, A.C. indigenous manufacturers to
Industrial Motors (Rating of 200 incorporate the latest advances
H.P. and above) etc. The Bhopal production and techniques as
Factory is expected to commence ved from time to time in
production in 1960-61: industrially-advanced coun-
This also ensures that the
tical goods produced in India
equal, if not superior, to
foreign product. The electrical
dustry has so far exhibited
dynamism which redounds to
credit of the private sector
alive to its responsibility in ex-
pansion in the context of elec-
trical development in the country.
therefore, looks to the future
optimism.

QUALITY

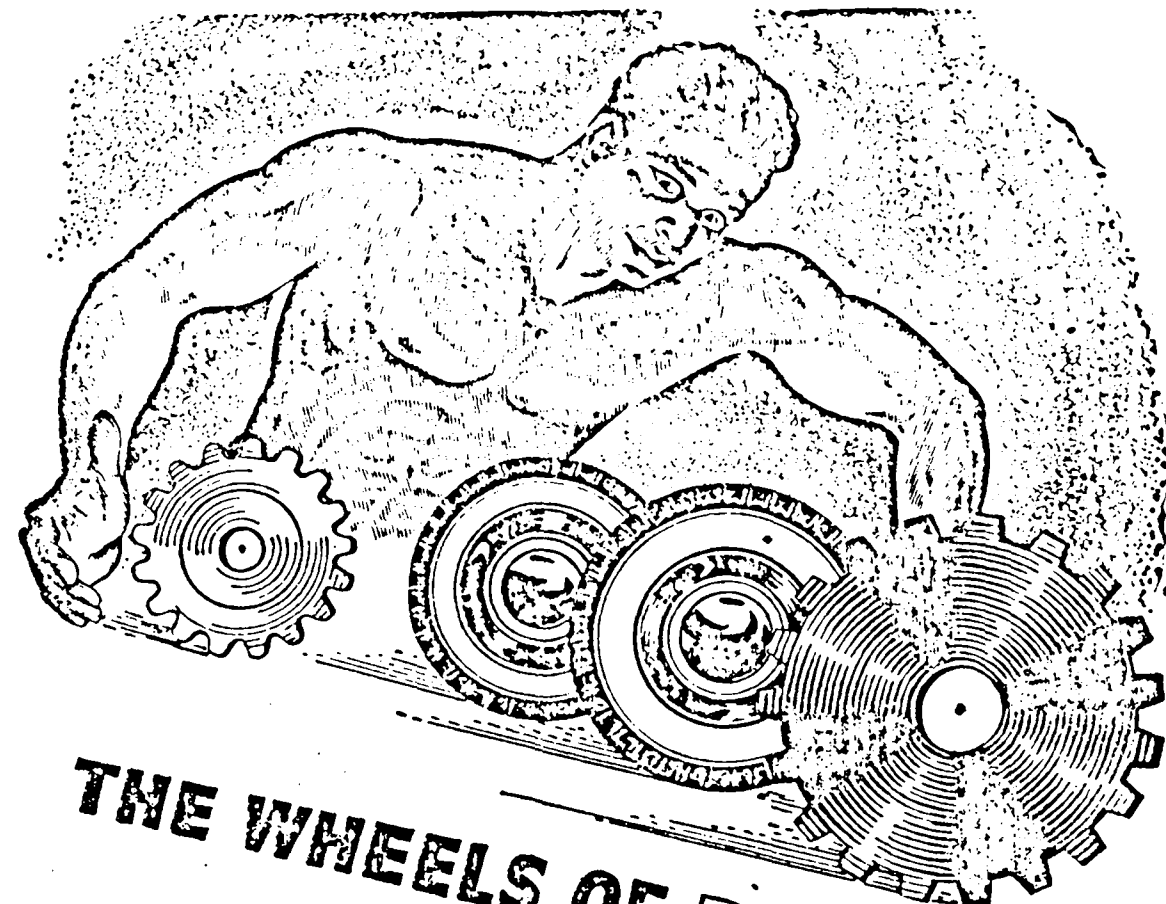
In the electrical industry, the
emphasis on high standards of
quality laid by all leading indi-
genous manufacturers is a mat-
ter about which the country can feel
proud: They all possess adequate
testing facilities and follow a ri-
gorous system of testing in various
stages of manufacture. The indus-
try has always been extending its
full assistance to the Indian Stan-
dards Institution in formulating
Standards in conjunction with
consumer and other interests.
When the ISI Certification
Marks Scheme was introduced,
many of the leading electrical
manufacturers set an example to
others by applying for licences
under the scheme. However, there
are a few brands of electrical
goods going about the market and
little is known about their qual-
ity or any tests applied on them
before release to the market. In
the expanding electrical industry
in our country, none will grudge
any production from any source
but let it all be to quality and ac-
knowledge standards. Any produc-
tion of electrical goods with insuffi-
cient equipment either for manu-
facture or testing should not be
tolerated, if India is to advance.
The safeguards in this respect
rest only with consumers, who
should make a careful selection
of the goods they allow to be used
in their premises in the interest
of their own safety.

MACHINE SCREW INDUSTRY

THE Government of India
accepted the recommend-
ation of the Tariff Commission to
the period of protection to the
chine screw industry till De-
cember 31, 1959. The rules of
protection will remain as ex-
istent, namely, 50 per cent ad-
valorem or 60 paise per lb.,
whichever is higher. Ma-
chine screw manufacturers obtain
pluses of indigenous wire from
Indian Steel and Wire Pro-
ducts Ltd. against quota certifi-
cates issued by the Iron and Steel
Commission. The Commission has
recommended in its last report
the allotment of quotas of
steel wire should be increased
as to meet the requirements
of manufacturers to work two
and that, if there was any
city of indigenous wire at
time, licences should be
granted to manufacturers to import
requirements. Emphasising the
importance of machine screws
Commission points out that
are used in fitting metallic
and equipments in all indus-
trial and agricultural machin-
ery requiring fasteners and fix-
tures. They are required by rail-
way transport establishments, man-
ufacturers of all kinds of light
heavy engineering goods, and
electric motors, fans, trans-
formers, automobiles, aircraft, bus-
es, sewing machines, house-
hold and radio receivers. The de-
mand for machine screws has in-
creased sixfold in the past three years,
having regard to the progress
of industrial development under
the Second Five-Year Plan. The
Commission has estimated that the
demand will rise by about 50
per cent in the next five years.

RAW MATERIALS

The pride of place among raw
materials used in the electrical
industry naturally goes to cop-
per, which has to be of high con-
ductivity. As there is no refin-
ery in India to produce this grade
of copper, all the requirements
have to be imported. Fortunate-
ly, high conductivity copper is
now in plentiful supply and at a
comparatively low price in the in-
ternational market. However, the
need for India's self-sufficiency in
this vital raw material for the
electrical industry and for strate-
gic purposes cannot be over-
emphasised. It is hoped that the
Government will pursue its efforts
to produce enough electrolytic cop-
per in our country. The other im-
portant metal viz., aluminium has
gross per year.



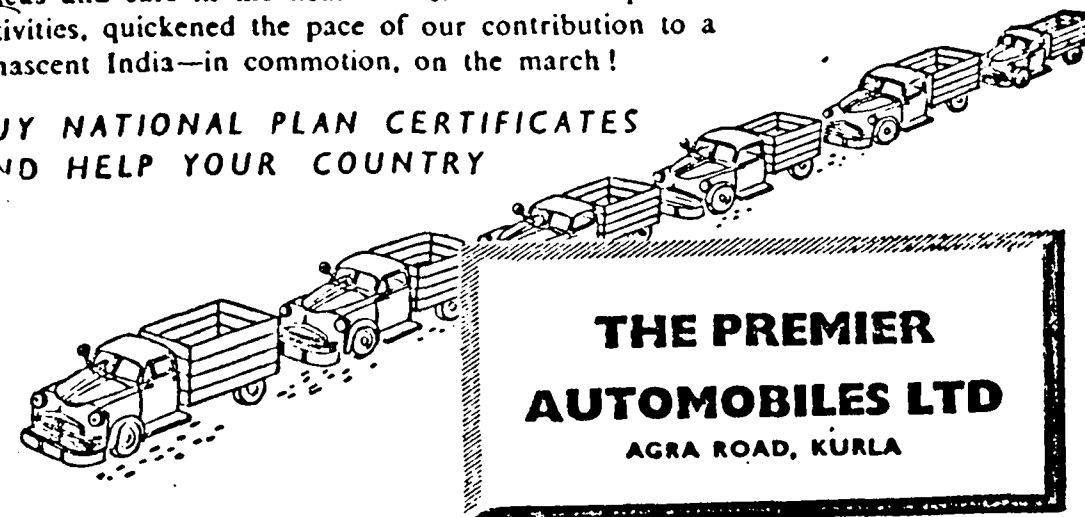
THE WHEELS OF PROGRESS

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renascent India—in commotion, on the march!

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T. R. BHAGAVAT, B.A., B.L.,
Ag. General Manager.



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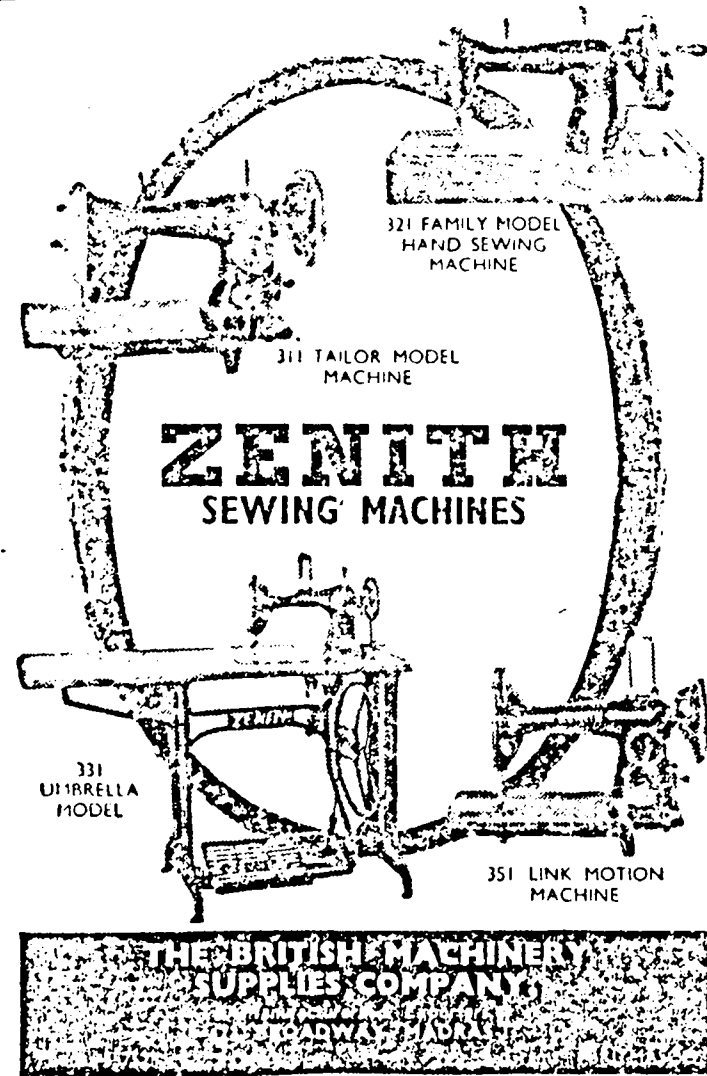
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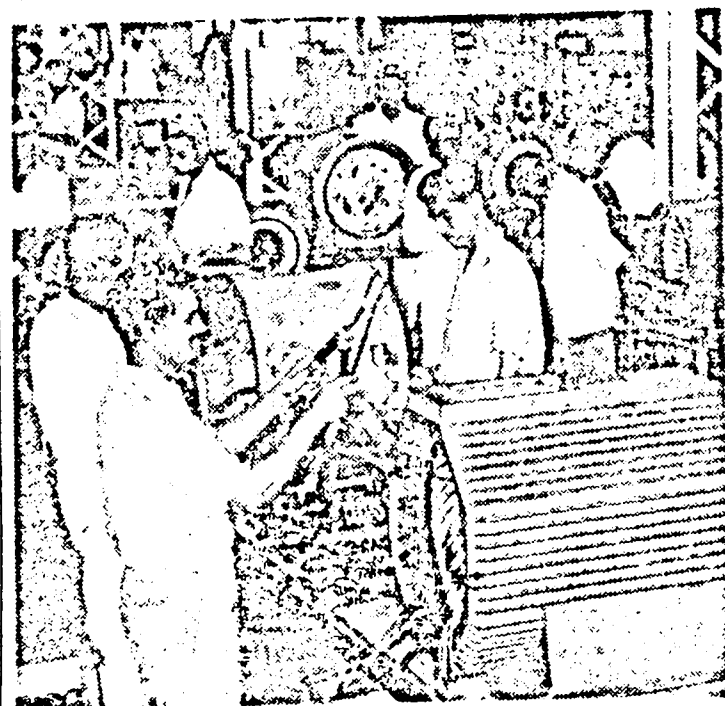


ZENITH
SEWING MACHINES

DELHI-6

SIMLA-1

BOMBAY-4



Winding of motors

MANUFACTURE OF ELECTRICAL GOODS

Contributed

THE Electrical Industry can be broadly divided into two categories namely: (1) Light Electrical Industry such as manufacture of fans, electrical lamps, radios, batteries, motors, electrical tools and household appliances such as refrigerators, etc. and (2) Heavy Electrical Industry which concentrates on manufacture of heavy machinery for industrial development like manufacture of electric motors, transformers, alternators, motor control gear, switch gear, etc.

The heavy electrical industry was in its infancy at the end of the Second World War. But during the last decade this industry has shown rapid progress in the manufacture of some of the items mentioned above. In fact, most of the industries mentioned above have achieved the targets decided for them by the Planning Commission in the first plan period and some of them have even exceeded the allotted targets.

The index of per capita consumption of electricity indicates the advancement of a nation and the progress made by the country. The Second Plan therefore envisages the setting up of large thermal and hydro-electric schemes for generation of electricity such as Bhakra, Nangal, the DVC, Pakhal, Nagarjuna, Chuni, Kovva and Riband projects. The per capita consumption of electrical energy in India has risen from 2.75 KWH in 1951 to 4.8 KWH in 1953. It has been estimated that power generation in the Second Five-Year Plan will be almost doubled and any increase in the consumption of power would result in increased demand for the various electrical products. Consequently the industries manufacturing these electrical products must also show a rapid progress to meet the increased demand.

In this article the progress made in the second plan period, namely, heavy electrical industries in recent years is examined.

ELECTRIC MOTORS

In the First Five-Year Plan the production of electric motors has almost tripled within a short span of five years. The production has steadily increased from 81,000 hp in 1950 to 2,52,000 hp in 1953. During 1953 the production has further increased to 3,39,000 hp. The present rate of production is approximately about 500,000 hp per year and looking to the present rate of production it is expected that there will not be much difficulty in reaching the target of 800,000 hp by the end of 1956-57 as fixed by the Planning Commission. The progress in the last two years has been quite remarkable and at the end of the plan, actual production may even outstrip the target stipulated.

In the Second Five-Year Plan, a few new units have been sanctioned and licences have also been granted for the expansion of several existing units in order to meet the increased demand envisaged. The electric motor industry

for motors upto 250 hp. For motors in the range of 200 hp and above, pioneering concerns have made satisfactory progress, and are already producing motors in these ratings. There has also been an attempt by some State Governments to manufacture small motors in the Cottage Industry scheme and this has also helped to increase the present rate of production.

Although quite a few licences are granted for manufacturing fractional horse power motors, very little attempt has been made by the industry to manufacture these motors. However, during the next 5/6 years, the industry will take up the manufacture of Fractional H.P. Motors to meet the entire demand of the country.

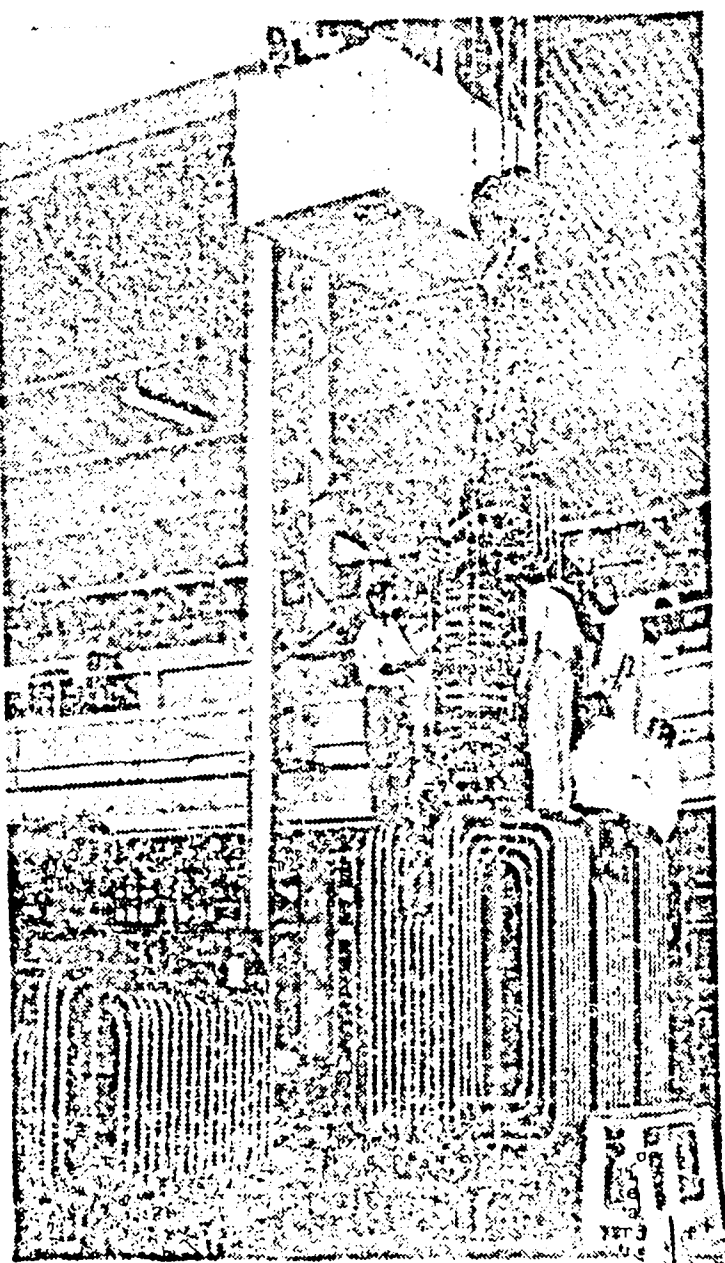
TRANSFORMERS

In the field of Transformers, since the generated power by all the electrical plants needs to be distributed and consumed there has been an upward trend in the demand for transformers. The production of transformers has shown a progressive increase over the 1950-51 level of 179,000 kva rising in 1953-54 to nearly 620,000 kva. The range of electric transformers has taken place and production in the country is still higher than in 1950-51. This covers all the distribution range of transformers required by the country. It does not, however, take into account Power Transformers that are required in the Receiving Stations and Sub-stations. The field of manufacture of transformers of voltage upto 33 kv and above will be left to the Heavy Electrical Equipment Project of the Central Government which is being set up at Bhopal. Large transformers of 33 kv and 66 kv are already being manufactured in the country by firms like Crompton, Parksons and National Electrical Industries Ltd., Bombay.

The techniques of production have also improved considerably and the manufacturers have shown interest in adopting the latest techniques of design and production in keeping with developments in this field in other countries.

India's requirements of special transformers such as welding transformers, instrument transformers and mining type transformers are also growing. But at present these are not being manufactured within the country. The lacuna in this field should be covered as early as possible.

Besides developing sufficient capacity and talent for the manufacture of transformers, it is also necessary to develop ancillary industries for which the country is more or less exclusively dependent on imports at present. This



A large size power transformer under manufacture.

refers to the production of various types of valves, thermometers, protective equipment gauges, etc.

Some manufacturers have already undertaken the manufacture of Small Generators required for self-generating sets and also for Train Lighting Generating Sets for railway coaches. The industry will, no doubt, show very good progress in this line in due course.

Although the progress in regard to manufacture of motors and transformers is very rapid in the last 6/7 years, the progress of development in the field of manufacture of switchgear and control gear has been rather slow and the bulk of the requirements is being imported. It is, therefore, very necessary that the development of this industry should be carefully studied in order that the industry is established on a proper footing.

MOTOR CONTROL GEAR

With regard to the manufacture of motor control gear and domestic and industrial types of metal switches also, the progress has been far from satisfactory. It is, therefore, necessary, in the interest of the country's progress, that a proper and speedy development of these industries is undertaken. In this context, it is heartening to note that quite a few new concerns have been given licences to manufacture these items and it is hoped that by the end of the Second Five-Year Plan, the country will have enough capacity to meet the indigenous demand for Motor Control and Switchgear.

A note of caution must be sounded here. While the tempo of industrial development is very rapid, it

is found that the supply of raw materials to the industry is not consistent with the increase in production. As the production in the electrical industry goes higher and higher, the basic materials required for the industry such as electrical steel sheets, stampings, copper, shunting, etc., should also be available in sufficient quantities, but at present these are in very short supply. This is particularly the case in regard to electrical steel sheets and shunting steel and the industries are finding it extremely difficult to get their full requirements of these materials and achieve their planned targets. Due to the foreign exchange stringency, the industries are finding it extremely difficult to obtain licences freely to import their full requirements of these essential raw materials to augment the limited supplies from indigenous sources.

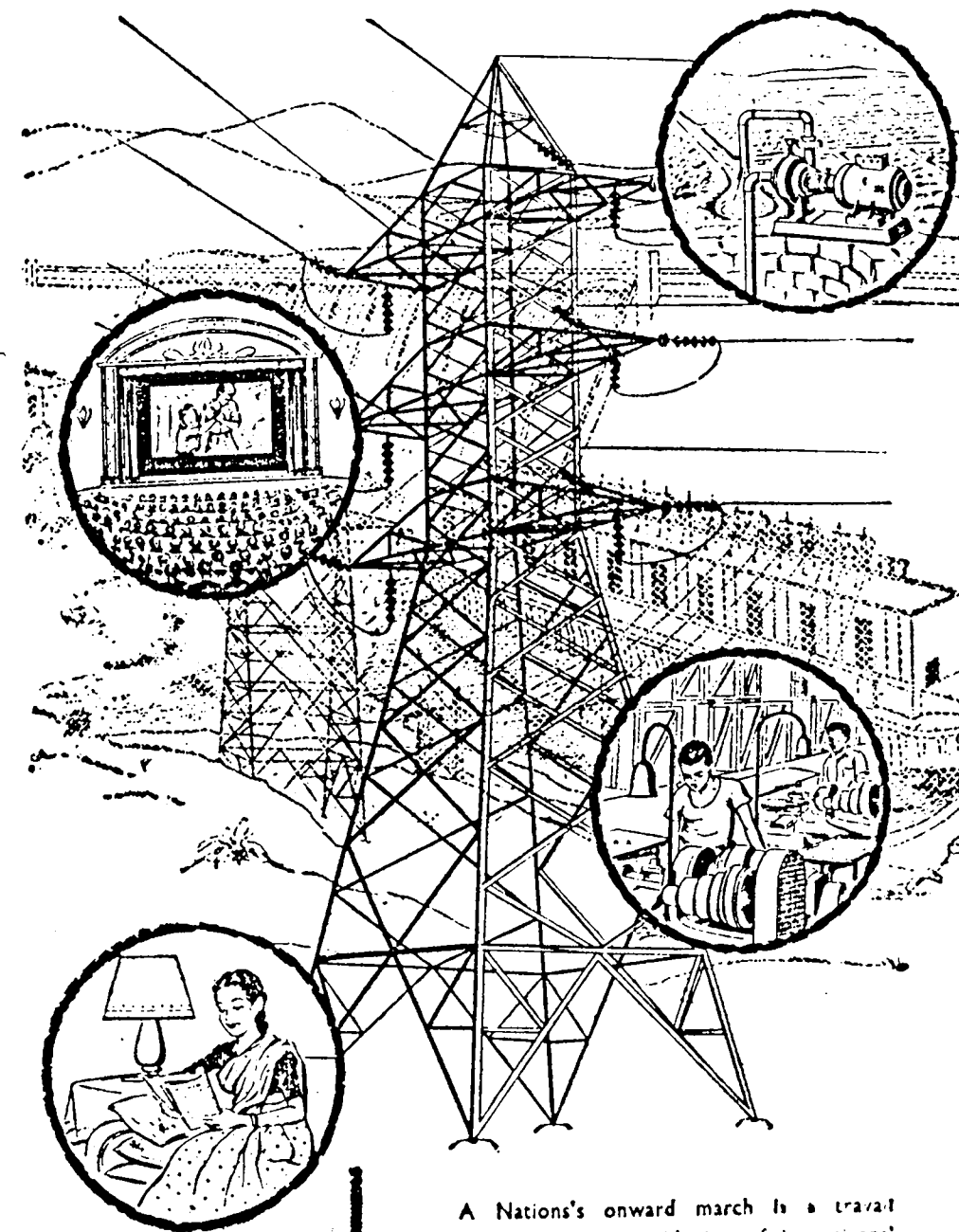
With the increase in production of transformers, motors, etc., the demand for laminations and stampings will also increase considerably. It is, therefore, necessary to take steps to develop the new units could also take advantage of the latest techniques developed in other countries and in this connection special mention may be made of the use of cold-rolled silicon steel sheets in the manufacture of transformers.

Another important raw material required by the electrical industry is "insulating materials" such as presphane, slotting, leatheroid, etc. The bulk of our requirements of these insulating materials is being imported at present and it is necessary to develop the manufacture of these important items which have a direct bearing on the manufacture of other electrical equipment.

The Government of India have provided for the expansion of many allied industries in the Second Five-Year Plan and it need hardly be said that the success of each one of these industries depends upon the progress made in the other industry, as all of them are inter-dependent. The new steel plants when they come into production, will definitely be in a position to meet the requirements of the electrical industry for steel.

SCOPE FOR ONE MORE UNIT

Sometime back the Minister of Heavy Industries, stated that, in the light of the increased activity envisaged during the Second and Third Five-Year Plan, there is scope for at least one more unit of the size of the Heavy Electrical Project and that it was necessary to plan for this from now itself. Looking to the advance made during the last few years, one feels assured that the electrical industry in the country, encouraged by a very generous and helpful attitude of the Central Government, has made considerable progress. If, however, the raw materials required for the industry still keep on coming from abroad, the cost of the materials with heavy import duties on them becomes prohibitive for economic production of machinery for being exported to foreign countries, where we have to meet international competition in price and hence the imperative need for taking steps to make the country self-sufficient for its requirements of essential raw materials needed by the industry.



Power to grow Electrically

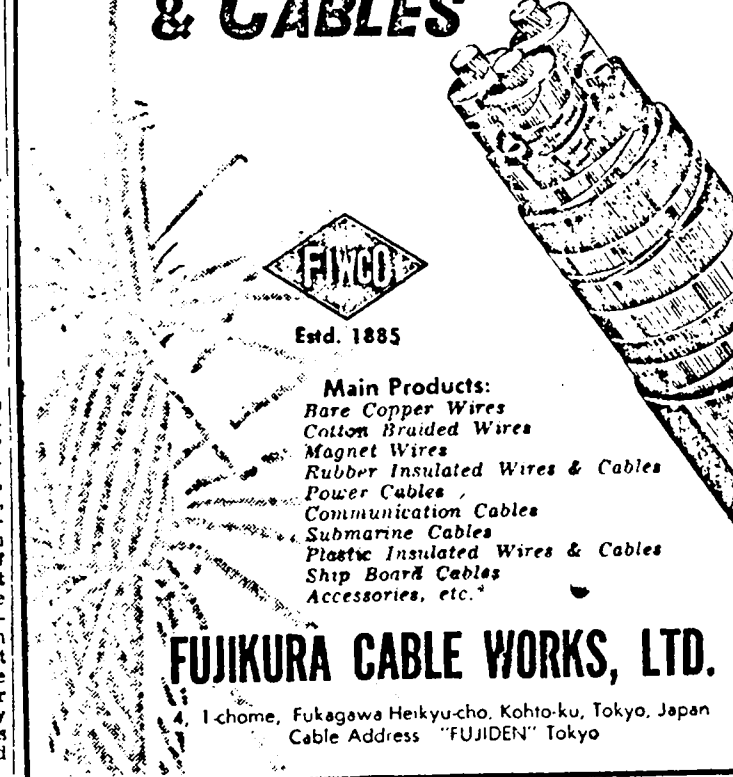
A Nation's onward march is a travail necessitating constant widening of its citizens' opportunities for advancement. In other words the watchword is to grow. Growth is a challenge and its life blood is electricity flowing through the arteries of industrial plant and distribution systems serving the people in diverse ways.

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ELECTRICAL EXHIBITION IN LONDON

THE Rt. Hon. Sir David Eccles, K.C.V.O., M.P., President of the Board of Trade, will open Britain's largest-ever display of electrical equipment at the Electrical Engineers Exhibition to be held at Earls Court, London, from 25th to 29th March, 1958.

This Exhibition now ranks as one of the largest in Britain and will cover an area of 450,000 square feet as compared with 330,000 square feet in March, 1957. More than 400 firms have booked space. There is no limit to the variety of interests that will be catered for—every type of electrical equipment ranging from 8-ton generating apparatus to transformers the size of a wedding ring.

It is stated that 3,000 technicians will be in attendance to answer enquiries from visitors, and, of course, there will be interpreters and guides for the convenience of overseas buyers. Incidentally, of all the overseas visitors who attended the 1957 Exhibition, the largest number came from India. Over 3,000,000 watts of electricity will be connected and more than 1,000,000 units will be consumed during the five days of the forthcoming show. A minimum of 1,000,000 yards of electrical wires and cables will go into the many intricate electrical installations at Earls Court.

Altogether, more than 40,000 items of British electrical equipment will be on show. For example, there will be cables such as those used for the 138,000 volt submarine power cable link between Vancouver Island and the mainland of British Columbia. Of special interest to overseas visitors will be the system of Electrical Safety comprising H.C. copper,

tinned earthing conductors in strip form, robust bonding clamps and specially designed Dyrrol Earth Electrode. This system is used in connection with the new Burma Pharmaceutical Laboratories installation as well as in Rhodesia, Belgium, Nigeria, etc.

Electrical engineers will be attracted by the range of overhead transmission line fittings, thermoplastic mouldings and extrusions, solderless terminals and fitting tools. The fitting of terminals by a mechanical process eliminates the dry joints encountered during soldering and obviates the embrittlement of the conductors which results from the heat applied during soldering. In addition, the operation of fitting a terminal is speeded up and ceases to require a skilled operator.

A special feature will be a display of electricity in hospitals, planned with the co-operation of architects and electrical engineers to show the latest design and equipment and lay-out of hospitals under modern conditions; and there will be a stand covering Education, Careers and Training in the Electrical field, the Services, Institutions and Associations.

Pulley gear and flywheel bearing equipment will be in evidence as also will "super siren" designed as a fire warning for factories. This siren has an audible range of half a mile in still air and a note which penetrates all usual factory noises. Moreover, it will operate for periods up to one hour without overheating the motor. It weighs only 10 lbs., the diameter being 7 1/4 inches and 7 7/8 inches long, foot mounting.

Electric power control is of the utmost importance the world over; and there is no doubt that the mo-

dern method of electric power distribution is busbar trunking. Busbar trunking consists of bare copper bus bars housed in a light but rigid, totally enclosed steel duct. At intervals of two feet along the duct a tapping position is provided to receive a plug-in fused distribution box. These "tapping" boxes can be plugged in or removed with perfect safety while the busbars are "alive". In this manner electric supply is brought by way of busbars and tapping boxes to positions within easy reach of the electric load. Connections from the tapping boxes to the load can then be completed by short runs of cable in conduit or other recognised means. Busbar trunking is totally enclosed and steel clad throughout, and since no continuous insulation, other than air, surrounds the busbars the system is fire-resisting and unlikely to harbour tropical pests. The trunking complete with busbars is made in standard 12-foot lengths. These together with short lengths, right angle bends, tee-pieces and cross-over pieces, allow the system to be erected in a variety of ways to suit individual requirements. Busbar trunking distributes electric power to motorised machinery in the Indian Telephone Industries Limited, factory at Bangalore. It has also proved suitable under tropical conditions in Equatorial Africa, Egypt, Sudan, Persian Gulf, Pakistan, Burma and Malaya.

Many and varied are the types of industrial and domestic electrical equipment that will be on show at this comprehensive Exhibition. Every need and interest will be catered for and expert advice will be available on the spot. Many of the products on show will be demonstrated.

Full information, brochures, tickets and details of visits to Power Stations and factories may be obtained from the organiser, Mr P. A. Thorogood, Electrical Engineers (A.S.E.E.) Exhibition, Museum House, 25, Museum Street, London, W.C. 1.

THERMAL STRESS IN FACTORIES

From a Special Correspondent

INDUSTRIALISATION of a tropical country presents climatic in-plant thermal problems of far greater magnitude than those normally encountered in the industrial countries of the West. It has been found by experience that, for the present at least, the statutory regulations providing for acceptable conditions of work, as regards temperature and humidity, in the United Kingdom, Germany and the United States, are not practicable in India. Before considering any new regulations or a revision of that portion of the Indian Factories Act which deals with ventilation, temperature and humidity control in industry, it was considered desirable to obtain adequate information on thermal stress.

Recognising the necessity for collecting adequate data on the different aspects of the problem as applicable to this country, the Government of India obtained the services of Dr. William F. Ashe as Thermal Environment Health Consultant through the U.S. Technical Co-operation Mission in India. Dr. Ashe outlined a programme of investigations to be carried out in the textile industry in Ahmedabad with the co-operation of the Ahmedabad Textile Industry Research Association, to ascertain the magnitude of the heat load problem in the textile industry and to determine the upper limits of tolerance to workers to heat and humidity. The project was jointly sponsored by the Union Ministries of Labour and Health. The results of reaction of the body or one that endures indefinitely or permanently life-long residence in a tropical country does not carry with it automatic acclimatisation for work in artificially produced climates that are unusually hot. The volunteer textile workers required a period of gradual acclimatisation in order to be able to work successfully in the experimental conditions that were being produced. This preliminary acclimatisation was necessary even though these men had been acclimatised naturally some months before (during the preceding summer), as that acclimatisation would have been retained only if they had continued to work every day in conditions as hot as those under which acclimatisation had been acquired. Living for a few days or for a few weeks in cool conditions results in loss of acclimatisation. It is very important for employers to direct men who are new at their job in severe thermal stress, or to direct men who have been away from their hot work, while on leave of absence, to make careful and slow adjustment again to the hot environment of their work. Equally important, perhaps, is the instruction to workers as to (a) profuse sweating, which is harmless, (b) large amounts of water, and (c) ample quantities of salt, both of which must be injected in sufficient amounts to avoid the ill-effects of water and/or salt depletion. These rather simple instructions, conscientiously given and followed, could help industry and labour to avoid nearly all cases of heat collapse. Also, for drinking purposes, cool water is more beneficial to workers than either very warm or very cold water.

The data obtained in the experiments conducted at Ahmedabad show that Indian men respond to thermal stress in very much the same way as do men tested in a similar manner in other countries of the world. However, Indian volunteers withstood thermal stress a little better than did men who have been tested in other countries. Any greater ability of Indians in this regard merits separate investigation. It is reasonably certain that Indian volunteers performed in severe heat at least as well as did the American subjects tested at Fort Knox.

In experiments carried out in several parts of the world, differences in responses of men to heat have been observed when various types of exposure to heat were tested. Such differences in responses were the result of increasing or decreasing any one of a number of factors such as (a) the amount of clothing worn, (b) the velocity of air movement, (c) the amount of work required of the workers, (d) the amount of energy radiating from the surrounding structures, etc.

Volunteers able to stand the highest levels of thermal stress were those reported to have been wearing the least clothing, but it may be of benefit to workers in India to wear minimum clothing consistent with propriety and safety. It should be stressed that under certain conditions, increasing air movement may change an intolerable condition into a tolerable one. However, at high temperatures, say about 100 degrees, high velocity of air in an add-large amount of heat to the human body and cause an already intolerable situation to become still more so.

When exposure to excessive heat is inescapable, the combined thermal and physical stress of the workers must be kept within safe limits (1) by reducing the rate of work or (2) by increasing the frequency of their periods of rest.

Near furnaces and other equipment that must be kept very hot during operation, special problems of thermal stress arise due to radiant heat. Each of the problems of this type should be investigated separately to establish the needs for shielding the equipment, the workers, etc.

Among Indian miners, the reported causes of heat collapse occurred near or above the line designated as relatively easy. These data merit consideration in setting an upper limit for the thermal stress that may be permitted in industry.

It is suggested by those who carried out the Thermal Stress Project that similar studies, including radiant heat loads, be carried out in the steel, glass, aluminium, paper and other heat industries in India. The project also recommended that (1) at the appropriate time, after additional information is acquired, the Factories Act be amended or supplemented to include realistic thermal restrictions compatible with health and productivity in a tropical country; and (2) the quality and performance specifications for the hygrometers (T-Wall) permanently installed in the mills under the Factories Act be modified to provide for an accurate and reliable instrument.

VARIETIES OF RUBBER GOODS

THE products of the Indian rubber industry number nearly 75. The chief varieties are: automobile rubber components, automobile tubes and tyres, balloons, belts, bicycle tyres and tubes, bicycle brakes, handle bars and footwears, gloves, soles and heels of various types, hospital sheets, hot-water bottles, icebags, mats and bedding, collars, moulded goods, plastic shoes, rubber corks, balls, railway rubber components, rubber fabrics, rollers, and tubing, surgical rubber goods, tennis balls, toys, rubber corks, vulcanising patches and wellington boots. This is a comprehensive range of manufacture, which gives rubber materials for a very large variety of uses ranging from wheels to aircraft tyres and tubes to and from hospital necessities to railway equipments. From bursting balloons, the range of products goes up to the hard elastic. From goods of play, it goes up to goods for various industrial uses.

OIL PRESSURE LAMP'S INDUSTRY

THE Government has accepted the Tariff Commission's main recommendation that protection be granted to the oil pressure lamps industry may be discontinued when the present period of protection expires on December 31, 1957. The attention of oil pressure lamps manufacturers, who import brass rods and tubes and finished components like pressure gauges, mantle holders, nipples, pump valves, etc., has been invited to the Commission's recommendation that they should like immediate steps to meet their requirements of these articles from indigenous sources. The attention of manufacturers, who do not have candle power testing equipment, has also been drawn to the Commission's recommendation that they should take steps to instal such equipment without delay.

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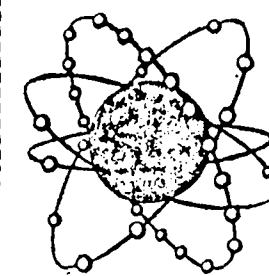
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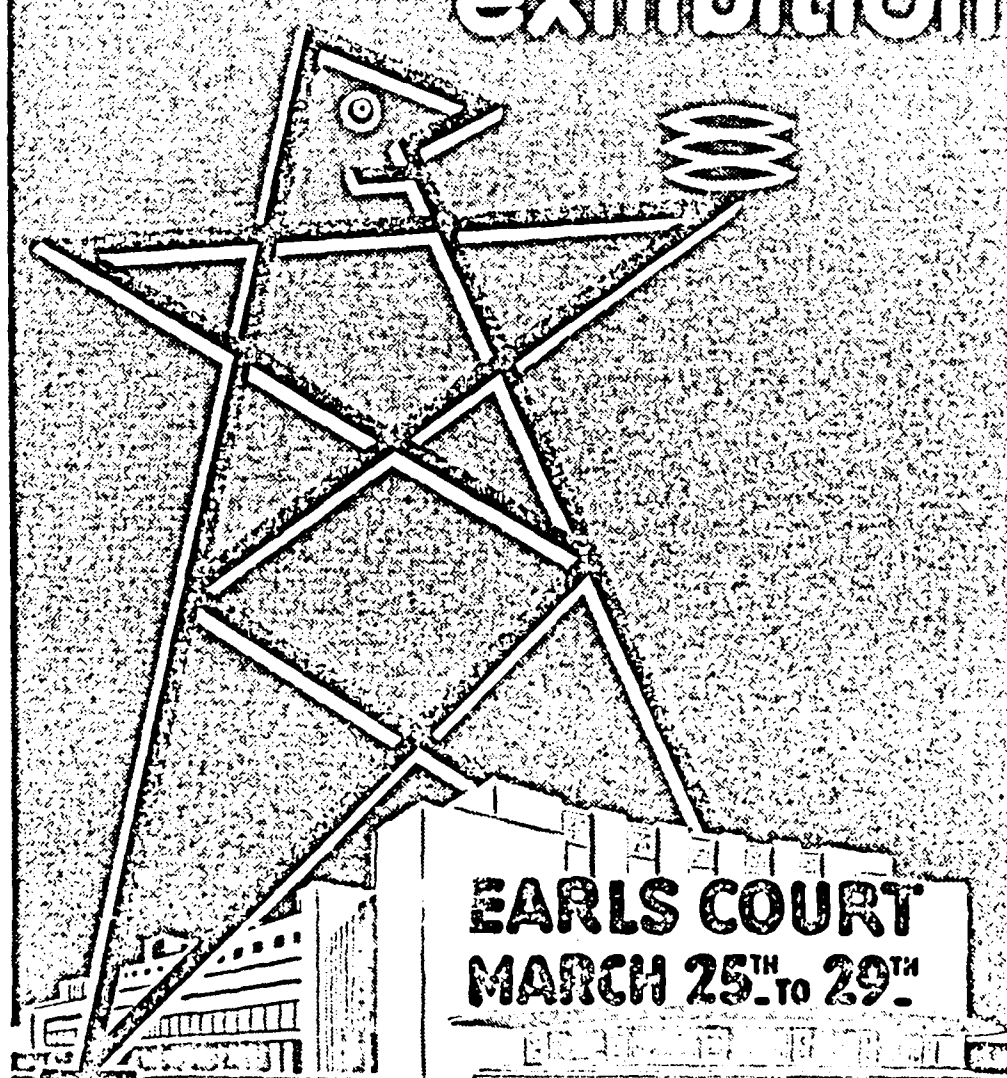
AGENT FOR INDIA:

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P.O. Box No. 1966. Telephone: 261978. Telegrams: "Wideeye, Bombay"



A.S.E.E.
1958

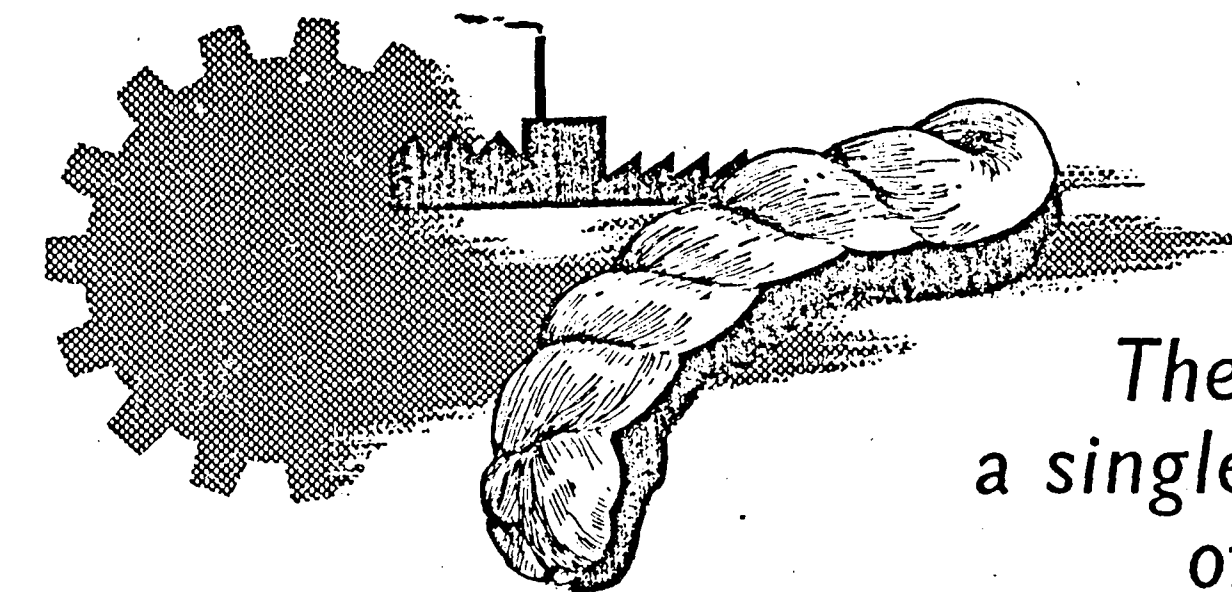
electrical engineers exhibition



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MARCH 25th to 29th

From 25th to 29th March, 1958, EARLS COURT, the huge Exhibition centre in London, will be the scene of the greatest Electrical Exhibition ever staged in the United Kingdom. It will be sponsored by the Association of Supervising Electrical Engineers.

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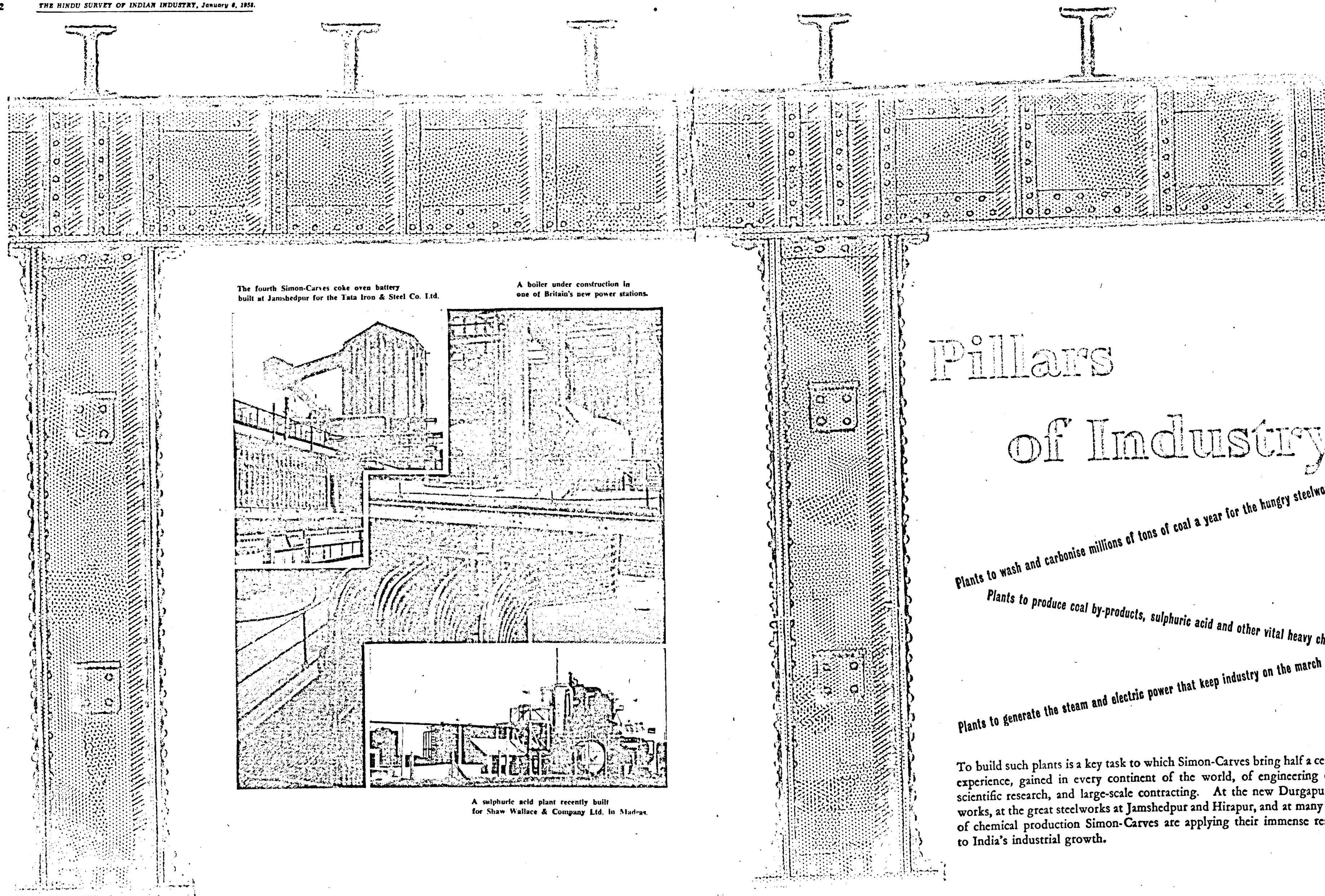
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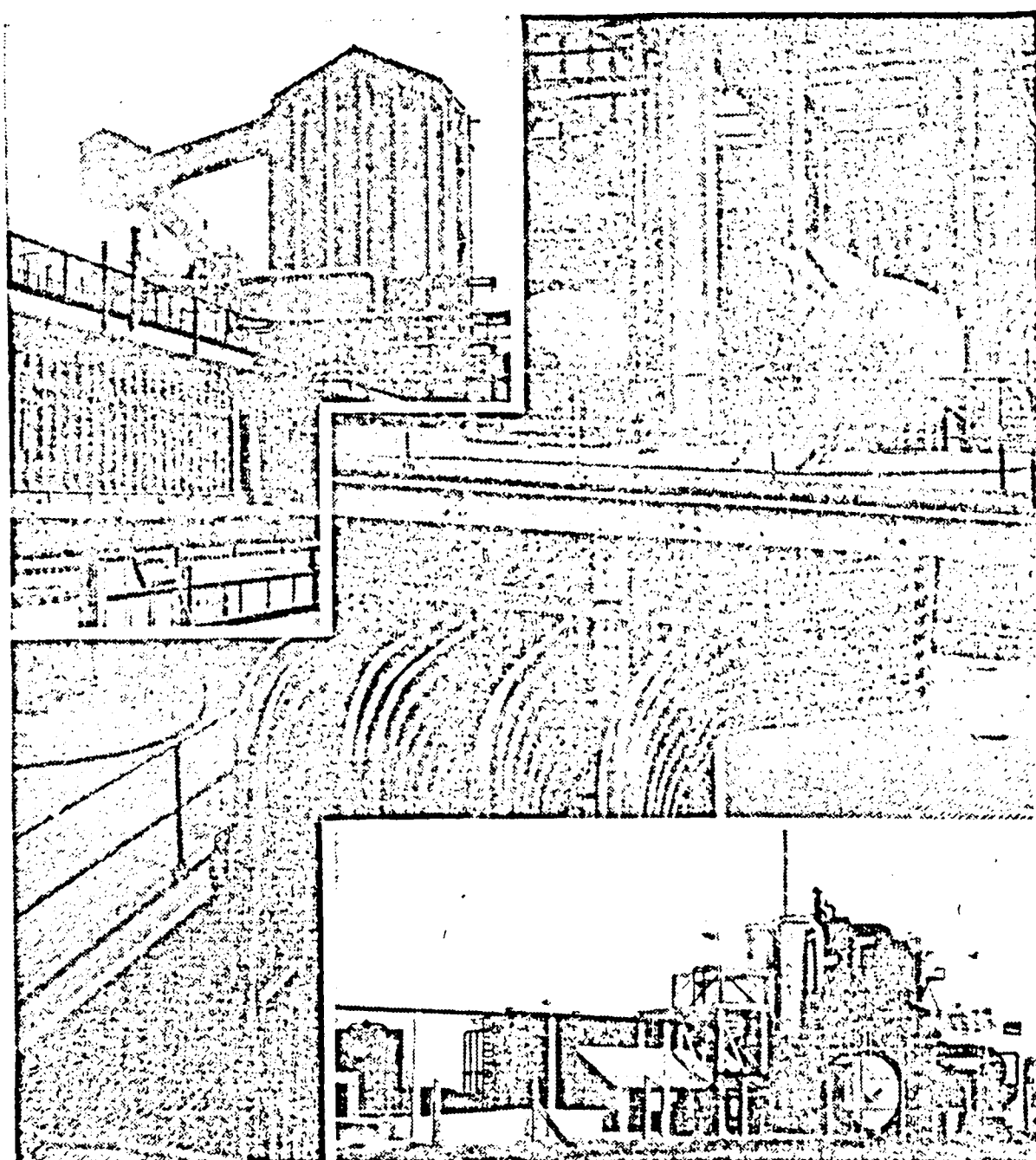
STORY OF THE BATTERY INDUSTRY

- AL 423



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A boiler under construction in one of Britain's new power stations.



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BATTERY INDUSTRY IN INDIA

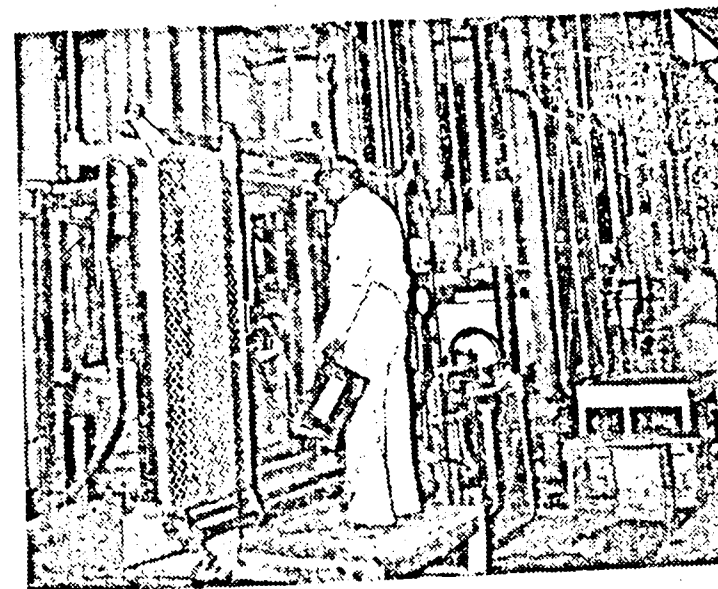
(Continued from page 71)

by the Indian Posts and Tele-
graphs Department, require most
careful manufacture as correctly
made plates give life of 10 to 25
years depending upon the type of
service involved. The average
reader probably does not realise
that every time he lifts up his tel-
ephone, a storage battery is in the
background in the exchange pro-
viding the electrical current re-
quired for the call which is being
made. Furthermore, these batteries
enable the telephone exchanges to
carry on in times of power failure.
Thus essential urgent calls are
not affected by such mains failures.
Special batteries for the ground-
starting of aircraft and for special
defence telecommunications and
signals purposes are also being de-
veloped by various manufacturers
and many of these are now being
made completely in India.

The Indian industry has also to
meet the new designs required by

the automobile manufacturers, who
obtain all their requirements of
original equipment batteries in the
country. There are in the country
some fifteen approved battery ma-
nufacturers, who come under the
scope of the Industries Develop-
ment and Regulations Act 1951 and
among these are one or two units
with first class factories comparable
with the best in Europe, America,
or in any advanced industrial coun-
try. The smaller units are also
showing a good progress and are
having their particular fields of out-
let. There is plenty of competition
which is a good thing and encour-
ages efficiency and quality. In this
age there is no doubt that the
consumer in India has become far
more quality conscious over the
last few years and as a result of
experience. The introduction of
Polymer separators some years ago
by Chloride and Exide Batteries
(Eastern) Private Ltd. has meant
that the previous weakest part of
a battery, the wood separator, was
avoided, and replaced by the in-
destructible plastic separator.

Because of the somewhat wide-
spread smaller assemblies or re-

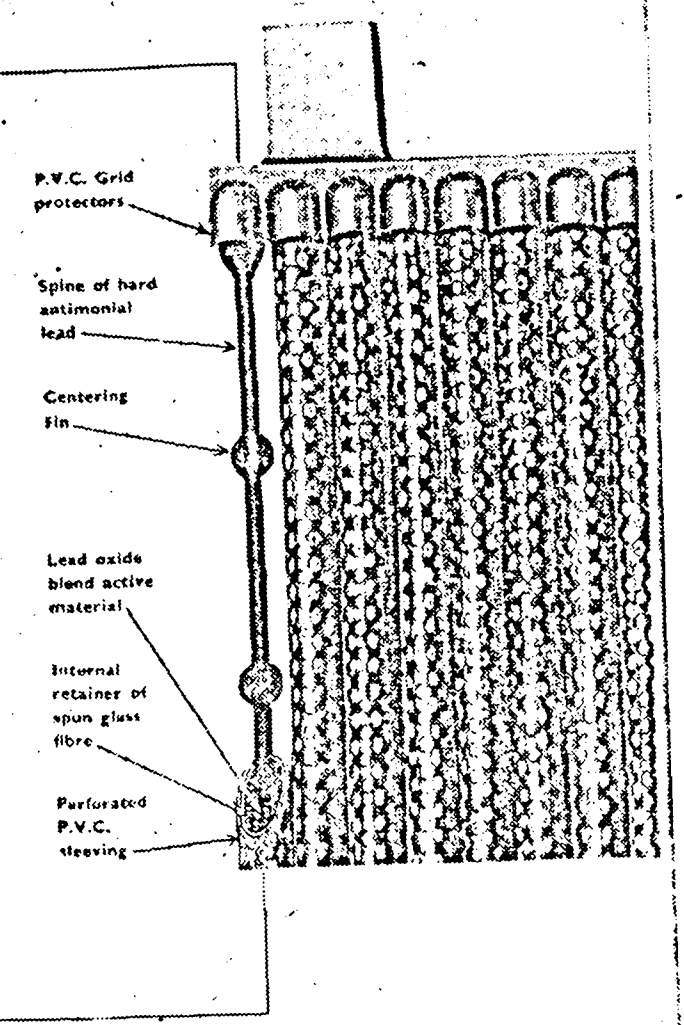


Powerful hydraulic presses mould the hard rubber battery con-
tainers at the Exide Factory.

builders, there is some times the
belief that the manufacture of a
storage battery is a simple matter,
but a visit to one of the larger
units does enable a somewhat clearer
appreciation of what is consid-
ered necessary for the production
of a quality engineering article.
Fully equipped laboratories includ-
ing air-conditioned test rooms,
chemical and electrical laboratories,
rubber testing laboratories in those
factories which make their own
containers, a thorough knowledge
of the various electrical, chemical,
rubber and plastic technologies in-
volved are all essential require-
ments. The better quality batteries
as produced in India under
correct quality control process
methods compare favourably
with batteries produced any-
where in the world and fur-
thermore in view of the rigorous
conditions which are met in the
transport field—maintenance not
always being of the highest stand-
ard, to say the least—this essential
need for top quality is a necessity
and not a luxury.

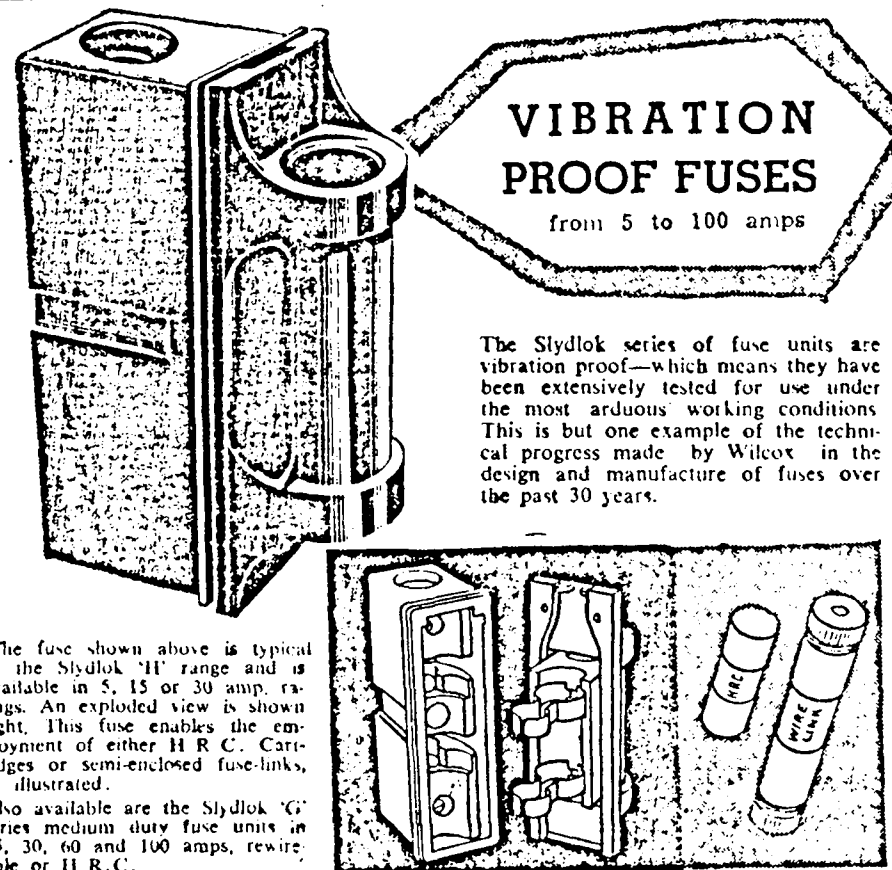
The Indian Standards Institute
has taken up the question of Stan-
dards for various types of batteries
and its specification for light mo-
tor vehicle batteries, have been in
operation now for some time past.
It is a sound specification based on
world practice in this matter and
it should not be beyond the capa-
bilities of the various Indian ma-
nufacturers to meet its require-
ments. It calls for various tests in-
cluding a very satisfactory life test-
ing procedure, all of which should
help to raise the quality of the bat-
teries available to the Indian con-
sumer.

It will be seen, therefore, from
the above remarks that the storage
battery industry has already ach-
ieved very creditable progress but
it has the challenge of an increas-
ing demand both by quantity and
by an increasing range of types of
batteries. It can be fairly said that
where there is sufficient demand
and production can be economical-
ly arranged, the Indian storage bat-
tery industry will certainly meet
this demand. It is keeping abreast
of latest techniques and has al-
ready, over the past few years, in-
troduced many new types of pro-
duction to its manufactures. A great
deal of new plant has been installed
over the past few years and this
has helped enormously in these dif-



A new type manufactured by Standard Batteries.

icult days when foreign exchange
expenditure must be kept to a mi-
nimum. In this respect the two largest
units have installed lead recovery
plants which in themselves effect
major savings of foreign exchange
each year, and which in times of
international crisis can help to keep
supplies of storage batteries avail-
able to all essential users through-
out the country where imports of
essential raw materials are pre-
judiced. Thus, this industry is cer-
tainly playing its full part in the
Indian economy.



VIBRATION PROOF FUSES

from 5 to 100 amps

The Silydlok series of fuse units are
vibration proof—which means they have
been extensively tested for use under
the most arduous working conditions.
This is but one example of the techni-
cal progress made by Wilcox in the
design and manufacture of fuses over
the past 30 years.

The fuse shown above is typical
of the Silydlok 'H' range and is
available in 5, 15 or 30 amp. rat-
ings. An exploded view is shown
right. This fuse enables the em-
ployment of either H.R.C. Car-
tridges or semi-enclosed fuse-links,
as illustrated.

Also available are the Silydlok 'G'
series medium duty fuse units in
15, 30, 60 and 100 amps, rewir-
able or H.R.C.

SLYDLOK 'H' SERIES FUSE UNITS

AND 'X' SERIES FUSE UNITS

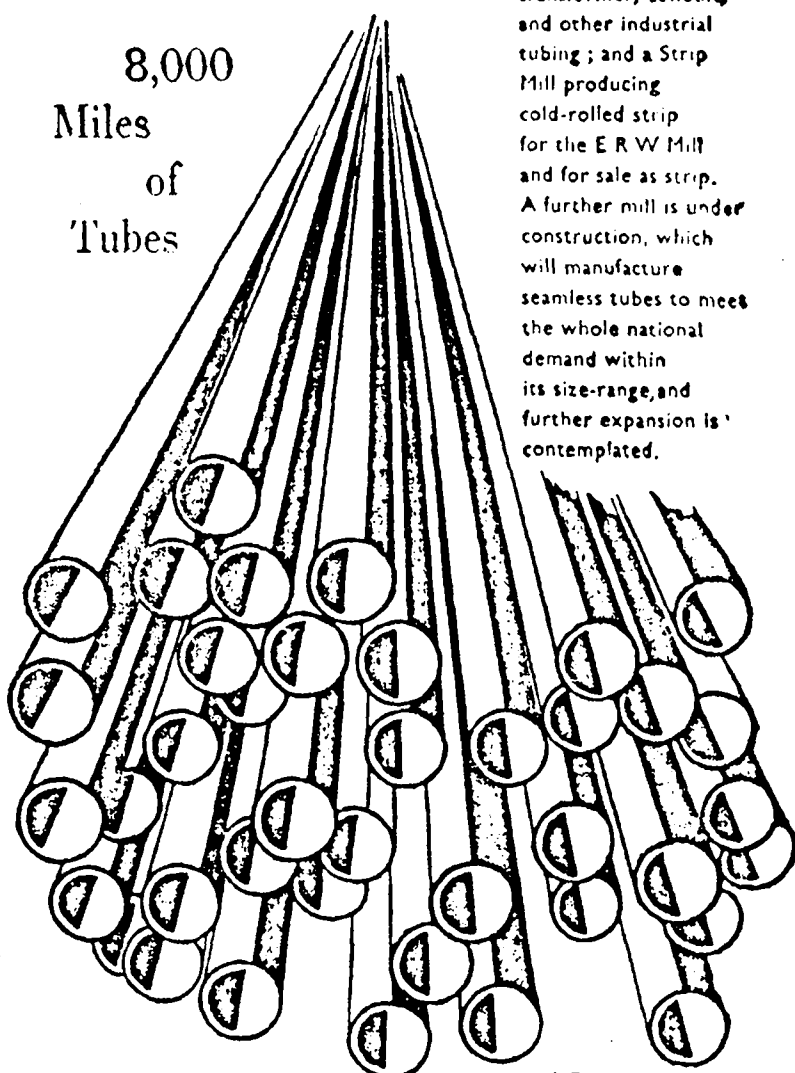
'X' type fuses have been exported to India for
many years—mainly in rewirable form in 5, 15,
30 and 60 amp sizes for 250 volt working.

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and other industrial
tubing; and a Strip
Mill producing
cold-rolled strip
for the E.R.W. Mill
and for sale as strip.
A further mill is under
construction, which
will manufacture
seamless tubes to meet
the whole national
demand within
its size-range, and
further expansion is
contemplated.

8,000
Miles
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Tubes

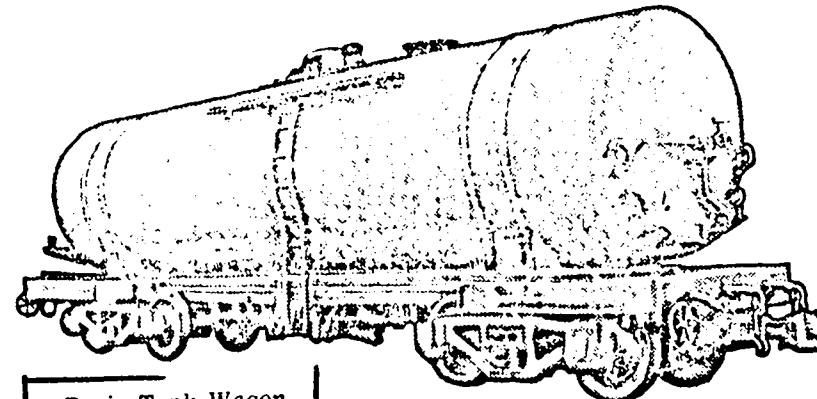


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Improved
for
many years

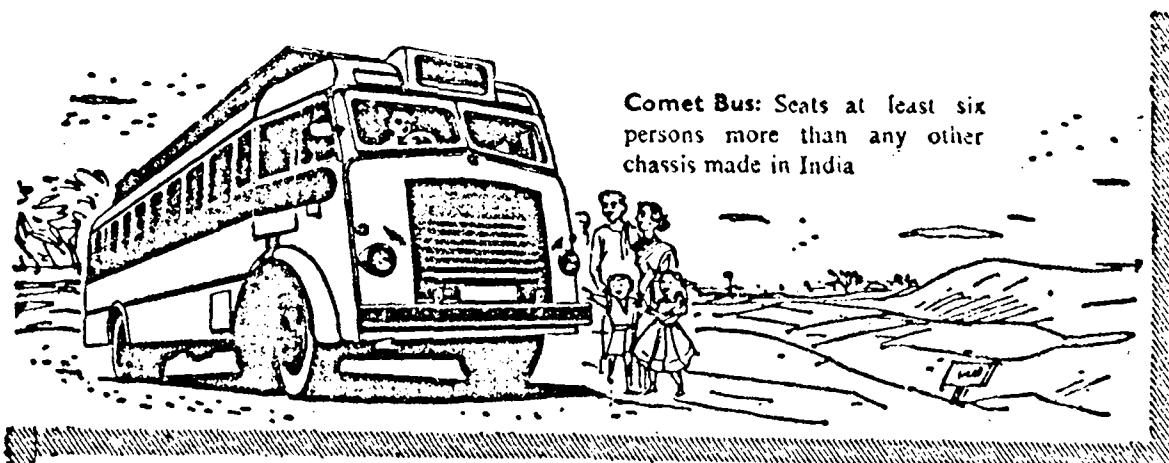
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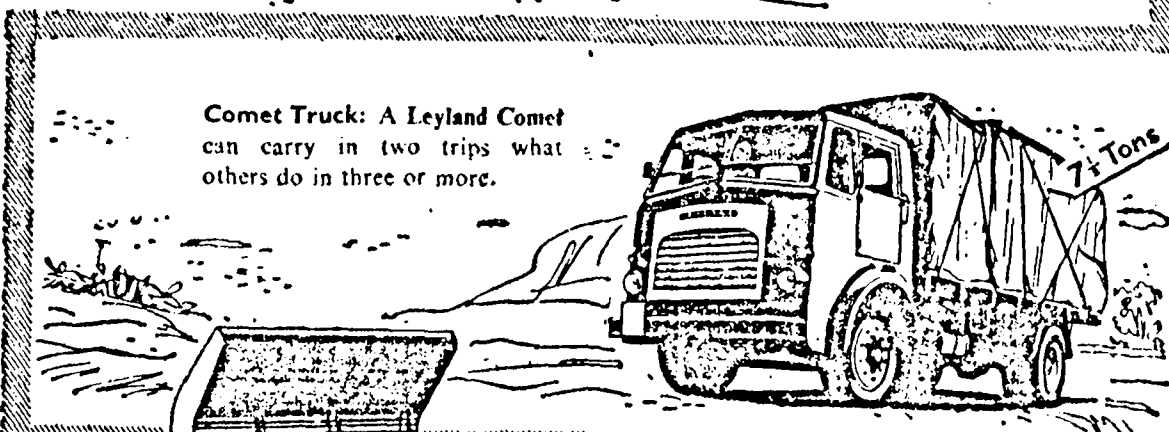
AHMEDABAD

Wherever there's heavy duty work to be done you'll find a Leyland Comet at work

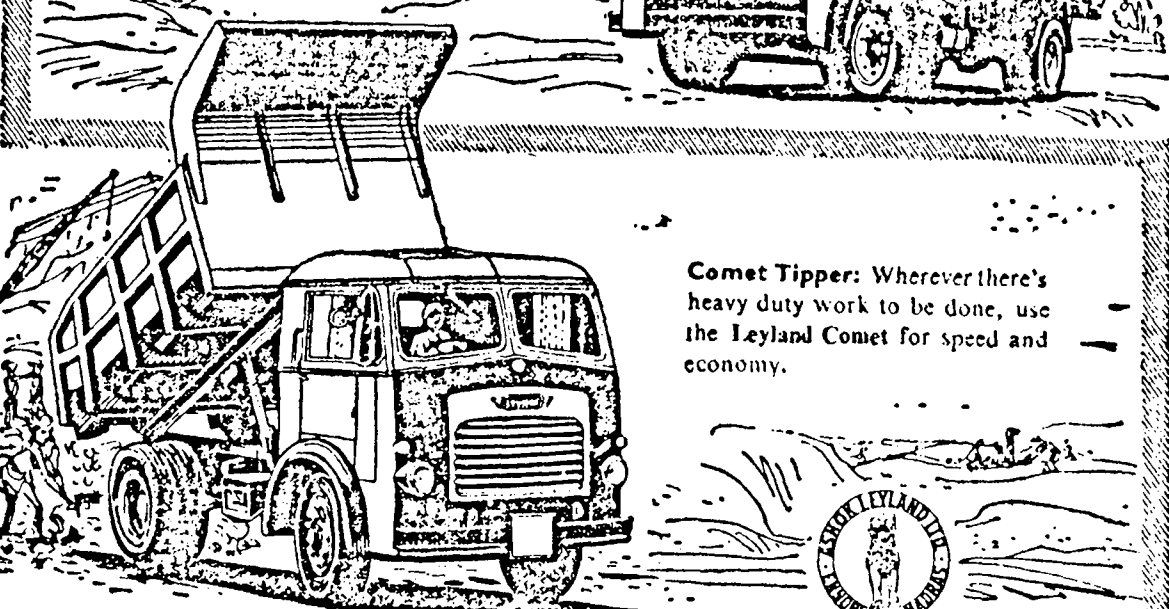
Whether what you need is a chassis for passenger transport, or a chassis for goods haulage, or a tipper, tractor or a special purpose heavy duty vehicle, there's none so economical and sturdy as a LEYLAND COMET. LEYLAND vehicles have proved their worth in phenomenally long life coupled with unrivalled reliability and economy in over sixty countries around the world.



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Comet Tipper: Wherever there's heavy duty work to be done, use the Leyland Comet for speed and economy.

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Ashok Leyland LIMITED

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LIGHT ELECTRICAL PRODUCTS

SIGNIFICANT RISE IN OUTPUT

THE production of electrical consumer goods such as lamps, fans, radio sets and batteries has increased from Rs. 5 crores in value in 1948 to Rs. 25 crores in the current year. The target production for the Second Plan is Rs. 40 crores.

There is in this country ever-widening scope for the production of light electrical goods, such as lamps, fans, radio receivers and batteries, considering that large-scale expansion in the output of electrical energy is contemplated in the Second and Third Five-Year Plans. During the period of the First Plan, the installed capacity for generation of electricity increased from 1.83 million kw. to 3.4 million kw. or by about 1.5 million kw. The Second Plan contemplates an increase of 3.5 million kw. in generation capacity, which will raise the total capacity to 6.9 million kw. by 1960-61. Tentative proposals for the Third Plan envisage a much higher level of output—about 15 million kw.

The increase in the output of light electrical industries over the period 1951 to 1956 ranges from 27 per cent to 93 per cent. On the basis of additional capacities, already licensed or approved, a large increase in the capacity of light electrical industries may be confidently expected at the end of the Second Plan. In fact, if the schemes now approved are implemented, the total capacity in several industries may be in excess of the targets fixed for them.

LAMPS

The electric lamps industry has made satisfactory progress, the output having increased from 15.3 million lamps in 1951 to 33 million (estimated) in the current year. It would, however, appear that the industry is not yet self-sufficient in respect of raw materials and components.

The present installed capacity for general lighting service and other similar lamps is of the order of 43 million and expansion schemes have been sanctioned for an additional capacity of 13 million lamps.

The capacity for the manufacture of fluorescent tubes and miniature lamps has been established during the First Five-Year Plan period. The production has increased substantially from 3.5 million in 1951 to a level of about 8.5 million during the current year. Substantial additional capacities have been sanctioned for expansion. Two schemes have been approved for creating capacity for special types of lamps, such as photo-flash lamps and mercury vapour lamps which have not hitherto been produced in the country.

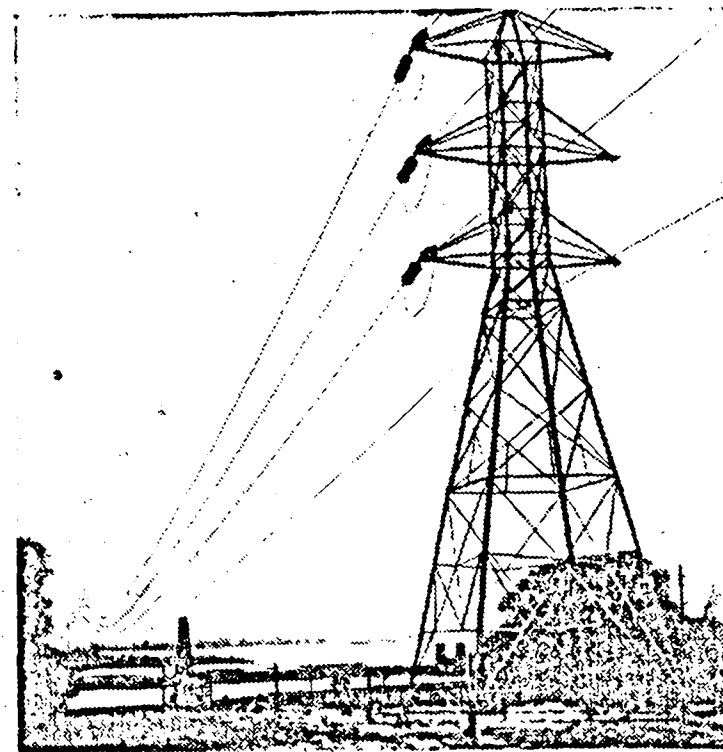
ELECTRIC FANS

The electric fan industry now produces over 500,000 fans a year, as against 212,000 in 1951 and a mere 180,000 in 1948. It is one of the new industries contributing to the country's foreign exchange earnings. Exports of fans are taking place at an annual rate of Rs. 20 to 25 lakhs.

The present level of production of the radio receiver industry is about 185,000 sets a year, as against 150,000 sets in 1956 and 83,000 sets in 1951. While items such as transformers, coils, cabinets, dials and miscellaneous metalware components are being manufactured in India and some beginning has been made in the manufacture of a few other essential components, the industry has still to cover a large field, represented by valves, condensers, resistances and loud-speakers.

HOUSE SERVICE METERS

Regular production of house service meters commenced from 1952 when the output was only 34,000 meters. At present production is running at an annual rate of 3,00,000 meters. The 1950-51 target, originally fixed by the Council at 450,000 single-phase meters, has since been revised to 650,000 meters per year. Schemes for expansion and new units for substantial capacities have been approved. The manufacture of polyphase meters has not yet been established in the country. Due consideration should be given to the manufacture of polyphase meters also.



Ganges Crossing: Cadmium Copper Conductors.

COPPER IN THE 'ATOMIC AGE'

By R. McAllister

THE progress of Sputniks in outer

space has diverted attention in recent weeks from important developments at ground level, which are of far-reaching consequence to India and other Asian countries. The key to the position is the peaceful use of atomic energy and the initial step in this direction is the advent of the operational atomic power station. The layman finds it difficult to grasp the basic facts of atomic physics. But in this application atomic energy is simply used as a source of heat to raise steam for generating electricity in the usual way.

Britain leads the world in this combined their resources and experience to undertake to erect atomic power stations in other countries. The Calder Hall generating station in England was the first atomic power station in the world, and atomic power stations for export are based on the same principle. Several stations are under construction in Britain and the first export order has come from Italy. The Italian station, which will have a capacity of 200 megawatts, will consist of a graphite moderated reactor running on natural uranium fuel, with a carbon dioxide gas heat transfer system to be used for steam raising. The actual generators will be of the conventional type. The contract provides for a period of seven years of collaboration and the British Atomic Energy Authority will be responsible for the extraction of plutonium from the spent fuel which will be returned to Britain for processing.

By supplementing existing sources of electrical power, the atomic stations more rapid and complete. India presents a vast field for the adoption of this new source of power if the necessary capital is made available. For the first time in history, electrical energy can be obtained without consuming fuels such as coal or oil, or the use of water power. It is the fact of being completely free from any dependence on such natural resources that makes the atomic power station unique and holds promise of a bright future to those countries which find a place for it in their development plans, having in mind that uranium is a very costly material.

Electrical power depends largely on copper, the best electrical conductor apart from silver. It is common knowledge that about half of all the copper that is produced in the world is consumed by the electrical industry. Most of it is in the form of wire for the windings of motors, generators and transformers employed in industry and in electric traction on railways. For cables of many kinds to provide light, heat and power wherever they are required, including domestic electrical equipment, and for telephone, telegraph, radio and television purposes. It will be seen that electrical power generation is supplemented by a great many manufacturing industries required to provide the equipment just mentioned and all taking advantage of copper's valuable electrical properties.

The very existence of sources of electrical power makes possible industrial expansion in many directions and it is said with truth

that there is scarcely an industry which does not use copper in one form or another. Copper for chemical plant, for instance, where copper's high thermal conductivity and resistance to corrosion have made it a traditional material for distillation plant and in brewing. Copper sheet roofing acquires a pleasing green patina as well as providing a roof covering that will outlast the fabric of the building. Copper tubes for hot and cold water, sanitation, and gas services are easily installed, neat in appearance and require no painting or other maintenance. In the automobile industry, great quantities of copper and copper alloys are incorporated in such items as radiators, fuel pipes, wiring and instruments. Many vital components of aircraft also depend on copper.

COPPER ALLOYS

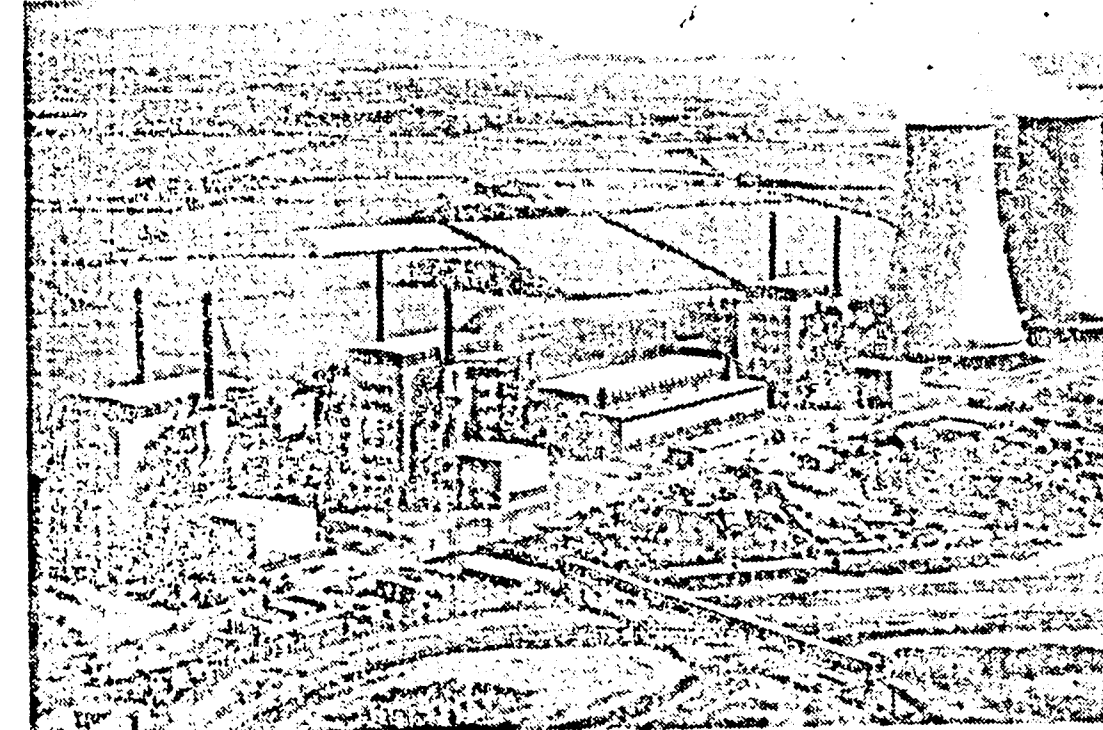
Many centuries have passed since the discovery that the addition of tin to copper produces a material called bronze, which retains some of the attractive properties of copper and yet has greater strength. A considerable history lies also with the copper alloy known as brass, in which zinc is the added element. But the importance of these materials is infinitely greater to-day than at any previous time.

Metallurgical science has made available a great number of bronzes and brasses of different compositions to suit the requirements of engineers and designers. Indeed, copper can be readily alloyed with many metals, including silver, cadmium, chromium, tellurium, beryllium, aluminium and nickel, and such elements as arsenic and silicon. The alloys retain most of the attractive properties of copper, such as thermal and electrical conductivity, ease of working, machining and joining, mechanical strength and resistance to corrosion.

A thorough knowledge of these materials and of their behaviour under widely varying conditions lies behind many technological advances of recent times, particularly in the new branches such as radio, radar, electronics, and in instrumentation and automatic control assemblies. In addition to the many vital roles in engineering played by copper and copper alloys, they are found in many items of everyday use such as pots and pans, safety pins, slide fasteners, pen caps and nibs, costume jewellery and cosmetic containers, screws and rivets, cigarette lighters, spectacle hinges, coins and medals.

It will be seen that if the financial obstacle to the adoption of atomic energy for the generation of electrical power can be surmounted, the possibilities of industrial expansion will become limitless. In this new industrial revolution, copper and copper alloys will be vital materials. India is not a great copper-producing country, and must rely on imports to make possible a policy of setting up an Indian industrial economy, but this must not deter the copper industry from playing an important part in all new developments.

Users of copper and copper alloys are fortunate in having at their disposal the services of an organisation whose sole purpose is to help them to make the most of copper. This is the Copper Development Association, 55, South Audley Street, London, W.1, which offers technical information and advice, and a number of excellent publications, without charge to those who show evidence of responsible status.

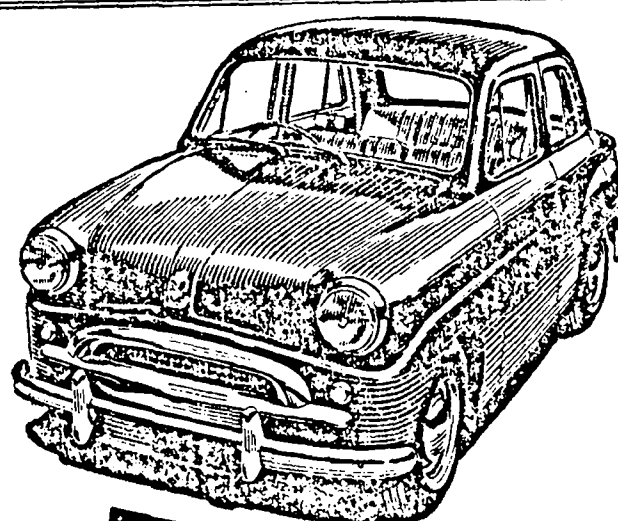


A general view of Calder Hall 'A' Power Station. (Courtesy: Atomic Energy Authority).

TRAVEL MANNERS

- ★ **CLEANLINESS** is next to Godliness. Let us cultivate the habit of cleanliness. We can help by not throwing scraps of food, skins and peel of fruit and water on platforms or in compartments. These should be consigned to the dustbins.
- ★ **SPITTING** indiscriminately on platforms is unhygienic. It is also bad manners. Let us use spittoons.
- ★ Let us not use cooled and filtered drinking water for other purposes.
- ★ Let us avoid sitting with the feet on the seat. This is annoying to others in the compartment, and is not good manners either.
- ★ Booking our heavy luggage in the brake-van will give our fellow passengers and ourselves more room in the compartments.
- ★ It is an offence to smoke in a railway train when requested by a fellow passenger not to. Let us avoid smoking when requested, or when the compartment is crowded or the doors and windows are shut.
- ★ Railways are the Nation's property. We can help to safeguard these by apprehending persons pilfering or causing damage to railway property. They should be pointed out or turned over to uniformed Railway Staff on duty. Unsocial elements indulging in unauthorised alarm chain pulling could be dealt with in like manner.

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THE HINDU SURVEY OF INDIAN INDUSTRY, January 6, 1958.

DEVELOPMENT OF RAILWAY TRANSPORT FACILITIES

By L. A. Natesan

Economic Adviser, Railway Board

THE profound influence of transport on economic progress has been clearly seen ever before. This has been recognised in the Second Five-Year Plan which placed the allocation on Transport and Communications at Rs. 1,365 crores out of a total of Rs. 4,800 crores. Of this amount, Railways have been given Rs. 900 crores—besides the contribution of the Railway Development Fund estimated at Rs. 225 crores. The allocation of expenditure in the Plan for road transport, ports and harbours, shipping, inland transport, civil air transport, other transport, post and telegraph and other communications, and broadcasting to be incurred by the Centre is only a little above a third of the railway figure and, including the allocation to the States, the outlay under the non-railway items will amount to a little over one half of that under the Railways.

The comparatively large expenditure on railways has been a subject of certain amount of controversy, but when all has been said it has been accepted that so far as the immediate future is concerned the bulk of the burden of the new traffic, generated by the Second Five-Year Plan will have to be borne by the railways. This is the main reason why railway development programmes have been given priority and special importance. Under the stress of the foreign exchange difficulties, the question of the test using of the Plan and concentrating on what has been deemed the core of the Plan, including the Steel Projects, railway schemes, ports, etc., has also focussed attention on the crucial role played by rail transport.

Although the doubts that railways have over-estimated their requirements have been largely dispelled, it is still necessary to emphasise the fact that the rate of increase in the demand for transport tends to exceed the rate of increase in the quantitative output of production. Expressed differently, during a developmental period the ton mileage measuring the quantum of the transportation tends to increase faster than the tonnage moved. Thus, for instance, during the thirty years of economic expansion of the United States 1929 to 1958, the tonnage originated on the railways rose from 100 to 181, the ton mileage increased from 100 to 264. The same feature has also been disclosed by the USSR during the decade 1928 to 1937. After analysing the experience of the two countries, Mr. James H. Blackman concluded:

"For the thirty-year period in the United States ending with 1929 the composite freight turnover of all carriers grew about five-fold, whereas total commodity output increased less than three-fold. This means, on the average, that freight traffic volume grew at over 1.5 times the rate of commodity production. Roughly comparable figures for the USSR for the period 1928-39 reflect similar disparities."

(Soviet Economic Growth, Edited by Abram Bergson, Chapter 4, Transportation, p. 135).

INCREASE IN TON MILES

The reasons for the greater increase in ton miles are inherent in the very process of economic growth. Transport is a function of production. The interdependence of the volume of traffic and production may be seen clearly during a period of economic growth and development. During such a period, a number of factors come into play, such as, a rapid increase in production, greater emphasis on distribution, accentuation of large-scale industry, movement towards territorial division of labour, increase in the volume of interregional traffic as a result of regional specialisation in production, etc., increase in the spending power and the cycle of increased demand for the output of consumer goods in the country. The effect of these developments on rail transport will be reflected in a steady progressive rise in net ton miles. Where rise in net ton miles is not accompanied by a corresponding increase in the means of transport, the type will react to the increased demands of transport in accordance with the comparative importance of the country's economic position. Where only a particular type of transport, such as Railways, is relatively more important, in India, this important type will have to form a greater proportion of the load of the new traffic and the load of the new traffic will be borne by the railway. The character of the increase in freight transportation on Indian

resources for other activities would be reduced, the costs of production would tend to rise, and the higher prices are likely to restrict demand and therefore consumption. Consequently, it is imperative to ensure that the supply of transport is being rendered with the maximum economy in real costs. This is likely to be brought about only by progressive improvement in the efficiency of operation. From this point of view, it is a matter for gratification that the Indian Railways have been making in recent years significant advances in operating efficiency. When progress in efficiency in operation on Railways, there is no single index which can afford an overall appreciation of the improvement. It is necessary to watch a number of indices of various aspects of railway activities, such as the serviceability of vehicles, its utilisation, speed of transport, fuel consumption and the ancillary activities of shunting operations. The improvement in the standards of work, as compared with 1950-51 may be judged from the statistics given below:

FACTORS IN RAILWAY OPERATIONS			
	Broad Gauge 1950-1 1955-6	Metre Gauge 1950-1 1955-6	
Percentage Serviceable locomotives	81.05	83.3	82.26
Percentage Serviceable passenger vehicles	83.83	89.8	91.0
Percentage serviceable wagons	92.72	95.5	91.36
Engine miles per passenger engine per day	135	164	131
Engine miles per goods engine per day	93	94	87
Gross tonnage per goods train	1,049	1,122	1,028
Net tonnage per goods train	479	524	428
Wagon miles per wagon day	38.7	40.3	38.5
Net ton miles per wagon day	454	541	312
Net ton miles per goods train hour	3,253	5,241	1,864
Punctuality of passenger trains	79.79	77.99	71.41
Speed of goods trains	10.8	9.84	9.32
Lbs. of fuel consumed per 1,000 gross ton miles: Goods and Prop. of Mixed	164.1	135.8	203.0
Shunting miles per 100 train miles: Goods & Prop. of Mixed	192.2	182.0	234.9
Wagon miles per shunting hour	61.3	64.9	6.34
	39.8	38.5	40.8
	346	391	383

We have in India another serious disability brought about by a railway system of multiple gauges. We have at present roughly an equal length of broad and metre gauge route mileage. Although this is a heritage of the past it has led to two distinct spheres of operation with non-interchangeable types of equipment. Consequently, the movement from the broad gauge to the metre gauge and vice versa becomes impossible and traffic has to be transhipped from one to the other. This leads to delay, damage in handling and additional expenditure and effort in connection with the transportation. The question of the uniform gauge has come up from time to time and this is obviously a long-term problem. We are not the only country suffering from this inconvenience of different gauges. Australia has the same difficulty. But the existence of the different gauges, however, has maintained real costs of transportation higher than might

(Continued on next page)

NEW POLICY FOR SHIPPING

By S. N. Hajji

Chairman, All-India Manufacturers' Organisation.

With the dawn of Independence in 1947, the outlook for national shipping companies completely changed and with the assurance by the Government of India that a "dynamic" policy of development of Indian shipping would be pursued, several shipping companies came into being. Since then the growth of Indian shipping has been by and large dependent upon the availability of funds for expansion of fleets. So far the Indian merchant fleet stands at the modest level of 570,000 tons gross and carries practically the whole of the coastal traffic and about five to six per cent of the overseas trade of the country. The aim of the nation is to carry, besides the whole of the coastal trade, which has been reserved for national shipping, at least 50 per cent of the overseas trade, which is the proportion universally acknowledged as the inherent right of the merchant marine of a maritime country. To do this, it was estimated 10 years ago that a fleet of two million tons was necessary, and this was acknowledged as the national target by the Government of India. But since then the country's coastal as well as overseas trade has been rapidly expanding and the estimates were made. It was of things to revise this national target reasonably upwards, but in the meantime, targets for the Five-Year Plan have been set under the Five-Year Plan initiated in 1951. The First Plan contemplated a target of 600,000 tons by 1956. Owing to many reasons, among which was the considerable hesitancy of the Government in executing its policy of assistance to Indian shipping companies, particularly in the matter of funds for the purchase of ships on reasonable and eco-

nomically sound terms, the progress was rather slow. Fortunately, thanks to the intervention of the Ministry of Shipping, the Minister of Transport, the difficulties were overcome to an extent and the Indian shipping companies entered on a programme of acquiring ships resulting in a tonnage of 400,000 G.R.T. at the end of the First Plan period, with an additional tonnage of 120,000 G.R.T. on order, thus making up the target of 600,000 tons.

TARGET FOR SECOND PLAN
The target for the Second Plan is 900,000 tons. Although the Indian shipping companies could not reach this target as a modest target, in view of the opportunity of the huge movement of goods along the coast and in the foreign trade of the country that was expected as an offshoot of the development of industries and agriculture, they plunged into the target at the earliest moment of Rs. 37 crores that had been provided in the Plan for the beginning of the Plan itself. But, as the amount provided was not enough even to achieve the minimum target of 600,000 tons, the Government had to order the construction of 28 vessels, aggregating 181,000 G.R.T. for reaching the Plan target. It

is imperative in the national interest that this target of 900,000 tons should be achieved, if not exceeded, and temporary difficulties should not be allowed to come in the way of progress. Since the utilisation of the Plan funds, there has been almost a stalemate in the progress of the shipping industry.

To meet the absence of loan funds at home and of foreign exchange abroad, the Government of India announced in September last in Parliament that they would be prepared to consider proposals for foreign equity participation on the basis of 49 per cent, leaving the balance of 51 per cent in Indian hands. Possibly, it was due to this decision that compelled the Government to announce this step, but even so no results have ensued. It was all to the good, therefore, that the Minister of Transport was able to announce at the Annual Meeting of the Indian National Steamship Owners' Association that the Government had accepted his earlier suggestion of a non-refundable Shipping Development Fund for providing cheap rupee loans for the purchase of tonnage.

While referring to the subject earlier, the Transport Minister had stated that he hoped to persuade his colleagues in the Finance Ministry, to provide about Rs. 10 to 12 crores annually to feed the fund. Though it is not the Minister of Transport in his address to the Indian National Steamship Owners' Association did not refer to the exact amount that will be available. It is hoped he will succeed in getting a provision of at least Rs. 10 crores a year so that this amount together with the amounts of rupee loans that have been provided to the shipping companies and interest thereon will enable the Government to provide the essential fund required to reach the target fixed for the Second Plan. It was good to learn that foreign exchange earnings of Indian shipping will also be available to be utilised for development of Indian shipping. Furthermore, the Minister has expressed the hope that the development rebate will be increased "well above the present figure of 25 per cent" in view

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have been the case. The situation does not appear to be without a short-term or even immediate solution, judging from a recent development on the North American Railways. This is the Trailer-on-Flat-Car, more commonly referred to as the piggyback service, which consists of a trailer on wheels. The trailer which has the consignment loaded on it, rolls on and off the flat car and enables door to door service being rendered on rail-cum-road transport. Use of these trailers has enabled goods to be moved by road and rail without involving any loading and unloading of the consignment at the rail points of origin and destination. In the United States the trailer also moves across the river or sea. The use of the trailer-on-flat car in the United States has spread from coast to coast during the last few years, and appears to have fitted in with the policies of both its reorganised truckers as well as the Railways. In a development of this type may probably be seen an early solution to the problems of gauges and transport shipment points in our country.

Emphasis has to be laid on real costs as any decrease in these will be reflected in the general level of freight rates. In fact, one must say that over a period, economies in operation and improved methods tend to bring about a steady decline in the rate of freight charges to other costs. It is the operation of this factor that has steadily helped to extend the market, increase output of goods and decrease the cost of production and prices.

Another important development in recent years has been the more progressive attitude towards standard of living, and in accordance with this, the cost of labour in sympathy with these liberal ideas, has increased expenditure on this. Increased expenditure on this has been financed out of the economies resulting from increased productivity and higher efficiency. The cost situation would have been affected adversely and prices would have had to rise with corresponding increases in the cost of production and the markets. Mention is made of this aspect here for the reason that in future we may have also to take into account the same trend which have been found so effective and absorbing increased wage and other costs.

FREIGHT RATES

The pricing of transport is expressed by the freight rates. From what has been stated, it is clear that the factors calculated to raise costs have to be offset by better efficiency and augmented productivity. But the existence of the different gauges, however, has maintained real costs of transportation higher than might

Mention is made of these costs because so far as can be seen from the immediate future there can be no question about the increasing demands for economies in freight rates, such as to help small scale and cottage industries, to render similar assistance to large-scale industries to promote export trade, etc. The report of the export Promotion Committee, 1957, while examining the question of aid to export promotion, observed that transport costs sometimes formed a substantial part of the prices of the product and that, in fact, international trade did not take place in certain commodities because of prohibitive transportation costs. Amongst the various recommendations of the Committee, it is an essential railway freight rates to export commodities. This is not the occasion to examine the economic implications of such measures. There can, however, be no doubt that such a policy of concessional freight rates in connection with export promotion policy, there will, unless the cost of such assistance is absorbed by economies of the type mentioned, inevitably be a corresponding increase in the freight rates on the non-export traffic moved by railways within the country. Changes of this kind will have far-reaching effects on the geographical distribution of the level of employment and wages in these two segments, etc. This is one of the reasons why particular attention has to be paid to the factors tending to keep down the real costs of transport.

It has been stated already that the improvement in operating efficiency and increased productivity have acted as a cushion to absorb some of the effects of such increase in recent years towards raising the real cost from this point of view certain of the more recent developments connected with the reorganised truckers and the more important of these are the introduction of electrification of the Eastern Railway, the development of piggyback service of the centralised traffic control and the trend towards the larger capacity wagons.

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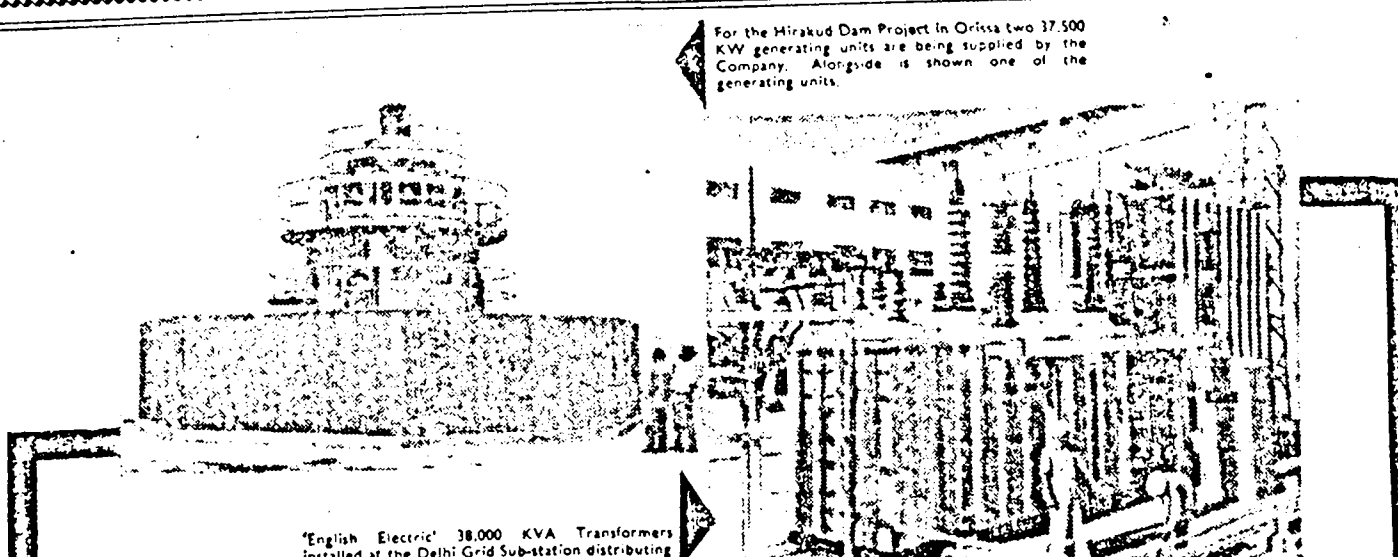
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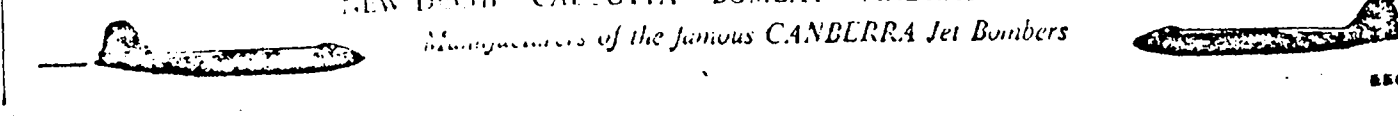
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TRANSPORT UNDER SECOND PLAN

By Sir L. P. Misra
General Manager, Hindustan Motors Ltd.

In a comparatively undeveloped country like ours striving for a higher standard of life with a balanced economy no problem with a bearing on this object can be neglected but whatever the development in other fields, transport needs will be found to be common as lack of adequate transport facilities will hamper progress in all these activities. The need for an all-round effort for the development of transport facilities to meet the growing volume of traffic resulting from our Plan is, therefore, overriding. This is hardly the time for us to discuss the merits and demerits of the various types of transport available in the country nor is there any justification for any fear resulting from competition among them for competition can come into play only when supply exceeds demand. As things stand at present and are likely to be for some years to come there is not the slightest chance of the supply of transport facilities over-reaching the demand. There is a consensus of opinion among all concerned that a substantial percentage of the traffic offering in the course of the First Plan could not be carried in time and retard the general development resulting from the impetus of the First Plan. The Second Plan offers a still bigger challenge to those in charge of the various forms of transport in the country.

AGREEMENT WITH JAPAN

The annual lift involved in the targets of production laid down in the Second Plan was carefully worked out at the beginning of this financial year by a number of associations and individuals in the country. It amounted then to 270 million tons. Various Ministries concerned, though sceptical then, are now veering round to this over-all figure. Since then the annual targets originally laid down for cement and foodgrains have increased by four and twenty million tons respectively. Recently, as a result of the agreement with Japan, the overseas trade is estimated to increase from 18 to 30 million tons. These are only recent additions to the lift. You may be certain that as the Second Plan develops many unexpected additions will have to be made to the original target of 270 million tons. The problem before the country is how to deal with these lifts without increasing the allotments already sanctioned in the Plan. The following four alternative methods of transport are available in the country: (i) Railways, (ii)

Sea-routes along the Coast, (iii) Inland waterways and (iv) Roads. For over three-quarter of a century since their inception, the Railways provided the quickest and the cheapest form of transport. In fact, the general estimate even now is that they are providing about 85 per cent to 90 per cent of the total ton miles annually carried in the country. Naturally on their well-being and well-doing depends the welfare of the State. Whatever developments take place in other forms of transport, Railways' contribution will remain for some years a major portion of the country's transport efforts. Only two years back the Railways were annually lifting about 85 million tons. They have now programmed for a lift of 180 million tons per year by the end of 1960-61. The cut made in their original allotment of Rs. 1,425 crores is also being restored. There is, however, very little chance of their getting more than the sanctioned amount during the currency of the Second Plan. In fact, even if more funds could be placed at their disposal, the Railways would not be able to spend more than what has been sanctioned for them. The only obvious alternative left for them in the circumstances is to get the maximum out of the equipment and resources likely to be available at the end of the Second Plan by (a) increasing the output of each wagon in course of the year and (b) utilising the staff on Railways in the most efficient manner practicable.

UTILISATION OF WAGONS

So far as utilisation of wagons is concerned, Railways do not get the best out of them either in respect of the mileage run or the tonnage carried. It is common knowledge that a wagon is kept moving in India on an average for about four hours out of twenty-four. Out of the remaining 20 hours, about 17 hours are wasted in halts, in junction yards or sick. It is heartening to find that the Railways have undertaken a special drive now for improving the output of their wagons on both these counts. They have in fact already achieved much better output than what could be thought of a few years back.

In regard to utilising the staff, there has been a very considerable increase in the number of Railway staff and this should be a matter of concern to all concerned. As a result of the economic depression of 1931, all the Railways in India undertook a

job analysis of the work done by each Railway employee. It led to improved efficiency and very considerably reduced the number of men in employment. The present is a very opportune moment for a similar job analysis being undertaken. With the development of traffic, the Railways will be requiring more and more staff and would easily absorb those found surplus after the job analysis. The two suggestions mentioned, if carried out are bound to increase their target of lift by at least 10 to 15 per cent leading to an increase in the programmed lift to 210/215 million tons with the equipment and staff at their disposal and not unduly raise the cost of this lift.

COASTAL SHIPPING

The present tonnage of the coastal shipping is about 2,14,000. Efforts are being made by shipping companies to increase it but their problems are enormous. Any substantial improvement in their lifts will involve provision of additional tonnage which takes time to build. In any case, they will be encouraged to raise their target of lift through improved output of the present vessels or procurement of new ones by about 10 million tons.

Inland waterways have been sadly neglected in the past. We have in India about 25,000 miles of rivers and canals with a perennial flow but out of this only 5,760 miles are being utilised—(i) 1,537 miles navigable by steamers, (ii) 1,474 miles navigable by large country-boats and (iii) 2,748 miles of canals and backwaters navigable by comparatively smaller country-boats.

The Government has now realised the importance of inland water transport and is concentrating its best energies on its development. Unfortunately, the improvements contemplated or in hand are in the nature of long-term measures and involve large amount of capital expenditure. Such improvements are likely to materialise after some years. No immediate relief can, therefore, be expected from them. There is, however, considerable scope for development in this direction through the construction of small country-crafts of 5-ton capacity costing about Rs. 5,000 and requiring a maximum draft of 2 feet of water. They can still play a very useful role in taking over traffic (betweens rivers and centres of population) consisting of foodgrains, firewood, timber building material, ores and other traffic of a

(Continued on Page 84)

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HIRE PURCHASE FINANCE

By B. T. Thakur

Chairman, Hindustan Motor Corporation Ltd.

WHEN even organised banking is so backward in India, it is no wonder that there are so many gaps and deficiencies in our credit structure. We lack many specialised types of financial services, which exist in other countries. Credit agencies are handicapped to commerce and industry. As the Indian economy grows, the lack of well developed banking system and absence of specialised credit agencies becomes more pronounced.

But at the present moment when the danger of inflation still persists, introduction of new types of credits may tend to aggravate the inflationary potential. No one wants the force of inflation to gather further strength.

All types of credit do not lead to increase in prices. The secret of efficient monetary management, however, lies in discriminating control of credit. Loans and advances against consumer goods and foodstuffs, which are in short supply, would obviously increase the distributors' capacity to hold up sales for increase in prices, and will therefore be inflationary in their effects. On the other hand, the financing of transport services which help in the quicker movement of goods and commodities may assist in their more even distribution and thus check the rise in prices in those areas where, due to lack of means of communication and movement, the supply may be inadequate. Qualitative control of credit is more important, from the point of prices, than quantitative restrictions.

I am dealing with the subject of hire purchase finance, not with a view to its immediate or universal introduction but subject to the limitation that its establishment must cover only the type of goods as help deflationary, and not inflationary forces; and that prior approval of the Central Monetary authority must be obtained for its introduction.

PRACTICAL ASPECTS

In its practical aspects, hire purchase finance resembles to a large extent sales on instalment credit. Instead of the buyer paying the price of the article purchased, in cash or in instalments, he pays a fixed future date, the seller and buyer agree that the latter would pay to the former an agreed amount of money, more or less, somewhat higher than the cash sale price, not in one lump sum but in a number of instalments spread over a fixed period, at equal or predetermined intervals.

There is, however, one material difference between the two types of finance. When an article is bought on credit and its price is to be paid at some future date, whether in lump sum or in instalments, the ownership of the property passes over to the buyer and the seller's remedy for anything due to him would be on the basis of unpaid dues. But in the case of hire purchase finance the goods continue to be the property of the financier-seller, who is owner in law. The potential purchaser becomes the hirer, with right to buy for a nominal sum of a rupee or so, known as option money, after he has paid all the agreed instalments. These instalments are usually payable every month and are in the nature of rent payable for use. Option to purchase cannot be exercised unless the terms of arrangement between the parties, in regard to payment of stipulated instalments, are fully and faithfully observed.

The hire purchase financier performs a double role. He is not only a lender, but also a trader-cum-financier. He is thus a double-edged sword. The practical difference between the two methods of credit is that in the former case when there is a default in payment of instalments, the financier cannot seize the property. If he finds any difficulty in recovery, he must file a suit against the purchaser for amount due to him and may even attach the debtors property including the article sold on credit. In the latter case, on the

failure of payment of monthly hire, the financier or seller can repossess the article without going to court, because he is the real owner and the possessor is only a user on payment of hire. The moment he fails to pay the pre-arranged rent, he forfeits his right to use it.

Hire purchase finance can be introduced for many types of goods and articles. Machinery, motor vehicles, cycles, radios, furniture, sewing machines and refrigerators can all be the subject matter of hire purchase arrangements. When of long-term nature, it can be employed to help people to buy houses and assume the form of financing services provided by housing societies.

MODE OF HIRE PURCHASE

Important ideas and elements in the hire-purchase financial service are:

(a) The hirer is a party who agrees to make use of an article and pays a portion of the cost of the article, including necessary initial expenses like registration, insurance, valuation etc., as an initial payment. He is to hold up the article or first hire, before the goods are handed to him for use. To the cost and service charges, which the financier must get to cover element of goods and commodities may assist in their more even distribution and thus check the rise in prices in those areas where, due to lack of means of communication and movement, the supply may be inadequate. Qualitative control of credit is more important, from the point of prices, than quantitative restrictions.

(b) The total cost to the financier, inclusive of all charges expected above, less initial hire received, is then distributed equally over a number of monthly instalments, the total period of hire determined by the arrangement, which in turn is governed by the life of the property, its wear and tear and the benefits of its use to the hirer. The hirer is also given the option that on his punctually paying the stipulated monthly hire, the financier will sell the article to him for a nominal sum of say, a rupee. If the hirer makes default on monthly hires, he is given a slight period of grace before interest is charged for the number of days he delays the payment of hire. When all the agreed monthly hires are paid, the financier transfers his rights in the property of the article to the hirer, who from then onwards becomes its owner.

In India, hire purchase service for motor vehicles has been in existence for many years. But it is not on an organised basis. Mostly, private financiers handle it, the business of each such firm being usually small. Some have registered limited liability companies to do this type of business. But the ownership of such companies is not broad-based on the basis of a large number of shareholders. General-ly, they are concerns of members of a family or of a firm. With the exception of one or two hire purchase financiers, the rest of them are small and do business on individual or partnership basis. When each hire purchase financier handles a limited quantum of business, the incidence of cost of administration and of business risk are large.

Even if the full programme of expansion in railway services, as contemplated by the Second Five Year Plan, is successfully completed, there will be still large gaps in the country's transport arrangements. These can be expeditiously met only by developing road traffic. For this we need more commercial motor vehicles, both passenger buses and freight trucks.

FINANCING TRANSPORT SERVICES

To achieve this purpose we need: (a) Increased availability in the supply of motor vehicles and (b) Increased opportunities for transport operators to be able to ply them with as little initial capital as possible. With the shortage in foreign exchanges, India must increasingly depend on expansion in internal motor manufacturing capacity to augment the supply of motor vehicles; and to increase opportunities for development in actual road traffic, so that transport agencies and operators should be able to ply their vehicles

with small capital. We need large well-organised hire purchase agencies to assist in their sale.

It is gratifying to record that the Government of India is fully alive to India's traffic problems. It is doing everything possible to encourage development of indigenous motor industry. It has also recognised the need for the establishment of largescale financial agencies specialising in hire-purchase business of motor vehicles. Unless it were so, there was no need to change, the State Bank of India which now permits that bank to provide credit for sufficient duration to be of service for this purpose. Even the Reserve Bank of India should be ready to help ordinary commercial banks to extend credit for this business.

If inflationary potential is to be curbed hire purchase financial agencies for motor vehicles must discriminate in their acceptance of requests for such facilities. They should obviously, refuse requests from individuals and institutions, where the primary purpose is not to help movement of traffic but to pamper one's vanity or to provide luxury of a personally possessed motor transport. Services of these agencies should mainly be made available for the acquisition of commercial motor vehicles, both freight trucks and buses, for areas where transport facilities are absent or inadequate, so that the cost of moving men and goods may come down and so assist in bringing down prices and costs.

Two Motor manufacturers, the Hindustan Motors Limited, and the Tata Engineering and Locomotive Co., Limited, have established their own agencies to help transport operators to enter road traffic business, with little initial capital. Their primary aim in providing this service for intending buyers of motor vehicles on hire-purchase basis, is no doubt to help in the sales promotion of their products. But there is no conflict between the development of motor industry and motor traffic. A substantial increase in sales will bring down the cost of production and selling price, which will in turn further stimulate road traffic.

MISUNDERSTANDING OF TERMS OF BUSINESS

There is a good deal of misunderstanding about the terms on which hire purchase business is done. Some think that hire purchase finance should be akin to bank advances, where credit is available on mere interest basis. This is obviously an incorrect approach to the problem. The article, which is the subject matter of hire purchase, unlike security in bank loans, keeps through use and wear and tear, steadily depreciating in value. Moreover, it is not under the custody of the lender. There are several instances in which hire purchase business has been done in underdeveloped countries, where goods so hired and hired, completely disappear leaving no trace. Involvement of financier in substantial loss. Lack of roads and transport facilities are great handicaps in the vigilance and efforts of the Police to apprehend such culprits. In a number of cases the hirer removes the hired property to some other place, and there sells it as if it were his own, to some unsuspecting buyer; and then disappears. This involves the financier and the new buyer into disagreeable litigation and costs.

Over and above the credit and business risks, on account of the retail nature of the transaction, because small amounts are involved in each deal, the incidence of administrative expenditure is also great. An agency providing this type of service must possess specialised knowledge both of the merchant handling the trade in these goods and of the financier well versed in the intricacies and techniques of credit, prices and fashions. A change in the model of a motor vehicle increases obsolescence of its earlier makes and models and thus heavily depresses their resale value.

DIFFICULTIES INVOLVED

In times of depression, financial agencies specialising in motor hire-purchase business find themselves heavily saddled with surplus of many motor vehicles which the hirers find difficult to continue to ply profitably. Rather than suffer loss on running business, they prudently terminate their hires and return the vehicles to the financier. Those who have transport agencies and operators some experience of actual hire purchase arrangements of motor

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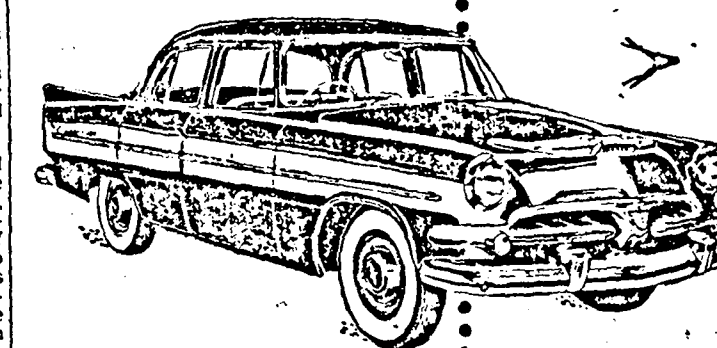
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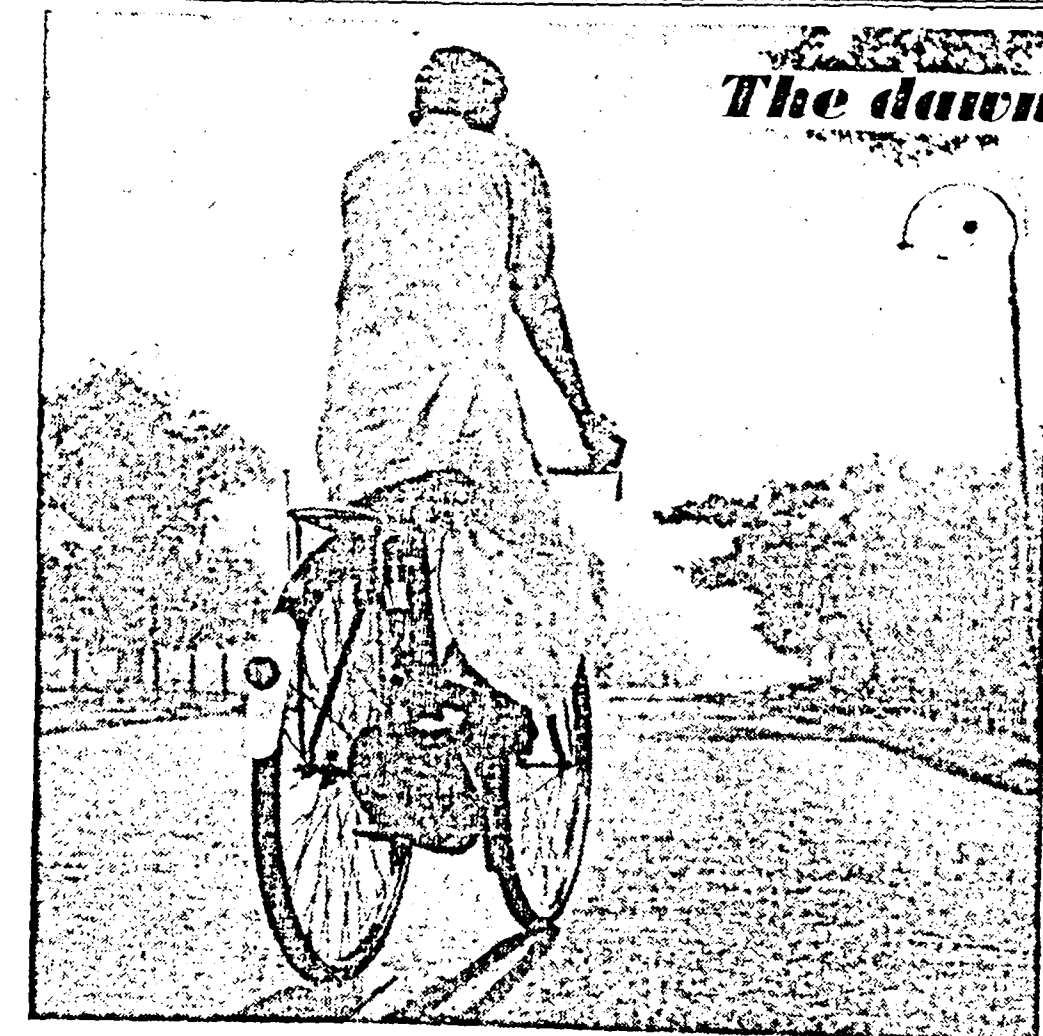
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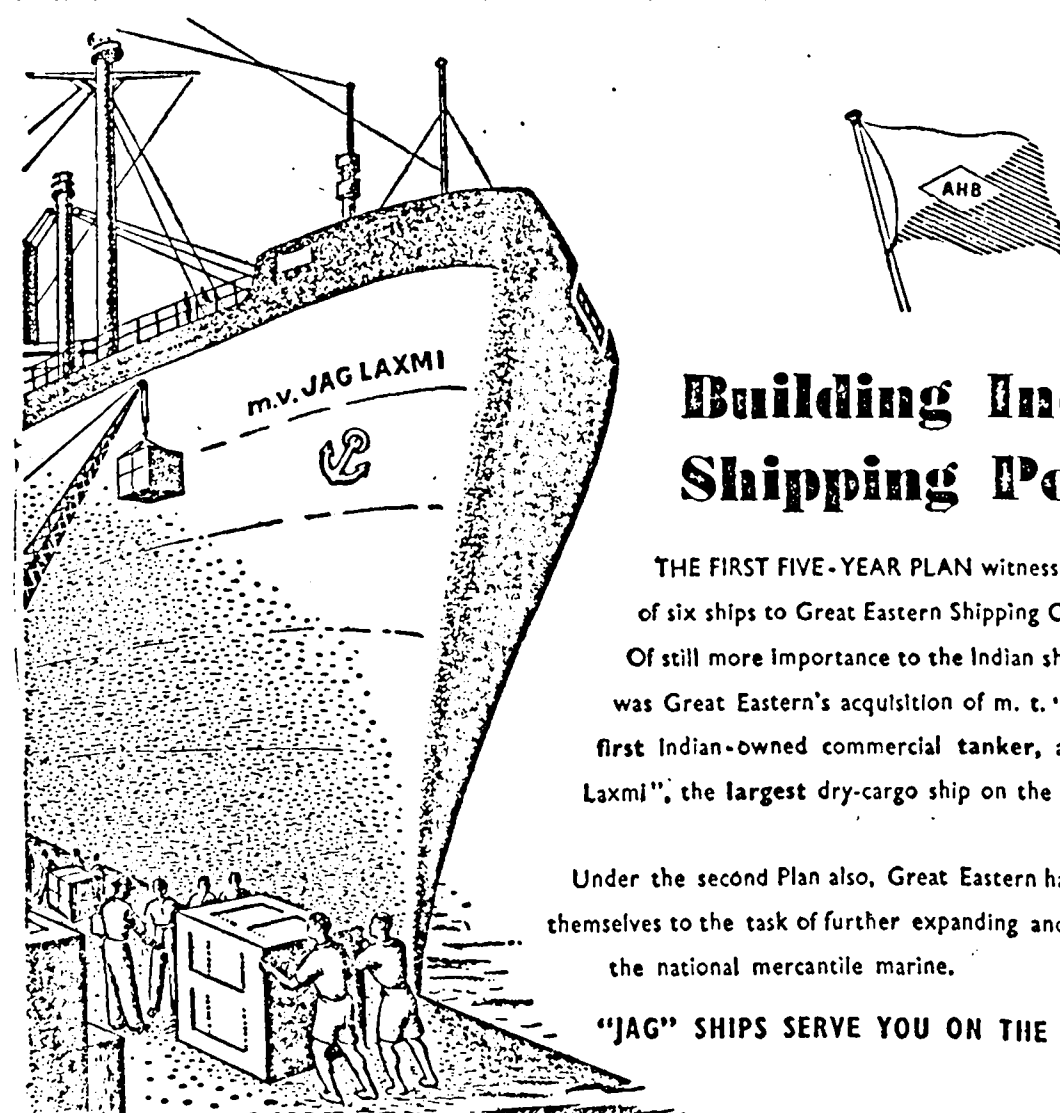
India is forging ahead. A great industrial future is envisaged. At the same time we have also provided for the social, moral and aesthetic needs of a growing nation.

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vehicles must know how in the United Kingdom, United States and other countries these financiers had their premises, godowns and yards packed full with surrendered motor vehicles. There were no buyers or fresh hirers for such second hand motors, trucks and buses. They suffered heavy losses. Unless the terms of business leave sufficient scope of profit, to provide for the ups and downs in trade, there would be no inducement to people to undertake any venture. Hesitation becomes more pronounced in new and untried fields of business. One should not judge the profitability or remunerativeness of a business merely by looking to the gain in good years, and ignoring the hazards and losses in the bad ones. One must take the rough with the smooth.

In a democratic free economy, forces of competition create many an automatic adjustment in rates, prices and terms of business. If any business offers more than reasonable return or gain, others will enter the field which would lead to improvement in the terms for the buyer-hirer. In such cases, the terms of trade and hire may not even be adequate to meet costs and risks. Sanity and prudence will then come through losses and defaults, and fair, just and reasonable terms will be the result.

The most important thing to see in a hire-purchase business is whether the hirer earns enough income to meet his living expenses, working costs, and service and hire charges. A financier would obviously be an imprudent businessman if he were to accept requests for business merely on the basis of what he got as initial fee and to cover all expenses, including depreciation, then the transaction is worthwhile and good. Over and above the accounting part of meeting the hire, the financier will have to be sure about the knowledge, experience and capacity of the hirer to correctly and profitably work the machines of machinery. A person may be a good technician, but successful industrial employment of machine tools requires something more than mechanical and technical know-how. He must be a good industrial manager, wide awake and able to foresee and anticipate changes in trade and markets. He must have enough working capital, and a good sales organisation.

As soon as Indian standards of living and income grow, hire purchase financial service will be extended to many types of goods and purchases. In the main, however, durable goods offer greatest opportunity and scope. A young married couple who can spare every month Rs. 100 or Rs. 200 from their monthly income can conveniently enter into a hire purchase arrangement for the acquisition of domestic furniture, electric fans, radios, telephones, sewing machines, refrigerators and other durable goods which people need for good living and convenience and worthy subjects of hire purchase finance. Now-a-days one can purchase air tickets including hotel expenses on such basis. Even one can buy clothes on instalment basis. But the risk and cost in such specialised personal articles, which have little or no resale value, must obviously be great and involve the buyer in more than average cost for these services.

DEPENDABLE AVAILABILITY

In India where incomes and standards of living are low and where one lives from hand to mouth, it will perhaps take a long time before such services can be universally offered to ordinary householders. The essential feature of hire purchase finance is non-failing and dependable availability of a surplus income, month after month, with which to pay the hire due for the articles or goods acquired. If there is no such capacity, then it is bad both from the financier's point as well as the user-buyer's point.

On account of unchecked family growth and social inability to maintain aged parents and unemployed and destitute relations, very few people have any real surplus which they can pledge to get household goods on credit. Large scale expansion of this financial service in the domestic and personal fields must, therefore, await a substantial increase in the rate of per capita income.

Ultimate scope for institutions specialising in hire purchase business is indeed vast. But for the present, particularly in view of the threat of rising prices, the country will have to move very cautiously and in only those fields which are of national importance and do not threaten to add to inflationary tendencies but on the contrary to counteract such forces. If austerity is the need of national policy, obviously agencies which through the supply of credit, assist in the procurement of consumer goods, are uncalculated.

INDUSTRIAL MACHINERY PURCHASES

The principles of hire-purchase can be applied for the acquisition of industrial machinery, both large and small-scale. But it would also be necessary to apply in these cases the tests of income and outgoings. If the income or earnings are greater than what is needed as hire and to cover all expenses, including depreciation, then the transaction is worthwhile and good. Over and above the accounting part of meeting the hire, the financier will have to be sure about the knowledge, experience and capacity of the hirer to correctly and profitably work the machines of machinery. A person may be a good technician, but successful industrial employment of machine tools requires something more than mechanical and technical know-how. He must be a good industrial manager, wide awake and able to foresee and anticipate changes in trade and markets. He must have enough working capital, and a good sales organisation.

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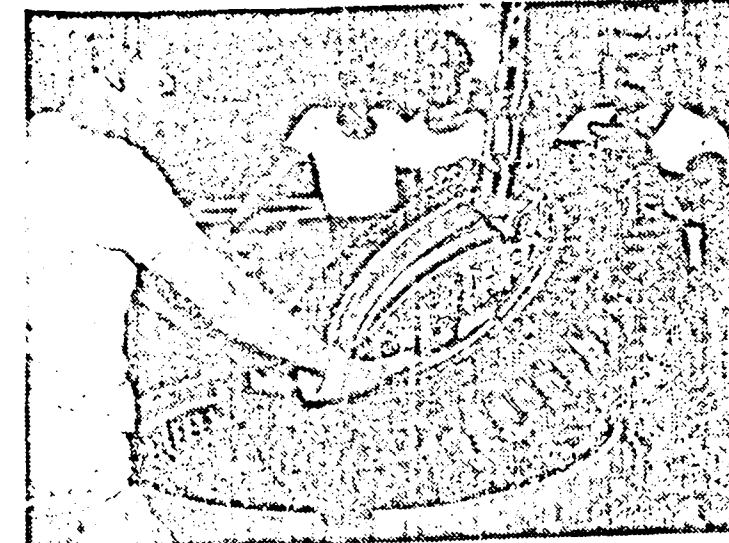
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GROWING DEMAND FOR RUBBER PRODUCTS

Contributed

THE rubber manufacturing industry is one of the basic industries destined to play an important part in the fulfilment of India's Five-Year Plans, meeting as it does to-day, the needs of numerous branches of the national economy. The industry made remarkable progress within a short period of 15 years as a result of two distinct advantages. India is the only country in the world where the manufacturing industry is largely fed with indigenous natural rubber and a rapidly expanding home market is the other contributory factor. This phenomenal growth of the industry is evident from the import and export figures for rubber products. In 1935-36, India imported the bulk of her requirements of manufactured rubber goods valued at Rs. 2 crores. In 1950-51, the value of imports amounted to only Rs. 33 lakhs. In the same year, 1951, India had to depend for



A giant tyre being taken out of a mould.

goods to the value of Rs. 1.66 crores were exported, which rose to Rs. 1.73 crores in 1953-54. There has been a fall in exports since then, because of increased internal consumption. To-day, India's rubber manufacturing industry is not only capable of virtually meeting the entire internal demand but also of earning valuable foreign exchange.

ESTABLISHMENT OF FACTORIES

In 1920, a small factory for manufacturing moulded rubber goods was started in Calcutta. Three years later, two other factories were established for manufacturing waterproof fabrics and rubber covered cables. But it was not until a decade after that the industry may be said to have really established itself on a commercial basis. The Bata Shoe Co. Ltd., began operations in 1933 and

concentrated mainly in and around Calcutta and Bombay, the industry now consists of more than a hundred units. Product-wise, these may be grouped under six categories: (a) Tyres and tubes, (b) Mechanical and general rubber goods (c) Footwear (d) Rubber covered cables (e) Latex foam and sponge rubber goods and (f) Small factories operating on cottage industry basis for the production of dipped goods and moulded articles. The different products now manufactured in India consist of tyres and tubes for automobiles, trucks and buses, motor cycles and scooters, bicycles, aeroplanes, tractors and earth-mover equipment, animal drawn vehicles and handcarts; tyre and tube repair material and accessories; footwear, shoe heels and soles; fan belts, transmission and conveyor belts; general mechanical goods like railway brake fittings, engine mountings and insertion sheeting, etc.; battery containers, ebony sheets and rods; waterproof fabric and clothing; hospital sheeting and gloves; latex foam cushioning material, sponge rubber; and general rubber goods including sports and surgical goods, rubber tubing, pedal rubber, brake blocks, etc.

CONSUMPTION OF RAW RUBBER

A comparison of the annual consumption of raw rubber by the different sections of the industry will help to assess their relative size and importance.

Sections of the Industry — Consumption of Raw Rubber (% of the total for the whole industry)

Sections of the Industry	Consumption of Raw Rubber (% of the total for the whole industry)
Tyres and Tubes	68.0%
Footwear	13.0%
Mechanical rubber goods	8.5%
Latex foam	2.0%
Proofed fabrics	2.0%
Rubber Covered cables	1.5%
Miscellaneous	5.0%

In India, as elsewhere in the world, the progress of the rubber manufacturing industry is dependent primarily on the growth of the tyre section of the industry. Dunlop and Firestone, between themselves, account for the entire production of giant, car, aero and tractor tyres and tubes. They manufacture nearly 90 per cent of balance tyres and tubes, while the balance is produced by National Rubber Manufacturers Ltd., Calcutta; R.B.S. Jain Rubber Mills, Howrah; and Travancore Rubber Works, Trivandrum.

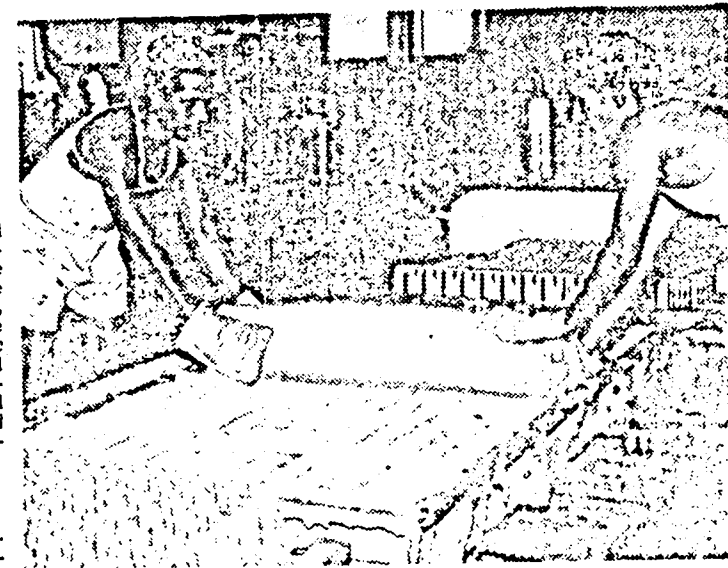
It is estimated that about Rs. 13 crores is invested in the entire

TYRES	1949	1952	1954	1955	1956
(a) Automobile (in 000's)	57.2	60.1	69.4	73.5	78.2
(b) Cycle (in 000's)	284.3	349.1	435.5	479.0	526.7
(c) Tractor (in Nos.)	—	321	1596	2044	2564
(d) Aero (in Nos.)	—	37	293	367	305
(e) In HOSES	8.4	12.9	13.5	15.8	20.9
(f) Radiator (in 000's)	27.3	37.0	51.7	67.4	46.0
(g) Vacuum brake (in 000's)	157.1	320.8	405.5	477.9	550.4
(h) Other types (in '000 ft.)	—	—	—	—	—
(i) BELTING	4.0	46.5	41.7	54.6	60.4
(j) Fan belts (in 000's)	—	—	—	—	—
(k) Transmission & (in tons)	14.8	19.0	26.0	29.1	30.1
(l) Conveyor (in tons)	—	—	—	—	—
(m) Footwear (in lakh pairs)	5.7	11.5	15.3	19.1	21.7
(n) Dipped rubber goods (in lakh dozens)	—	—	—	—	—
(o) Latex foam (in 000 lbs.)	—	—	—	—	—
(p) Rubber covered cables (in lakh yards)	16.1	27.4	52.3	71.8	88.2

rubber manufacturing industry of which the capital investment (paid-up capital plus borrowings) of Dunlop and Firestone account for about Rs. 8.55 crores. The industry as a whole provides employment to about 18,000 people, of which the tyre section employs about 6,000.

Dunlop have recently initiated an anti-corrosion and abrasion resistant rubber lining service which is of great importance to the heavy motor vehicles and in the matter of storage and transportation of corrosive liquids.

In October 1952, the Government of India requested the Tariff Commission to conduct an enquiry and



A Dunlop mattress being removed from the mould after curing.

The footwear section of the industry has made remarkable progress in the last ten years. Production has risen from 120 lakh pairs per month in 1945 to 30.1 million pairs per month in 1956. But in spite of this, footwear consumption in India is only one pair to about 10 persons as against more than three pairs per head in the U. K. and the U.S.A. The Bata Shoe Co. Ltd., with their main factory at Bikaner, West Bengal, and others in Bihar and in the refugee township of Faridabad near Delhi, are the biggest producers in this section.

The production of conveyor belting, Transmission and Industrial Vee belts which were mostly imported until recently, has now commenced in the country. Long length braided hose, which has a wide application in industry, mining and agriculture, are also now being manufactured in India by the lead press process. That the industry is developing on sound lines will be seen from the following table of comparative production figures of a few selected items:

Items	1949	1952	1954	1955	1956
Permitted to South India Rubber Works, Indian Rubber Goods Manufacturing Co., and Cosmos Rubber Works to commence the manufacture of cycle tyres.	—	—	—	—	—
Plan and the growing economic activity in the country, the rubber manufacturing industry will be called upon to face bigger challenges.	—	—	—	—	—
The transport of goods and people by road is now receiving increasing emphasis. A sum of Rs. 209 crores is proposed to be spent for road-building under the Second Plan, which will result in a considerable increase in road traffic.	—	—	—	—	—
According to the Study Group set up by the Planning Commission a fleet strength of 10,000 trucks by the end of the Plan will be necessary to handle the growing goods traffic by road. The production of motor vehicles and in the matter of storage and transportation of corrosive liquids.	—	—	—	—	—
In October 1952, the Government of India requested the Tariff Commission to conduct an enquiry and	—	—	—	—	—

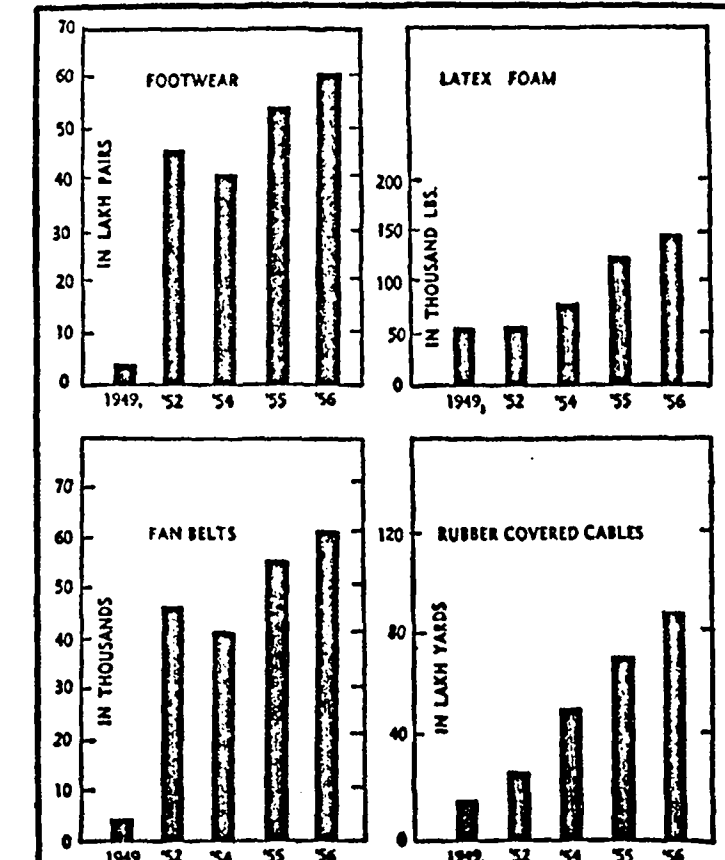
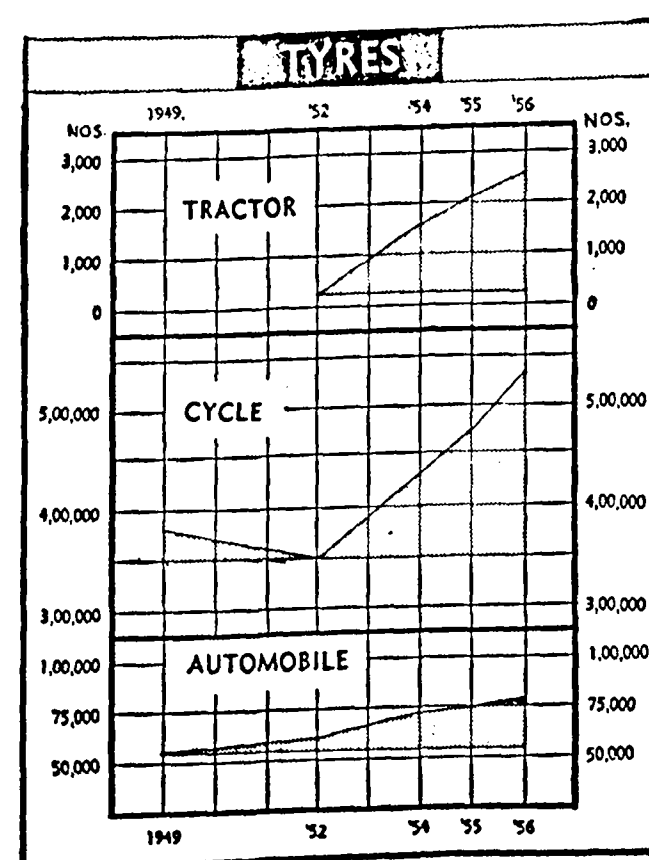
The demand in 1960 for automobile tyres is estimated to be 1,620,000 and 11,000,000 for bicycle tyres as against the actual consumption in 1954 of 824,000 and 5,436,000 respectively. Besides tyres and tubes, rubber is used in the automobile industry in various other forms such as fan belts, radiator hoses, ebony battery containers, micro-porous latex plates as battery separators, rubber adhesives for body building, latex foam cushioning, etc.

The development programmes of the railways and air transport will also involve greater demand on the rubber industry in the shape of brake and light fittings, engine mountings, latex foam upholstery, aero tyres, etc.

Rubber conveyor belting is extensively used in mines, the various power and river valley projects, a number of heavy industries such as iron and steel, cement, chemicals, etc. With further progress of India's heavy industries, the demand for conveyor belting is sure to rise. Similarly, in view of the increased production and consumption of electricity together with the growing industrial and agricultural activity envisaged under the Plan, greater demands will be made for rubber covered cables, transmission and vee belts, and hoses.

In the background of such increasing demand, the problem of indigenous supply of raw rubber assumes vital importance. The production of raw rubber has failed to keep pace with the rapid development of the manufacturing industry in the last few years. The gap has been growing at an alarming rate and in 1956, this stood at 5,552 tons with consumption at 22,996 tons and production at 22,444 tons. According to current

MONTHLY AVERAGE OUTPUT OF RUBBER PRODUCTS



According to current

estimates, by 1961, production will rise to 26,000 tons, while consumption will be about 60,000 tons, thus leaving a gap of about 34,000 tons. Attempts are being made to shorten this gap and the Government of India has sanctioned a subsidy scheme for replanting 70,000 acres of old and worn out plantations with new high yielding material spread over a period of ten years starting from 1956. Schemes for extending the area under rubber are also being explored. The question of setting up a synthetic rubber plant is still under consideration by the Government of India. Other important raw materials required by the industry, such as carbon black, sulphur, anti-oxidants and other allied chemicals, are now mostly imported and the possibility of manufacturing some of these in the country is also being explored.

NEED FOR RESEARCH

The rubber manufacturing industry is to-day highly advanced and its development depends on intensive research. A beginning has been made in this direction and the industry has drawn up plans, in conjunction with the Council of Scientific and Industrial Research, for the establishment of a Rubber Manufacturers' Research Association which will undertake research on a co-operative basis. India's rubber manufacturing industry has shown commendable progress within a short period, and it can be confidently expected to fulfil the new tasks ahead of it.

TRANSPORT UNDER SECOND PLAN

(Continued from page 80)

non-perishable nature, for which delivery time is not an important consideration. These are all cheap commodities but play an important role in the economic life of the riverine centres of population in India. Government must take in hand the construction of at least 50,000 boats of 5-ton capacity during the currency of the Second Plan as they will be able to do at least 50 million ton miles per year. Further, these boats will give direct and permanent employment to at least two lakh boatmen. Taking their dependants at the usual rate of four per worker, these country boats will maintain about ten lakh persons in addition to the labour employed on the boats. The construction of these boats will provide temporary employment for 50,000 workmen for 21 years. As the construction of the boats will be spread over the whole country and can be taken in hand and completed in a few months out of the local material, talent and experience available, the construction of these boats should not present any serious difficulty except that of finance. A portion of the finance required could be advanced on a co-operative basis or through rural banking or some other agency found economical and practicable.

It will be noticed that whatever developments may take place in the three types of transport—Railways, coastal routes, inland waterways, there will be a deficit in the lift targeted of at least 50 million tons and this will have to be thrown on the roads.

Recently at a transport conference held in Delhi, the Transport Minister's speech left no room for doubt that the Transport Ministry fully realise the urgency of filling the gap in the transport facilities with road traffic and are prepared to do all they can to ensure that the existing roads and those to be built in course of the Plan are utilised to the maximum and are equipped to take over a lift of about 50-60 million tons by 1960-61. Many of the handicaps imposed in the Motor Vehicle Act of 1939 have been eliminated in the new Act of 1956. The Government is also indirectly helping the hire purchase of public carriers. The scheme has not yet been finalised but is under active consideration of the Government. Let us hope that in the light of what the Transport Minister said at the conference on December 9, 1957 the proposed scheme will be brought into action without further delay.

The next important handicap of road transport and a very serious one is of delays in the issue of permits by the State Governments. For this purpose the country looks up to the proper functioning of the Inter-State Commission envisaged in the Motor Vehicle Act of 1956. It should be creat-

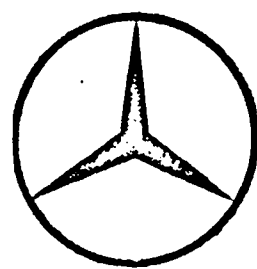
ed and begin to function as quickly as possible so that the handicaps on Inter-State traffic and the issue of permits may be removed. If these two vital measures of whose utility the Government themselves are convinced are brought into force quickly, the bottlenecks of the First Plan will become memories of the past and both the public and private sectors can look forward with confidence to seeing their production carried quickly and not detained as in the past.

The targets of the Second Plan represent the boldest attempts in our long and varied history. The Government has done its best to develop the resources available. It is now for the citizens of this country to pull up their sleeves and bend to the task ahead of each. We cannot at this juncture afford to waste time in controversies as to which form of transport should be given preference. Appeals to Government funds are futile. Let us get the best out of the resources we have and increase our output. The engine of internal combustion has changed the re-transport. The position to-day is that just as Railways can never be a substitute for roads or inland traffic, road and inland water routes can never become substitutes for Railways. Let the despatchers have a free choice and select the form of transport which best suits their convenience and requirements.

NEW POLICY FOR SHIPPING

(Continued from page 78)

of the progressive increase in building and replacement costs. It is hoped that the rebate will be raised at least to 40 per cent as in the U.K., if not to 50 per cent as has been urged by the industry. Government have also agreed, in response to the frequent appeals of the industry, to ensure proper liaison between the different Ministries and departments of the Government and the shipping industry so that as far as Government cargoes are concerned the interests of Indian shipping are in no way jeopardised or ignored. The prospects have also somewhat improved for coastal shipping following the implementation of some of the recommendations of the Rail-Sea Co-ordination Committee, though the increase in freight rates allowed has not been commensurate with the increase that has taken place in the cost of operations, and no decision has been taken in regard to the important recommendations of diversion of cargo for coastal ships. Taking an over-all look it may be said that the new year and the years to follow hold forth good promise of a speedier march towards the goal that has been set. With the active support of the Government, clear indications of which have been given by the Transport Minister recently, it should be possible to achieve progress soon.



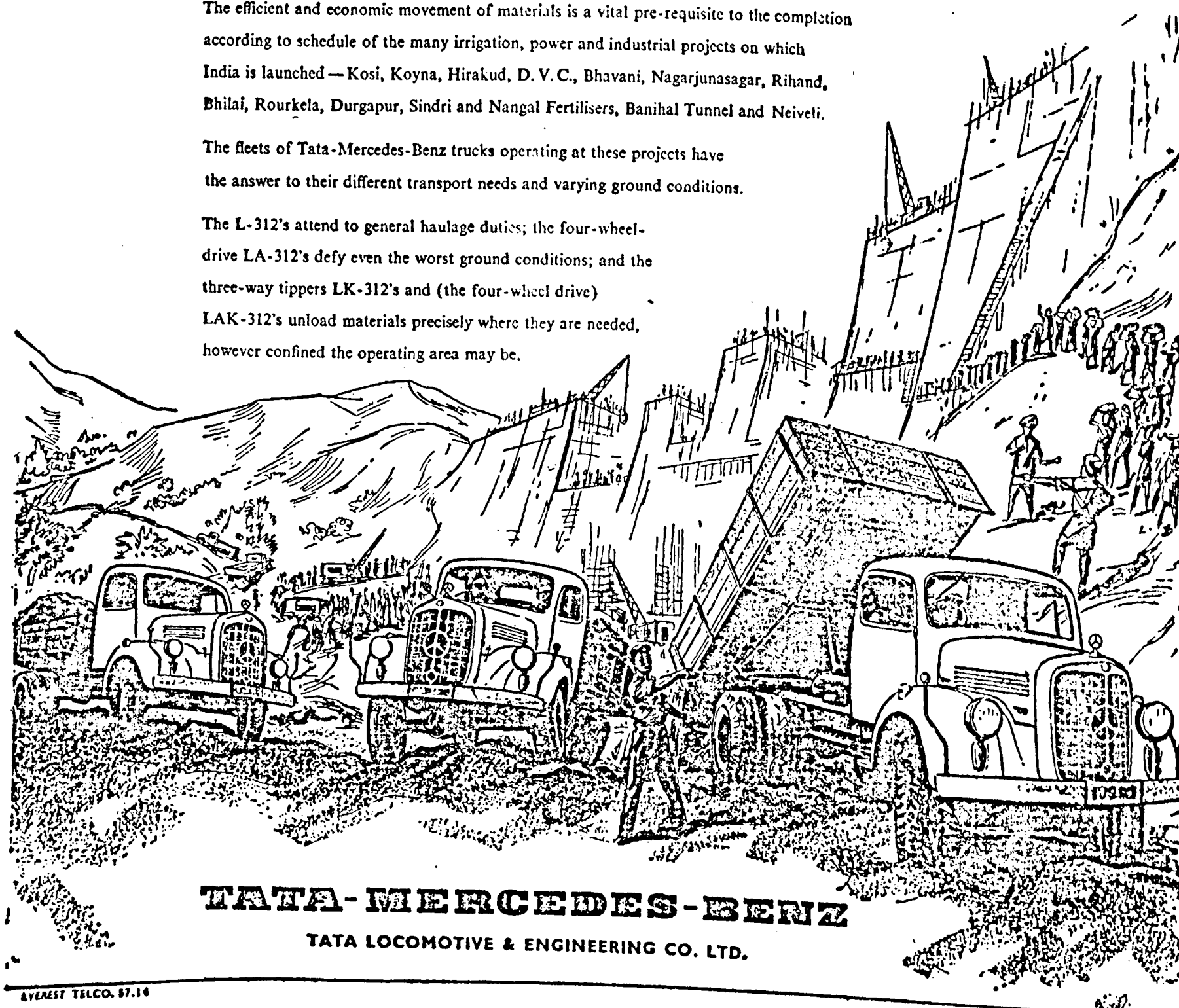
AT THE PROJECTS

The efficient and economic movement of materials is a vital pre-requisite to the completion according to schedule of the many irrigation, power and industrial projects on which India is launched—Kosi, Koyana, Hirakud, D. V. C., Bhavani, Nagarjunasagar, Rihand, Bhilai, Rourkela, Durgapur, Sindri and Nangal Fertilisers, Banihal Tunnel and Neiveli.

The fleets of Tata-Mercedes-Benz trucks operating at these projects have the answer to their different transport needs and varying ground conditions.

The L-312's attend to general haulage duties; the four-wheel-drive LA-312's defy even the worst ground conditions; and the three-way tippers LK-312's and (the four-wheel drive)

LAK-312's unload materials precisely where they are needed, however confined the operating area may be.



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Component Manufacturing Unit in the T.I. Cycles Factory, Ambalpur.

MANUFACTURE OF BICYCLE COMPONENTS

By A. M. M. Arunachalam
Managing Director, T.I. Cycles of India Ltd.

MUCH has been said and written about the history and development of the Indian bicycle industry. From the standpoint of industrialisation, the bicycle industry can be said to have well established itself as one of the leading light engineering industries supplying the cheapest form of individual transport. Before India became independent, there was only one bicycle manufacturing unit in the country producing output in the best pre-war year was about 50,000 bicycles. By 1951, at the beginning of the First Five-Year Plan period, two more manufacturing units, well-known British manufacturers, came into production and the output was increased to 1,14,000. These two units had a great advantage with the backing of technical knowledge of well-known manufacturers which enabled them to start off and progress. Actually, with the starting of these two units, the bicycle industry in this country can be said to have had the real impetus to make it what it is today.

Although a bicycle looks a comparatively simple affair, it is little realised that it is composed of nearly 200 different parts which if individually counted, will add up to over 800 parts. Since these parts are all of high quality and precision-made, it calls for great technical skill to make them. Emphasis on precision and technical excellence is all the greater when the production is to be on a mass scale. It is from this point of view that large-scale production units score a distinct advantage over small scale units.

As the cycle production in the country increased, it became more of an economical proposition to start manufacturing cycle components, and during the last three or four years this side of the industry has made very rapid progress. The development of the industry as a whole in India did not follow the same pattern as that prevalent in most highly industrialised countries, which was to develop subsidiary industries who specialised in the manufacture of few component parts which became common to the whole industry, and these were supplied to the major manufacturers who thus saved the expense of putting up plant to manufacture sufficient quantities only for their own requirements. In our country this aspect of component production has rested on the manufacturer and as a consequence the anomaly arises whereby, in a country which is comparatively under-industrialised, the major manufacturers of cycles are producing as much as 90.95 per cent of the total component parts which go into their cycle.

The Government have also enabled the manufacturers to bring in modern methods of scale units on the cottage industry basis. The progress of the industry has been so good that recently two units have started manufacturing freewheels and chains, which are the most complicated components of a cycle. Shortly, one or two of the important components, such as bottom bracket axles and bottom brackets are expected to be manufactured in the country in large quantities and of high quality.

STEEL TUBING

One of the most important items required for the manufacture of cycles is steel tubing. Most of this material had, until recently, been supplied by Tube Products Limited, Oldbury, U.K. Two new companies for the manufacture of steel tubing in this country, namely Tube Products of India Limited and the Indian Tube Company, have now put up plants and are supplying this tubing in large quantities to all the cycle manufacturers. The tubing supplied by E.R.W. (Electric Resistance Welded) tubes. These two companies have been able to go into production in a very short period of time. The fulfilment of the policy of the Government and the intentions of the manufacturers to make the cycle industry in India self-sufficient is borne out by the very fact that five years ago manufacturers were allowed import of components to the value of Rs. 80/- per pack, and to-day's figure has been reduced to only Rs. 7.50. By the end of 1958 or the middle of 1959, the plan and target would be more or less to eliminate altogether the import of components necessary for cycle manufacture.

STABLE PRICES

The full economies of this indigenous manufacture are perhaps not at the present time apparent to the purchasing public, because all the raw material required for the manufacture of these components has of necessity to be imported, and it is anticipated that the adequacy of indigenous raw materials which, generally speaking, are of a special type to enable intricate manipulations and high speed machining will not be available from indigenous sources until 1961, but the manufacturers are passing on these benefits to the public through not increasing the prices of their cycles and have in fact, over the last few years, reduced their prices, and it is fairly safe to say that the cycle industry is the only consumer goods industry in India which has not shown a rise in prices so far.

The Planning Commission, having realised the importance of the large-scale manufacturers, has, however, for the sake of a balanced economy, been encouraging development of small-scale units. A large number of industries in modern methods of scale units on the cottage industry

try basis are mainly situated in the East Punjab. While most of these people have the necessary skill, it is important that the departments looking after this cottage industry should make available to these people proper raw materials and enough facilities to inspect and keep a close watch on the quality. Otherwise, most of these components would not find an easy sale in the market. In this context, the Ministry of Commerce and Industry have formulated schemes for helping these small units, and are in the process of establishing institutes in the various centres. The output of this section could easily be absorbed by a large number of small-scale assembler manufacturers and certain replacement markets. While emphasis on the cottage industry is appreciated, the should work as complementary to each other and not at cross purposes.

The Indian Standards Institute has set up standards for quite a large number of cycle parts. Most of the major manufacturers are already producing cycle parts of approved standard and specifications. The Standard Institute has proposed to issue Certificates of quality on components conforming to the standard set by them.

For a proper integration and co-operation of all the interests in the bicycle industry, it is a happy augury to note that recently two Cycle Manufacturers Associations have merged together and have formed one Association on an All-India basis. The Development Council comprising manufacturers, Government, traders, and distributors is continuing to do very useful work in co-ordinating the various interests of the industry. Full measure of credit for attaining the target set under the First Five-Year Plan and for establishing this industry in such a short span is, in a large way, due to the major manufacturing units, particularly T.I. Cycles of India Limited, Senaraj Industries of India Limited, and Hind Cycle Industries Limited. The medium scale manufacturers have also contributed considerably to the success of this industry.

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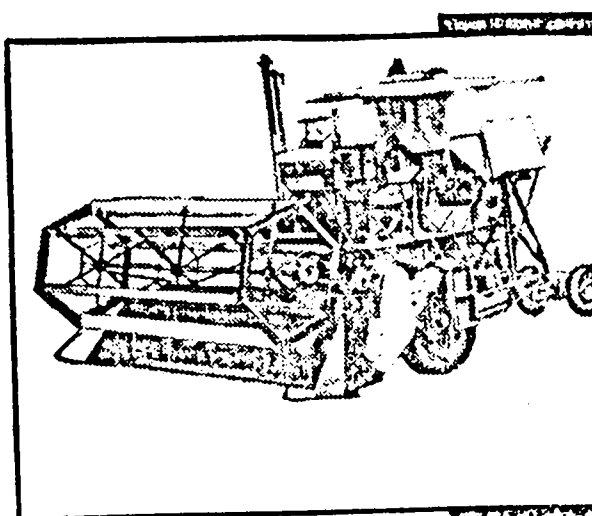
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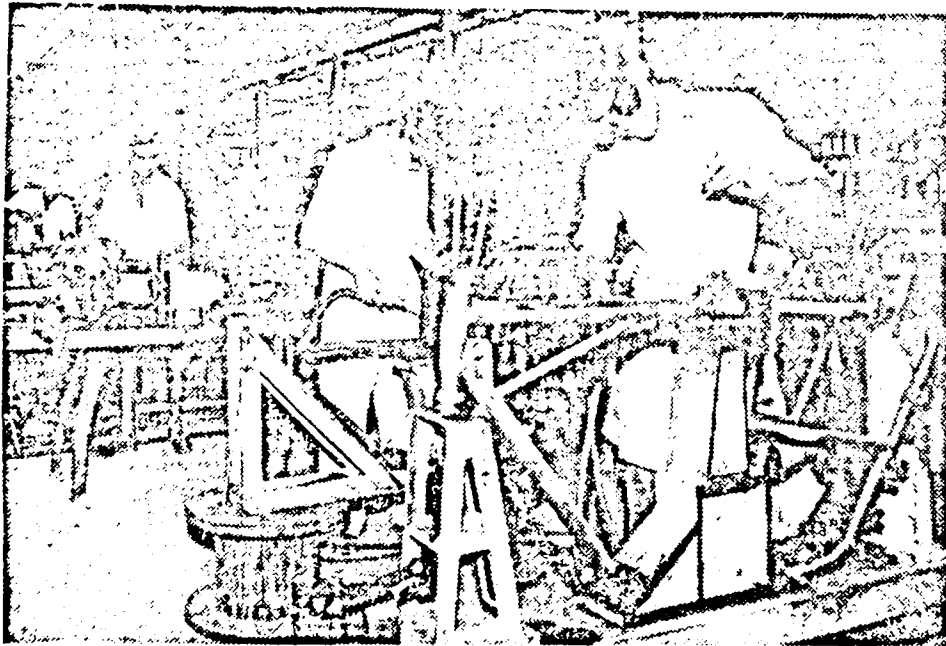
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MANUFACTURE OF MOTOR CYCLES



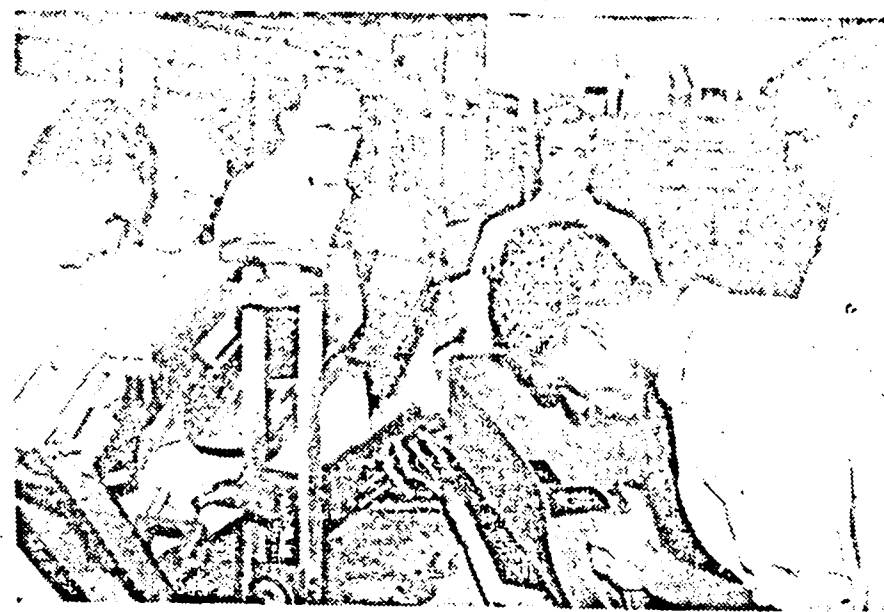
Royal Enfield Motor Cycles are being manufactured in collaboration with foreign interests in the newly-established factory at Tiruvottiyur, near Madras. (Above): Accurate jigs and fixtures are used by skilled operatives to build the frames.



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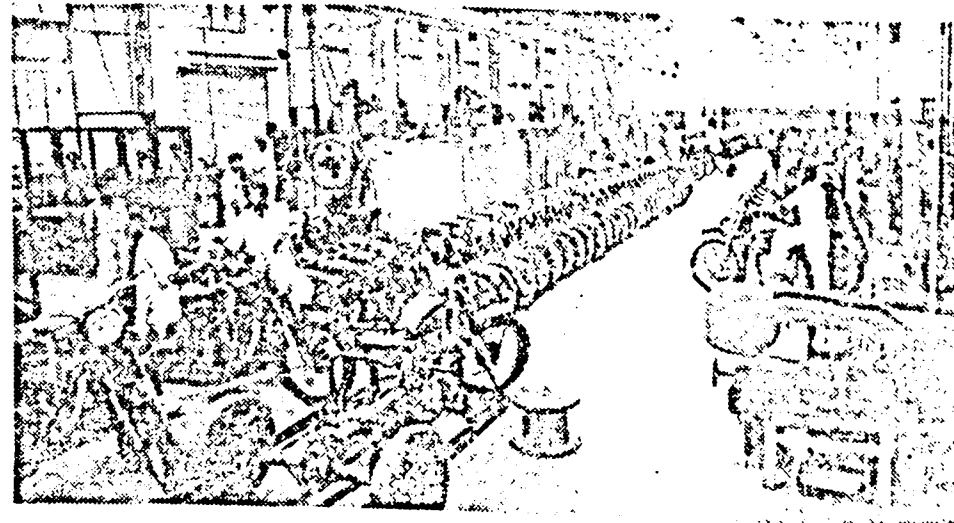
A section of the tool room which is the heart of the factory. (Below): The engines being assembled both for 150 and 350 cc.



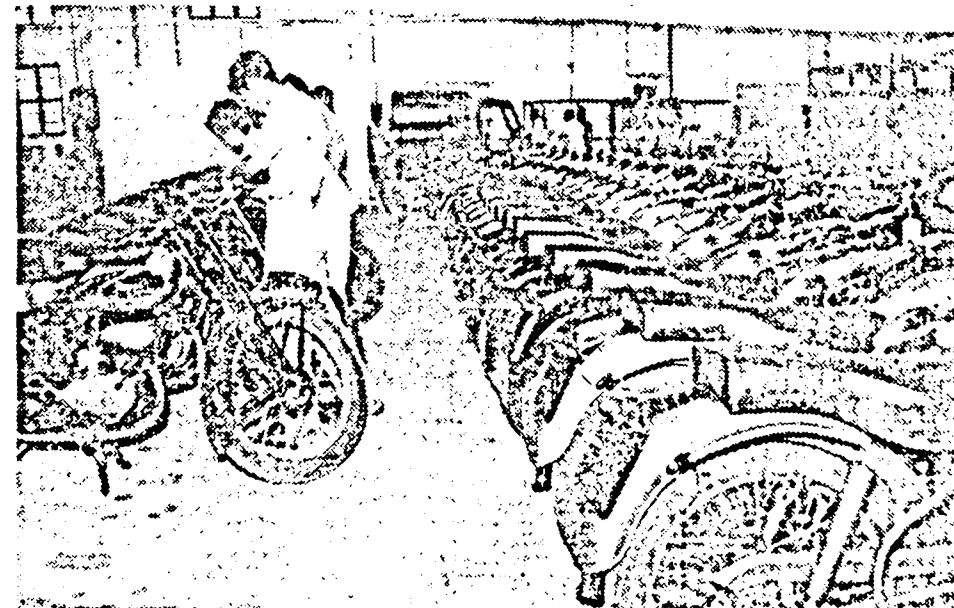
Visitors from the English Company admiring the skill and adaptability of Indian workers.



A section of the shop where some precision components are made.



The final assembly line. (Below): A batch of motor cycles ready for despatch after test and final inspection.



HALTING PROGRESS IN SHIP-BUILDING

From Our Industrial Correspondent

IT is now ten years since Indians only ship-building yard at Vengalpet commenced construction of ocean-going vessels and five years since the Government of India acquired the controlling interest in the yard from the Scindia Steam Navigation Company, to whose "pioneering" termination and closure" (in the words of the former Ministry of Production) the yard owed its birth. But Hindustan Shipyard—as it is now known—is yet to fulfil its promise of its founders as well as of the Government of India who are its present owners. It is yet to reap fully the advantages of the expert work done by its designers, Sir Alexander Gibb and Partners, Consulting Engineers of U.K.

The economic circumstances, both in India and overseas, in which ship-building had to take root at Vizag mark its progress in a way which is not only a comparative inexperience of the company in such a stupendous industrial task as ship-building, but also a comparative inexperience of the policy-making level have contributed to making the progress more halting, and more costly, than perhaps it need have been. Nothing exemplified the shortcomings of Hindustan Shipyard more dramatically than the gravely faulty construction of the vessel "Andamans" in 1957. So much of its cargo space has been filled with ballast, in order to make it seaworthy, that it ultimately could not be made to sail without this dead-weight, its running will entail, according to a competent authority, a recurring loss of Rs. 10 lakhs per annum to the Union Ministry of Home Affairs who is the customer for the vessel. Indeed, it was a little surprising that the Ministry took delivery of the vessel before the Committee that is inquiring into its faulty construction had reported. It seems, however, that the yard's shortcomings have now been realised at Vizag and, provided remedial measures are sustained, the yard can reasonably look forward to better prospects in the next five years. In these coming years, it must be repeated, the limiting factors will not be the external ones such as supplies of steel, marine engines and electrical equipment, although the position in respect of foreign supply is quite plainly tight for every productive enterprise in India; Hindustan Steel is likely to make satisfactory working arrangements for its supplies. The limitations to be overcome are internal and relate to the yard's organisation and management and the foreign technical competence which its technical competence must naturally be based.

Next year, Hindustan Shipyard will have to take a major decision regarding the agreement it has for technical collaboration with the Government of India. The experience of Hindustan Shipyard with A.C.L. under this agreement seems to have been unhappy from the outset and there will probably be little regret at Vizag when it is terminated. Notwithstanding the firm's reputation as ship-builder, the agreement was ill-conceived in so far as the firm's representative was made Technical Director of the Company, and while preferably the firm's services should have been enlisted in a purely advisory capacity, in practice it was found that this orders for six more, mostly for the Eastern Shipping Corporation, but their construction is naturally uncertain till the foreign exchange position distinctly improves. The yard was wise in placing a bulk order for 32,000 tons of steel, a result it is now provided with plates and structural to suffice till the end of 1958. The building programme will depend on availability of steel for the yard (imported and indigenous) from 1959 and on the success of negotiations, which are going, viz., diesel engines and electrical equipment. If West Germany is willing to accord deferred payment facilities to Hindustan Shipyard the yard will have reason to be thankful, for its diesel engines come from MAN and electrical equipment from Siemens, both of West Germany.

However, it is recognised at Vizag that when the Company terminates the contract with A.C.L. it still needs to have some technical collaboration with a foreign agency. With the decision, which has been taken to stand, in the future, it is proposed to buy designs for "repeat" vessels from the firm of Lubbe, Glender of Hamburg. The present idea for future technical collaboration seems to be to have representatives of this firm at Vizag and refer specific problems to them for advice for a fee.

In the year ended March 31, 1957 (which is the latest year for which full accounts are available) which full accounts are available, Hindustan Shipyard incurred a loss of Rs. 369 lakhs, after providing Rs. 162 lakhs for depreciation and its 3.21 lakhs for obsolescence of materials. The loss was attributable mainly to loss on assets which had to be discarded or dismantled either subsequent upon the development programme and to obsolescence of materials lying in stock over a long period. Production was constantly hampered by difficulties in supply of materials and equipment. The execution of the development programme and the improvement of production methods did not go well together. The latter in fact suffered on account of the development programme. An example was the provision of travelling cranes which rendered two berths idle—one for two years, the other for six months.

Yet, over the past five years as a whole, and especially since 1954-55, Hindustan Shipyard has made notable progress in its productive effort, as will be evident from the following table:

	Progress of work (In Rs. lakhs)				
	52-53	53-54	54-55	55-56	56-57
Productive labour	15.41	17.44	23.21	25.96	29.75
Materials	54.50	50.20	129.29	147.72	183.52
Total Production	125.36	116.49	210.84	247.62	298.04
Av. no. of workmen on roll	3,714	3,052	2,911	3,157	3,479

	54-55	55-56	56-57
(I) Cargo and Passenger Vessels:			
(a) Steel erected (tons)	4,415	5,045	6,733
(b) B.H.P. installed (main engine and generators)	4,200	7,480	11,840
(c) Outfit work units (100 units = 83,000 man-days)	120	260	323
(II) Small-size Vessels:			
(a) Steel erected (tons)	110	90	166
(b) B.H.P. installed (main engine and generators)	900	200	908

Shortage of foreign exchange has affected the shipyard's future building programme. The company has now got foreign exchange to complete the five vessels that are under construction (two for the Indian Navy, and one each for the representative was made Technical Director of the Company, and while preferably the firm's services should have been enlisted in a purely advisory capacity, in practice it was found that this

agreement seems to have been unhappy from the outset and there will probably be little regret at Vizag when it is terminated. Notwithstanding the firm's reputation as ship-builder, the agreement was ill-conceived in so far as the firm's representative was made Technical Director of the Company, and while preferably the firm's services should have been enlisted in a purely advisory capacity, in practice it was found that this

system which the Company is now following. But as the German suppliers have apparently been selected on this system, there is perhaps no harm done in coming to a long-term arrangement with them. Flat of Italy is also said to have offered supplies on deferred terms. Engines must be ordered two years in advance, so the sooner a decision is taken in the matter the less the loss in Hindustan Shipyard.

For the vessels to be built in the future the Company has chosen 9,500 tons, 6,000 tons and 5,000 tons as the standardised weights. Ship owners are co-operating in conforming to standard designs in their orders. Standardisation will reduce errors in planning, make labour work more quickly, and result in over-all economies. As the costs of construction are rising and further capital investment is under consideration, it is more important now than at any time since 1952 when the Government of India took over the yard. Since then prices of MAN and Siemens imports have alone risen by some 50 per cent, and these materials constitute nearly a third of the current cost of a ship built at Vizag. The technical and administrative staff has increased, certain categories of technical personnel have been upgraded, the pay scales of the drawing office staff have been revised upwards, and dearness allowance has been made variable with living costs. These measures must be expected to add to the labour costs.

The slow fruition of schemes like these for the dry dock and for the manufacture of marine diesel engines may not be entirely regrettable, for looking at what has been done, and left undone, at Vengalpet, it seems that Hindustan Shipyard's immediate objective should be consolidation rather than expansion. It is not to be said that the yard is as yet looking up. The administrative effort needed to make it look up will be immense.

bay is under construction. The major work still to be taken up is the extension of the jetty so as to accommodate three ships as against two that it can now take. The major project which it does not look as if Hindustan Shipyard will be able to take up in the near future is the construction of a dry dock. A dry dock is a necessary annex to a shipyard and one has been visualised for Vizag since Scindia days. Vizag's ships now go to Calcutta for dry-docking, which causes delays and makes this facility more expensive to the Company, owing to the perennial rush for berthing accommodation at Calcutta. The Government have sanctioned in principle the construction of the dry dock at an estimated cost of Rs. 215 crores which would be advanced to the shipyard as a loan. A preliminary report from the technical consultants for the project, Messrs. Hendel, Palmer and Tritton of U.K., has also been approved. But the project seems to be shelved for the present because of foreign exchange and other difficulties such as shortage of essential materials. The World Bank's team, which was recently in India to examine our port development plans would appear to have been sounded in the development scheme for the Vengalpet port, but it is said that the team did not view the suggestion favourably.

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RAZOR BLADE INDUSTRY,

By H. L. Malhotra
Vice-President, All-India Razor Blade Manufacturers'
Association.

WITH the imposition of a complete ban on the import of foreign blades, the Indian Razor Blade Industry has acquired a special significance and importance, involving both advantages as well as responsibilities. Certain critics of the indigenous industry expressed three-fold apprehensions, namely: (i) that the prices of the indigenous blades will shoot up; (ii) that their quality will deteriorate; and (iii) that the Indian industry will not be capable of fully meeting the requirements of the country. Experience of the past few months has belied these apprehensions and dispelled doubts, if any, existing in the minds of some. The Indian manufacturers may it be said to their credit, have shown greater (far-sightedness and greater regard for the ultimate prosperity of the industry and the larger interests of the country as a whole, rather than to petty considerations of temporary money making by raising the price of their products, and it is declared with pride and satisfaction that the Indian Manufacturers of Safety Razor Blades have scrupulously adhered to the prices of their products which prevailed before the imposition of the ban on imports. Rather certain concessions in prices were given by some of the manufacturers in the hope of special Pusa Gift Scheme and Diwali Scheme introduced by popularising the Indian manufactured safety razor blades instead of hoarding stocks by fac-

CAPACITY TO MEET DEMAND

As regards the capacity to meet the demand of the country, it would be necessary to quote some facts and figures. The production capacities of the five factories now in existence aggregate to about 800 million blades per year. The present rate of production is 400 million blades per year. The requirement of the country now are about 400/450 million blades per year. Thus the products are sufficient to meet all the present requirements, efforts are being made to further speed up the production and it is expected that, in the near future, there will be appreciable increase in this behalf.

The Government have now issued licences for setting up two more factories, one in U. A. and one other in Pondicherry. After these factories start functioning, we will have a production capacity of 100 million blades per year. As our total requirements by 1960-61 is estimated at about 600 million blades, we will be in a position to export 200 million blades per year after meeting the country's demands, thereby saving valuable foreign exchange, which is so very essential in the wider interests of the country.

POSSIBILITIES FOR EXPORT

Even now some of the manufacturers are exporting safety razor blades to foreign countries such as East Africa, Ethiopia, Iraq, Afghanistan, Singapore, Malaya, Laos, etc., and have further appointed Agents in Aden, Saudi Arabia, etc. In some of these countries Indian razor blades have acquired considerable popularity.

The razor blade industry in India has acquired good reputation and its importance is being felt by various foreign Western countries. One Indian manufacturer, sometime back bought over the international rights of a world famous safety razor blade brand, imported the services of foreign experts and technicians. To-day this manufacturer owns the third largest manufacturing unit in the world with an installed capacity of 500 million blades per year.

Though this industry has made considerable progress in our country, yet a lot remains to be achieved. What is most required is high productivity, judicious use of labour, capital and management, and above all high quality. The Indian industry needs the support of the Government so that it can pursue its plans for attaining highest quality standards and stabilising its position. The present impact policy of the Government has helped the industry considerably, and if it is allowed to continue for a period of about three years, the Government would be fully satisfied that the indigenous industry has stood the test and there would be no necessity for the import of foreign blades into the country. Import of the raw materials viz. steel strip, wax, paper, grinding stones and polishing compound should be allowed in sufficient quantities to enable production at full capacity. Encouragement should also be given in the export of indigenous products by adopting simplified procedures in the granting of refund of customs duty on steel strip and giving other facilities.

OIL REFINERIES IN INDIA

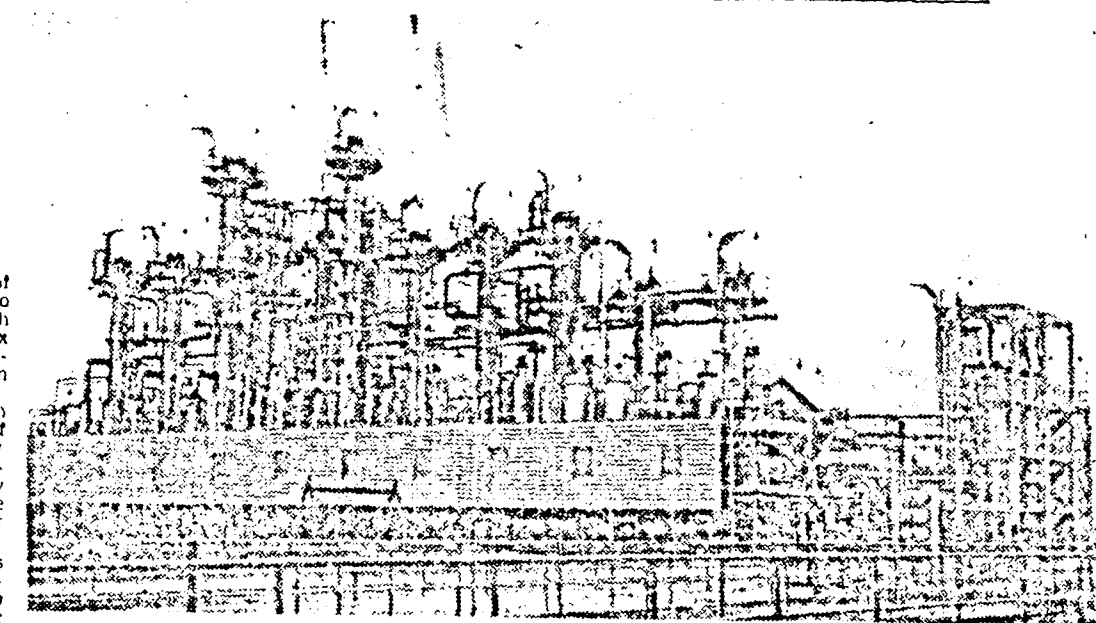
By J. Charanjiva
Co-ordination Manager, Burmah Shell Oil Storage & Distributing
Co., of India Ltd.

AT the end of the second world war over four-fifths of the total refining capacity was in the Western Hemisphere and nearly three-quarters in the U.S.A., but new construction in the Eastern Hemisphere, especially in Europe, has altered the picture somewhat. In recent years, the Stanvac Refinery in Bombay, the Calcutta Refinery in Calcutta, the Eastern Refinery in Eastern India, and the new refinery in the Western Hemisphere, have been built. The initial cost of the three refineries has been of the order of Rs. 64 crores.

In the past, the usual practice was to site refineries near crude oil fields. The Burmah-Shell Refinery is producing crude oil and a little over two million tons of refined products to the consuming areas. Recently, the trend has been to build refineries in the city of 12 million tons and 0.67 million tons of refined products, respectively. The production of the four refineries aggregates a little over four million tons as against India's current requirements of approximately five million tons per annum. The coastal refineries at Bombay and Visakhapatnam are running on imported crude oil. The Burmah-Shell and Stanvac Refineries are getting their supplies of crude from the Persian Gulf which has been a contributory factor in this development.

The world's refining capacity at the beginning of 1957 was 940 million tons compared with approximately 874 million tons at the start of 1956, bulk of which was in the U.S.A. The Soviet Union and other Communist countries had a capacity of approximately 90 million tons. Western Europe 137 million tons and Latin America 117 million tons. The Persian Gulf over the last few years has been commissioning an additional capacity of more than 100 million tons to meet the growing demand for oil are being developed in various countries, big and small.

A survey of possibilities and suitable locations for refineries in India was undertaken by the Government in 1948 at the time a few months' back, is one of the most suitable places for refineries. Following on these discussions, agreements were signed by the Government with the Standard Oil of India in the presence of a catalyst.



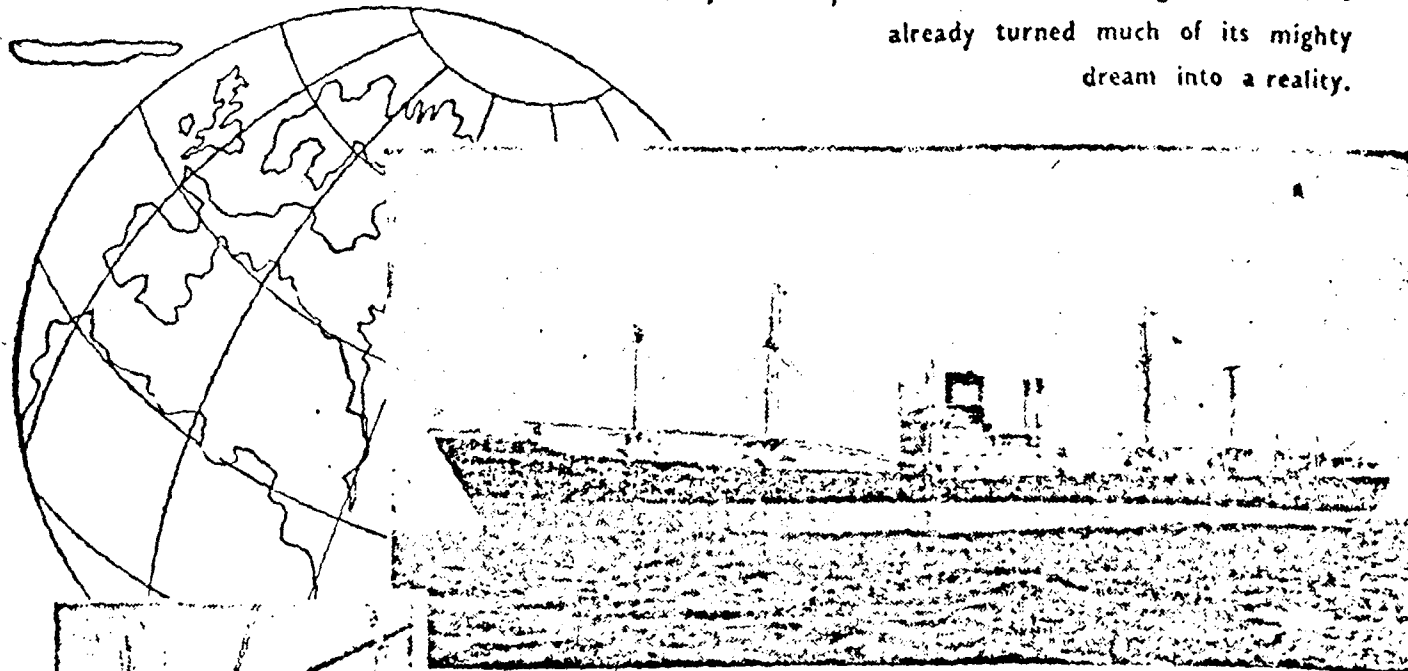
The Edelcrane Plant (Right).
The crude distillation unit at a refinery

The advantage to India of these refineries is very great for they are saving her a considerable amount of foreign exchange—it is estimated that the Burmah-Shell refinery saved foreign exchange for India to the extent of over 7½ crores during 1956. They are providing their part in providing employment and these gleaming silver industrial cities offer amenities to workers which do credit to the industry. They are providing the knowledge to India of a new technology which is of growing importance in the world. The refineries also help to produce a number of chemicals, some of which are specific to the oil industry. These chemicals include for instance catalyst, sulphuric acid, tetra ethyl lead, sulphur dioxide, caustic soda, red and orange dyes, etc. Approximately half the number are purchased locally. The same remarks also apply to spare parts for pumps, machinery of various sorts, pipes and valves, a sizable proportion of which is purchased from local sources. The output of the refineries is dependent on several factors, e.g.,

(Continued on page 94)

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OIL EXPLORATION IN INDIA

By A Special Correspondent

INDIA'S requirements of petroleum products at the present time amount to roughly five million tons per annum. For many years past the rate of consumption of the major products—petrol, aviation spirit, kerosene and fuel oils—has been increasing steadily, and as the process of further industrialisation gets under way in the successive Five-Year Plans, the demand for oil will continue to grow.

Five million tons is 1,400 million gallons. It sounds a lot, but in India it works out at only three gallons a head per annum compared with a per capita consumption of 600 gallons per annum in U.S.A., 500 in Canada, 150 in the United Kingdom, 110 in France, and 105 in the USSR. Any examination of these statistics invariably leads to the question: What proportion of the total consumption of oil is met from indigenous production. And the answer at the present time is: Less than one tenth. The phrase "at the present time" must be stressed, for the country's oil men are on the verge of new and very important developments in the indigenous oil industry.

areas of Ledo and Margherita. There were then no motor cars on the world's high ways, the aeroplane had not been invented, and ways of using oil and its products were limited to preserving timber, water-proofing houses, greasing the axles of railway wheels and providing lamp oil for use in primitive lanterns.

Such, then was the setting for the first oil industry in India. In September, 1889, the railway company began drilling a well near the track, and in November 1890, after 14 months' hard work, oil was found when the drill reached a depth of 662 feet. Other wells followed, some successful, some failing to find oil and some even catching fire, but progress in the jungle was slow. Very little was known about geology in those days and the drilling equipment could not reach the rocks which later proved to hold the main deposits of oil.

The first Assam Oil Company was formed by the A.R. & T. Co. in 1889, just 10 years after the first Dibrugarh well began drilling. In another 20 years passed, before oil production amounted to 14,000 gallons a day, and this was

Baliang, Namehik, Chhatachura, Baragola, Dhekiajuli, Nichugard, Bandersulia and Tiru Hills to name a few places—but in each case the crews returned to Dibrugarh after drilling unsuccessful test wells.

Prospecting for oil is a costly risky business. Crores of rupees have been spent on prospecting in Assam in the past thirty years or so, and the enormous capital outlay continues to-day. Every rupee invested in the work is stent for the sole purpose of locating an economically productive source of petroleum. Time, labour, materials, science, overheads, office expenses, welfare and health services—the total of all these costs has to be balanced against the unknown contents of the earth's rocks. This shows the economic importance of making an accurate selection of a possible productive zone before taking a decision to drill. And it explains the reason why oil exploration to-day tends to rely on more and more upon scientific methods.

The tide of the Assam oil explorers' fortunes turned at last with the promise of oil at Nahorkatiya. A group of tea pluckers on a visit to Nahorkatiya Well No. 7, which is now producing petroleum from rocks two miles under the tea bushes.



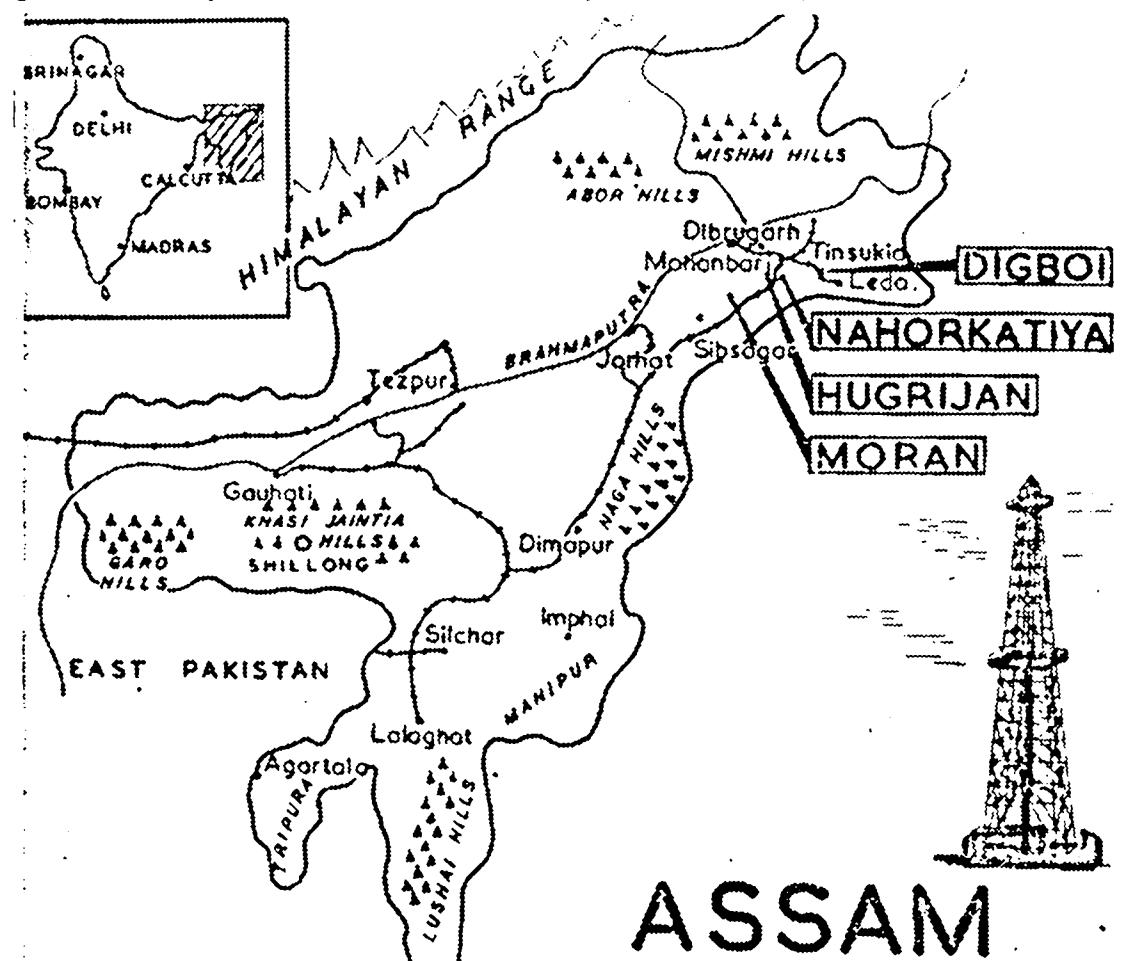
A group of tea pluckers on a visit to Nahorkatiya Well No. 7, which is now producing petroleum from rocks two miles under the tea bushes.

There are many who think that year at Nahorkatiya, and after the war moratorium were resumed again from October, 1953 to June, 1957 (except for one rainy season in 1956). The programme of seismic work in the Brahmaputra Valley was continued again in October, 1957. Nor is this the end of the list of AOC geophysical studies. Between November, 1953 and January, 1954 an aerial magnetometer survey was flown over 10,000 square miles of the valley.

THE AGE OF GEOPHYSICS
To-day is the day of the geophysicist, for all the easy-to-find oilfields of the world have already been discovered. In Assam, a close examination made before the war of the results of seismic surveys indicated the possibility of favourable structural conditions underlying the alluvium in the area of Nahorkatiya, a few miles away from the area indicated by an earlier gravity survey.

Further investigations had to be suspended until the war was over, but eventually it was decided to put the geophysical evidence to

(Continued on Page 91)



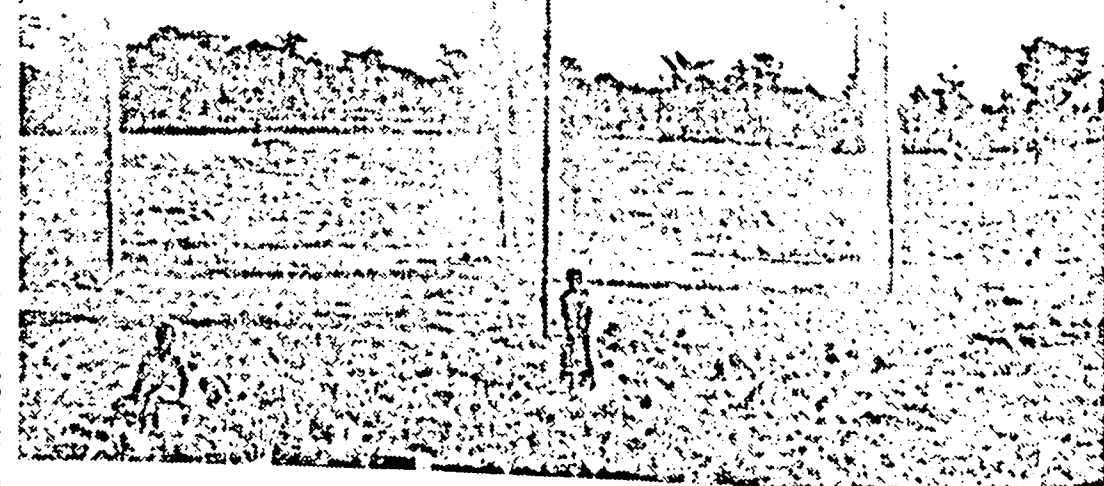
ASSAM

The proved oil areas of India lie in the north-eastern extremity of the State of Assam. Thirty deep wells have been drilled at Nahorkatiya and Hugrija in recent years. Still further down the valley lies Moran, where exploratory drilling is also in progress.

Of all the States in the Union, not sufficient to keep the Digboi refinery in full operation. The time finally came when the company found it impossible to carry on without further financial backing. The Burmah Oil Company then took over control of the Assam Oil Company and proceeded to send much-needed, up-to-date oil is confined to a relatively small area in the north-eastern extremity of the sub-continent. Here, at the head of the Brahmaputra Valley, lie the Digboi oilfield, which was only in 1951 that 410,000 tons per annum) and the newer, vastly more important, oil areas of Nahorkatiya and Moran—which, however, are not yet fully operative. Here, too, is the heart of the only full-scale petroleum industry in the country—for although new oil refineries have recently been constructed at Bombay and Vizag these plants operate on imported crude whereas Digboi embraces all phases of the industry, from the search for oil in the earth's rocks to the distribution of the refined products.

SUPPLY OF CRUDE OIL
The maintenance of this full-scale Assam petroleum industry, and of the thriving oil town which it supports, is dependent on an assured constant supply of crude oil from the wells to the refinery. Crude oil is the life-stream; by itself it is worthless to man, but once produced and transformed by the magic of modern refining it can serve mankind in a thousand different ways.

But no oilfield is everlasting (one at Badarpur, in the Surma Valley, lasted only 18 years and the oil cost more to produce than it was worth; while another, Masimpur, proved so difficult to work that the efforts there had to be given up) and so a constant search has had to be made for new sources of oil. This search through the jungle for a railway line from Dibrugarh to the coal



A seismic survey shooting job in progress near Nahorkatiya.

DEVELOPMENT OF ANCILLARY INDUSTRIES

By A Special Correspondent

THE growth of ancillary industries has been one of the significant features of the Indian economy in recent years. The establishment of capital goods industries has been accompanied by the development of ancillaries which produce the various parts and components required by the former. The present output of capital goods is of the order of about Rs. 25 crores per year, as compared to about Rs. 3 to Rs. 4 crores at the beginning of the first Five-Year Plan. The Second Plan with its emphasis on intensive industrialisation is expected to give a greater fillip to the development of ancillary industries.

The progress of ancillary units can be best illustrated with reference to the automobile industry. The Tariff Commission estimates that in 1953 the importance of the development of ancillary industries in the interests of the healthy growth of the automobile industry. It suggested that the manufacture of carburetors, fuel pumps, fuel filters, air cleaners, clutches etc., should be actively encouraged and that the automobile products should buy the products of ancillary industries in India for use as original equipment.

As a result of the Commission's recommendations, Government approved or licensed a number of ancillary units for the production of component parts. Some of these units have obtained technical collaboration with firms in the United Kingdom, Germany and Sweden. The trend in the production and installed capacity of ancillary industries is shown in the following table.

INDUSTRIAL CAPACITY & PRODUCTION OF ANCILLARY INDUSTRIES 1955 AND 1956.
(Figures in Units)

Industry	Installed capacity 1955	1956	Actual production 1955	1956
Clutch Discs	120,000	120,000	65,177	67,103
Cylinder Liners	300,000	300,000	133,326	142,187
Engine Pumps	2,000,000	2,000,000	1,917,762	2,000,528
Piston Rings	300,000	300,000	132,042	140,226
Pistons	300,000	300,000	129,000	140,101
Radiators	600,000	600,000	531,884	520,031
Shock Absorbers				
Spark Plug				

The increase in the production of automobile ancillaries is no doubt encouraging, but it should be remembered that we have yet to undertake the production of certain other types of ancillaries which are still imported abroad. In this connection it is worth recalling the observations made by the Tariff Commission in its latest report. "The automobile industry," says the Commission, "does not enjoy the advantage available to the industry in other countries of being able to draw on the resources of ancillary manufacturers for the supply of a variety of finished and semi-finished components. The disadvantage is particularly serious in the case of castings and forgings. Secondly, manufacture of automobile components requires heavy financial investment and can necessitate capital resources which are difficult to obtain from outside. Only by ploughed profits or through investment from outside, only by stages and over a period of time, while it is easy to develop the machining of components from imported forgings and castings, the production of the forgings and castings themselves to the high standard of quality required in this industry takes time to be established. In the initial stages the percentage of rejection is so high that the resulting increase in cost does not encourage rapid progress. The manufacturers have also experienced difficulties in obtaining raw materials of the right quality, e.g. pig iron required for castings. Fourthly, most of the manufacturers have had to cope with frequent changes in specifications introduced by their foreign associates."

NEED FOR FURTHER ENCOURAGEMENT

Notwithstanding these handicaps, India's automobile industry has made rapid progress. However, in view of the ambitious nature of the programme of development in the Second Plan it is important to see that every encouragement is given to enable the country to achieve gradual self-sufficiency in respect of ancillary units. One way of helping their development is by suitable adjustment of the import duties.

The Tariff Commission has recommended in its latest report that it is possible to carry out such adjustment of duties with-

out bringing about an undue increase in their overall incidence. The Commission has observed that "while each manufacturer should be expected to carry out the manufacturing programme adopted by him, the long-term interests of this industry require priority to be given, for the purpose of protection, to certain groups of components such as engine, transmission, rear axle, suspension, and chassis without the production of which the manufacture of automobiles cannot be said to have been established on a sound footing."

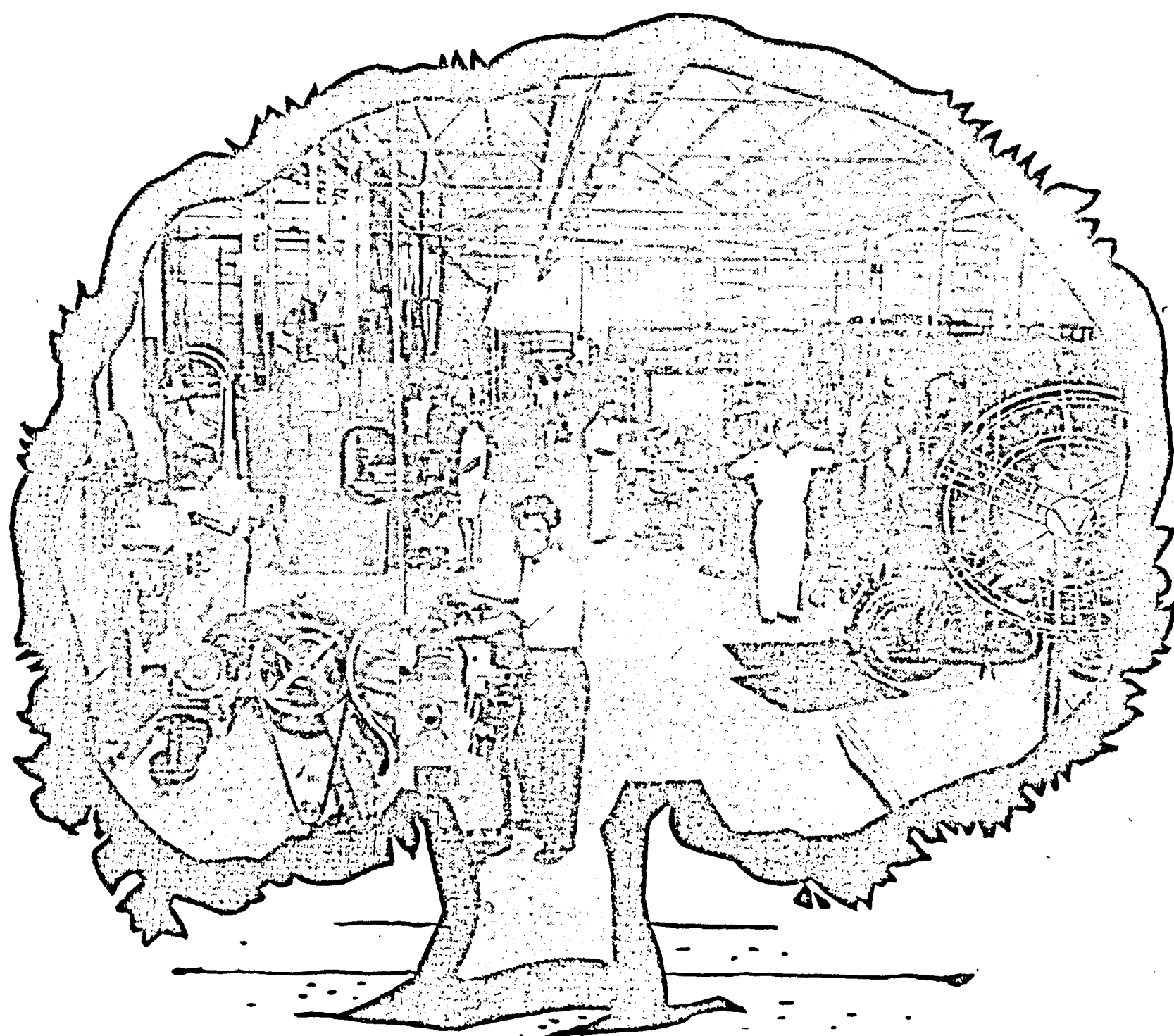
MANUFACTURE OF BICYCLE PARTS

The production of ancillaries for the bicycle industry has also made considerable progress. Under the First Five-Year Plan, the number of bicycles produced increased to 513,000 in 1955-56 as compared with 101,136 bicycles in 1950-51. As regards components and accessories, the trend in production and consumption in the First Five-Year Plan period is shown in the following table:

PROGRESS OF BICYCLE ANCILLARY INDUSTRY DURING THE FIRST PLAN

Year	(In lakhs Rs.)	Bicycle components & accessories, Value of indigenous production*	Value of Total Value of indigenous imports (Approximate)
1950-51	64.5	96.0	160.5
1951-52	64.9	144.5	233.2
1952-53	77.5	135.5	212.8
1953-54	91.1	98.0	189.0
1954-55	118.6	172.5	291.1
1955-56 (Estimated)	136.5	175.0	311.5

* Relates to calendar years. 1950-1951, 1951-1952, 1952-1953, 1953-1954, 1954-1955, 1955-1956, 1956-1957, 1957-1958, 1958-1959, 1959-1960, 1960-1961, 1961-1962, 1962-1963, 1963-1964, 1964-1965, 1965-1966, 1966-1967, 1967-1968, 1968-1969, 1969-1970, 1970-1971, 1971-1972, 1972-1973, 1973-1974, 1974-1975, 1975-1976, 1976-1977, 1977-1978, 1978-1979, 1979-1980, 1980-1981, 1981-1982, 1982-1983, 1983-1984, 1984-1985, 1985-1986, 1986-1987, 1987-1988, 1988-1989, 1989-1990, 1990-1991, 1991-1992, 1992-1993, 1993-1994, 1994-1995, 1995-1996, 1996-1997, 1997-1998, 1998-1999, 1999-2000, 2000-2001, 2001-2002, 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016, 2016-2017, 2017-2018, 2018-2019, 2019-2020, 2020-2021, 2021-2022, 2022-2023, 2023-2024, 2024-2025, 2025-2026, 2026-2027, 2027-2028, 2028-2029, 2029-2030, 2030-2031, 2031-2032, 2032-2033, 2033-2034, 2034-2035, 2035-2036, 2036-2037, 2037-2038, 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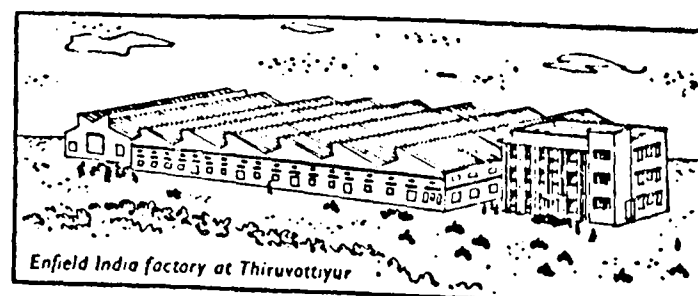


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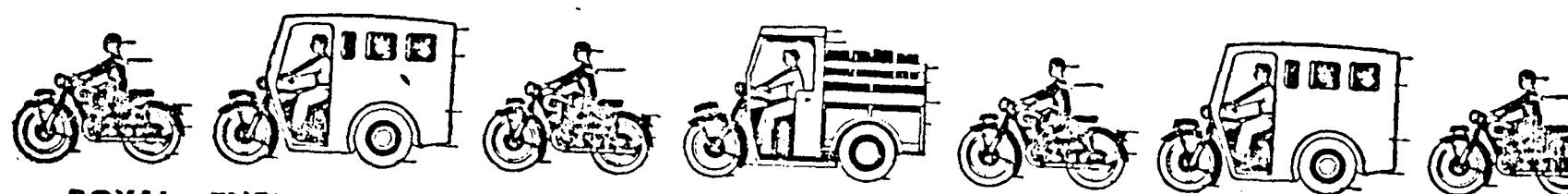
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THE HINDU SURVEY OF INDIAN INDUSTRY — SECTION III

BETTER DAYS AHEAD FOR AUTOMOBILES

From a Special Correspondent

THE place of automobile industry is significant in a country's economy. Apart from its strategic importance, it can influence the economy of a country in diverse ways. Wherever this industry has developed on a big scale, it has paved the way for expanding the economy by creating large-scale employment, developing subsidiary industries and in turn generating greater demand for the goods produced and more employment. The U.S.A. and the U.K. are outstanding examples in this regard.

The Central Government have not been slow in recognising the importance of this basic industry. The Industrial Policy Resolution of 1948 mentioned that the automobile industry is one whose planning and regulations should be their concern in the national interest. The first step in this direction was taken by Government in 1953. At their instance, the Tariff Commission enquired into the various aspects of the Indian automobile industry in that year and, as a consequence, of their recommendations, Government decided the lines on which the industry should be developed and the types and makes of vehicles which should be manufactured in the country. Prior to 1953 there were twelve manufacturers—run-assemblers of motor vehicles in the country of which only two firms had definite manufacturing programmes. And the others were engaged in assembling a variety of makes and models of vehicles. The Tariff Commission's findings confirmed that one of the chief reasons that contributed to the delay in developing the automobile industry in the country was the rather loose and undeveloped demand for motor vehicles and the many models and makes which were allowed to be assembled. On their recommendations Government restricted import licences to

those firms which submitted satisfactory programmes for the manufacture of vehicles. As a result, there are at present six approved manufacturers for automobiles in the country. They are, namely, Hindustan Motors Limited, Calcutta, Premier Automobiles Limited, Bombay, Mahindra and Mahindra Bombay, Ashok Leyland Limited, Madras, Standard Motor Products of India Limited, Madras and Tata Locomotive and Engineering Company, Limited Bombay. Two of these firms manufacture both passenger cars and trucks; two manufacture trucks only while one manufactures only jeep type vehicles. Two automobile diesel engine manufacturers, Simpson and Company and Automobile Products of India who had programmes for respectively manufacturing Perkins engines and Meadows diesel engines, were approved in 1955.

RECENT RAPID PROGRESS

The industry has benefited to a great extent by the steps taken by Government, as it facilitated progress in the matter of production of various components and provided a stimulus to some ancillary industries. A second enquiry was undertaken by the Tariff Commission at the instance of Government in 1955 and a number of recommendations submitted by them in 1956, were accepted by Government. Protection for a period of only two years was given to the industry and Government introduced a flexible price system under which the manufacturers would be free to raise their prices from time to time, subject to certain specific conditions. The Tariff Commission's recommendation have a delay in getting necessary machinery, there are no developed ancillary industries on which the manufacturers have tie-ups with foreign concerns and they have to also accepted. Government also ac-

corded priority to commercial vehicles in view of the processive increase envisaged in the demand for this type of vehicles during the Second Plan period.

The progress of the industry in general during these years has been satisfactory. The total annual assembling capacity on a single shift basis of the six manufacturers is approximately 50,000 vehicles. Although production has been very much below the capacity, 32,138 vehicles were produced in 1956 as against 6,002 in 1953, 12,146 in 1954 and 22,153 in 1955.

The above shows that the automobile industry has made real progress. But as the Tariff Commission had pointed out only two firms of trucks and the other in case of cars, there have not been licensed at the same time. However, it is essential that all the components are manufactured in the country in as short a time as possible. It is expected that 70 per cent of the components of trucks and cars will be produced in the country within the next two years.

The industry, despite its progress, is not developing at a pace as one would wish. A number of factors are contributing to the delay. It is felt by some that the target for the Second Plan, 57,000 vehicles, is ambitious. There are delays in getting necessary machinery, there are no developed ancillary industries on which the manufacturers have tie-ups with foreign concerns and they have to

Continued on page 127

INLAND WATERWAYS

Contributed

ANDREW CARNEGIE, the steel magnate once adopted a personal selection test at variance with the prevalent practice. Amongst a group of people set to untying parcels, only those who showed an awareness of time by cutting the strings were accepted. Argued the canny Scot: The age of frugality in time is over.

A similar approach to the question of inland water transport may not be inappropriate. Inland water-transport needs much more than the enthusiasm it evokes for justification as a main or even supplementary means of transport. Shorn of other relevant considerations, the question of economy is without any significance and can easily lead to a dangerous disregard of experience. The bullock cart long entrenched in the rural economy of India is being displaced by the ubiquitous lorry, which, besides continuing to capture traffic from the railways, inland water-transport suffers from the disadvantages of the bullock-cart and the railway. It is slow and it cannot offer a point to point service.

The idea of providing cheap transport through the length and breadth of the country by means of canals is not new. A challenging and ambitious scheme of inland water-transport as an alternative to the construction of railways was conceived in the latter half of the 19th century. The proposal included even a link between the Gangetic and the Cauvery basins. In the ensuing battle between Pluto and Neptune, as it was waggishly described, Pluto emerged victorious and few will deny the immense benefits to the country which resulted by the construction of Railways.

The eighteenth and nineteenth centuries saw a great deal of canal construction but the railway and the automobile revolutionised transport and the era of extensive inland water-transport is practically over. Even in the United States, out of 4,500 miles of canal, 2,444 were out of use even in 1911. In the United Kingdom, a Royal Commission reported on inland waterways and recommended various measures for improvement in the first quarter of the century but no action has yet been taken in the report.

The continuance of transport by water of iron ore or coal does not controvert the conclusion as economy of transport is a prime consideration in the movement of cheap and bulky material. The price of coal can be reduced in India at least at ports if a deep canal can be provided from the coal fields to the sea. Besides, in the form in which some of the schemes have been proposed in inland waterways have their multipurpose uses.

Canalisation of rivers effects an extension of the sea-way into the land and the advantages of ships loading and discharging at an inland port will be obvious. The great riverine systems of Europe and of America furnish striking examples of economic advantages of such transport. A parallel will be afforded if ships entering the Hooghly can move upto Patna, Cawnpore or Delhi.

A reference to the proposal for improving the Buckingham canal may not be out of place. South of Madras the canal traverses a more or less arid area and serves as a cheap means of transport for lucifer, a product of the area can be sent cheaply to Madras by canal. It is provided time is not of importance and other considerations do not exist. It was considered that the utility of the Krishna and Godavari canals diminished after the construction of the Railway. But they have their other uses. Great interest has now been aroused by the proposals to bring Godavari and Krishna surplus waters to Madras.

Much is heard about the advantages of multipurpose projects especially in regard to irrigation and navigation. "The exigencies of irrigation and navigation are incompatible and traffic is not attracted to a navigable channel which does not pass through large trade centres or is not in uninterrupted connection with the sea board."

The existence of a natural waterway and the absence of direct land routes confer, however, such predominating advantages on water transport that its development becomes a paramount necessity. The transport of tea from Assam to Calcutta is effected mainly through the river route. A detour from the undependability of the Assam rail link the whole of the traffic in tea and lute cannot be handled by it. Under existing conditions, the needs of the country in regard to ships will not be met for years to come and a very bold policy of shipbuilding supplemented by purchase will be necessary.

The development of ports has not kept pace with the growth of commerce. The expansion of the existing ports especially at Calcutta, Bombay and Madras is hardly any answer to the problem as apart from the difficulty of administering large units and their vulnerability to recalcitrant labour, constraints caused by transshipment are inevitable and the congestion in ports, already a grave problem, will not be simplified if the ports are expanded.

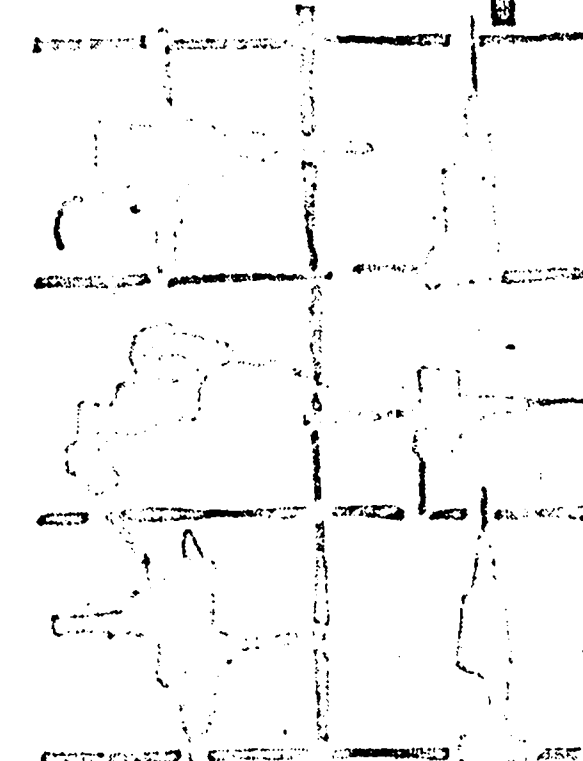
Calcutta was developed when railways did not exist. From its growth enormously on account of the industrial importance of the city. It is hardly necessary to touch upon the deficiencies of the Calcutta port to suggest the desirability of a second port on the Hooghly close to the sea. Such a port can, apart from handling all cargo from and to Uttar Pradesh or Orissa, serve as a coaling station for steamers. In view of the great increase in defence traffic, the port can be administered by the Navy and a safeguard against stoppages will be available.

The Kandla and the Cochin ports on the West-Coast can become more important and the development of Madras and Nagapattinam as ports may help in avoiding the waste which congestion in a port entails.

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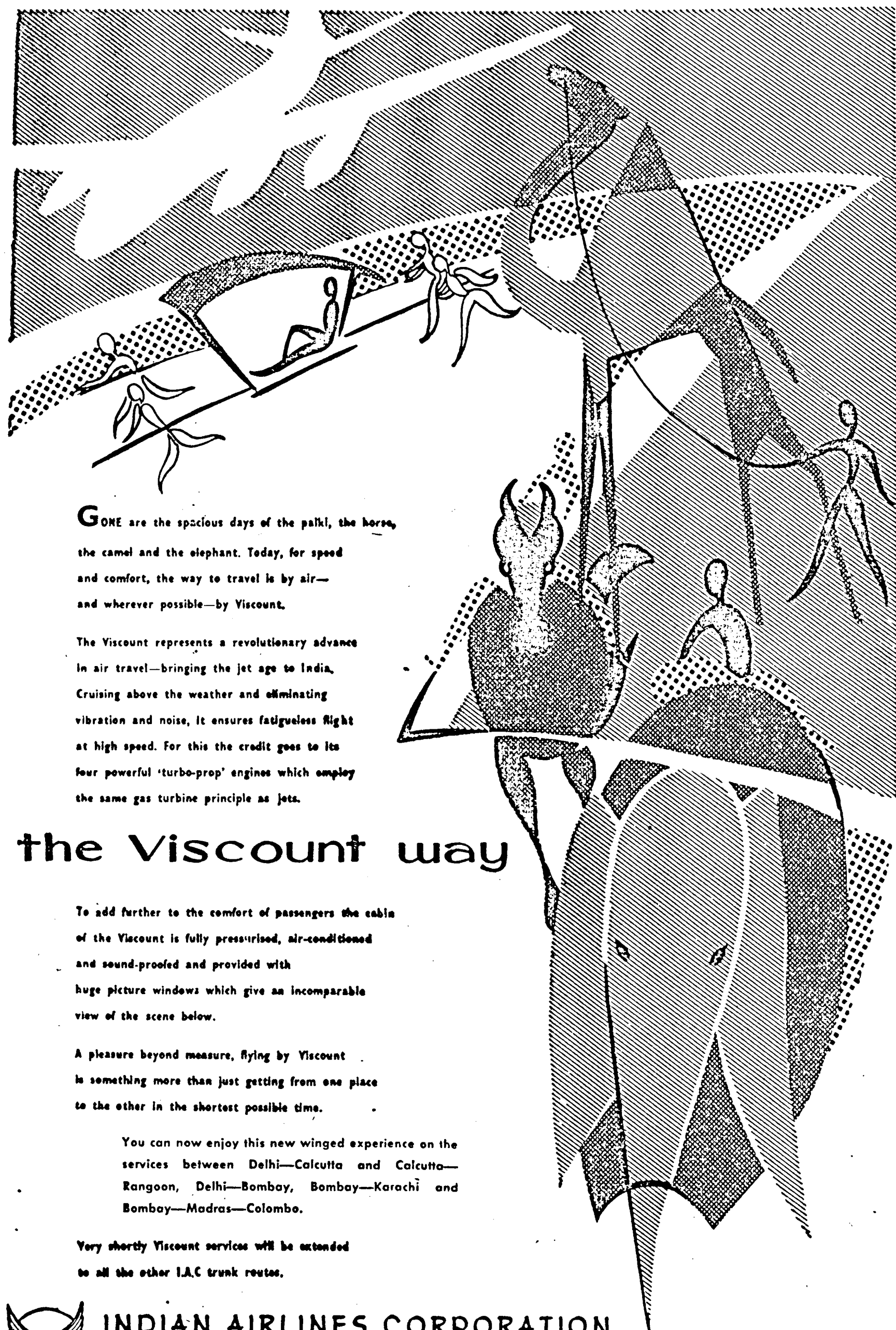


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RECORD OF HEAVY CHEMICALS

By C. G. Chandrasekar
Secretary, Indian Chemical Manufacturers' Association.

THIS is now a comprehensive survey of India's heavy chemical industries; it merely seeks to record the directions in which two of these have been forging ahead, in keeping with their importance to our industrial structure. Measured in terms of expansion of manufacturing capacity, actual production, diversification of products, or by-product utilisation, the development of these two industries shows progressive record.

Soda ash and caustic soda are the two heavy industries taken up for the present review because, alike by the volume of investment and the organisation needed to tackle production, they hold a primary place. Manufacturing capacity in both is rapidly expanding and in soda ash, even as between the two units that exist in the country, production in 1953 had reached 84,255 tons against the 78,000 tons the previous year. This is no doubt short of the demand that has been placed at a yearly 130,000 tons, particularly when it is remembered that by the close of our Second Plan period, consumption is expected to grow by a hundred thousand tons additionally. Moreover, of our current consumption, nearly 40,000 tons is of the heavy ash variety for which production facilities have until lately been non-existent. This was a serious lacuna, having regard to the fact that the glass and dichromates industries depend on such ash and the off-take of it is expected to grow approximately to 76,000 tons in the Plan period. With the expansion or the setting up of additional capacity for which licences have been issued, the manufacturing capacity may be ahead of our requirements. Initial licensing had raised it potentially to 25,500 tons from 80,000 tons at the beginning of 1953 but it was assessed that if the plants should turn out only 90 per cent of their rated capacity in actual output and if some of the ash be diverted to the production of caustic, there might still be some gap between the productive capacity and demand. Licences issued recently have therefore covered this gap.

IMPROVEMENT IN PRODUCTION

In the year 1950, the various schemes were in different stages of implementation but even so, production did register a substantial improvement and this is expected to reach 100,000 tons in the current year. The plant at Mithapur and the plant at Dhrangadhra have both expanded in recent times. Production at the Mithapur plant even in January had reached 1746 tons per day against the expanded capacity of 200 tons. Since then, the new Carbon Dioxide compressor which would stabilise production further at the higher levels has been installed and preliminary work has been taken on hand designed to carry the total capacity up to 400 tons daily. Even by 1954, the Dhrangadhra Chemical Works had announced their capacity to 120 tons daily—that is double their previous level—and steps are now being taken to take this to 150 tons. Among the new units that have been licensed, the schemes at Ramnagar and at Porbunder, respectively of 40,000 tons and 40,000 tons per year, are stated to have made some progress while the third plant will be at Tuticorin having a capacity of 30,000 tons. The fourth licensed subsequently, is also as big as the one sanctioned at Porbunder but its location is not known.

An important aspect of these developments is that all the units will have some provision for producing heavy ash while the plant at Ramnagar, close to the glass industry, will be devoted entirely to heavy ash. Thus the capacity of 70,000 tons a year is visualised for heavy ash and it will save foreign exchange roughly to the tune of Rs 2 crores a year.

The manufacturing processes employed or contemplated are standard practices, well tried out. The Mithapur plant is based on the standard solvay process, long employed by them, while a modified solvay process will operate at Ramnagar, enabling recovery of about 120 tons per day of technical grade ammonium chloride. This is a valuable fertiliser considered by many on par with ammonium sulphate and apart from the fact that the small percentage in it of sodium chloride and silicate will help to maintain soil condition, it will effect considerable saving of foreign exchange involved in the import of sulphur

From the factory's own point of view, this will minimise for them the problem of effluent waste disposal, which can be serious for a plant situated away from water-fronts. The Porbunder plant will also adopt a similar method. The new plant at Tuticorin will produce ash by conversion of caustic soda and its advantages will grow apparent when the disposal of caustic soda rather than of by-product chlorine will become the problem for us, as in many other countries. Originally, the licence was for the manufacture of soda ash by the standard process and conversion of a part of it into caustic soda. On the comparative economic and other advantages of the method now proposed to be followed being pointed out to Government, the licence was subsequently modified as indicated above.

The existing plant at Dhrangadhra, also far from the sea, has had in its turn to face the problem of effluent waste disposal. It has now been tackled to some extent by production of commercial grade calcium chloride from the waste. This product, however, has limited application yet and efforts are being made to popularise it in rapid cement hardening for making low cost roads, the manufacture of anhydrous calcium chloride for oil refinery and of precipitated CaCO₃ for the paper and rubber industries. Recovery of KCl and Magnesium Sulphate from the bittern of the salt works has also been undertaken. Thus, the industry is keeping itself continually abreast of developments while the Development Council concerned is trying to lay down norms of efficiency which will enable it to improve its record constantly. The units now expanded and to be set up in the future are fairly large units and are distributed also well, from the point of view of regionalisation. These are bound to reveal their advantages in the years ahead.

CAUSTIC SODA

The other heavy chemical, closely linked to soda ash in some plants and which is reviewed here is caustic soda. This is widely used in industries like paper, soap, new-print, textiles, rayon, aluminium, petrol, and other chemicals and the Planning Commission has estimated that the demand for caustic soda by 1960-61 would be around 140,000 tons. The installed capacity in 1953, spread among units and inclusive of about 4,000 tons available with the paper mills and production from which they consume themselves, was 44,000 tons. Production itself was 31,255 tons in the same year. The targets set for expansion of capacity and achievement of production by the First Plan period were only 57,125 tons and 33,000 tons in the light of which actual performance has been ahead of schedule. In recent times, the production of rayon grade caustic soda with a minimum purity of 98 per cent has been achieved and within a year of such production for the first time, output doubled itself. A second welcome development has been the production of caustic soda flakes, which are costlier and therefore involve more drain on foreign exchange when imported. Licences issued during the first plan period cover about 21,000 tons of caustic soda by the chemical process, spread between two units, and 85,124 tons of caustic soda by the electrolytic process distributed among them. The total productive capacity will thus be pushed up to 130,424 tons per year and it will be, regionally, well spread out. On the calculation, however, of only 90 per cent conversion of rated capacity and after providing for 28,000 tons of caustic soda to be converted to soda ash, the available supply to the market, it was figured out, might leave a shortfall of 35,000 tons still and certain licences have therefore been issued to fill up this gap.

An outstanding feature of these licences is that about 80 per cent of the licences issued (including those for the plants at Dhrangadhra and Tuticorin) is for the mercury type cells which until the end of the war were in vogue only in Europe and Japan. Caustic from these cells is of 50 per cent strength direct and the quality of the product is superior to that from the diaphragm cells and is of 98 per cent purity. Another advantage is that these cells may also be utilised for producing 70 per cent caustic soda which may be packed in drums directly and sold after cooling. The material is salable as such and thereby saves

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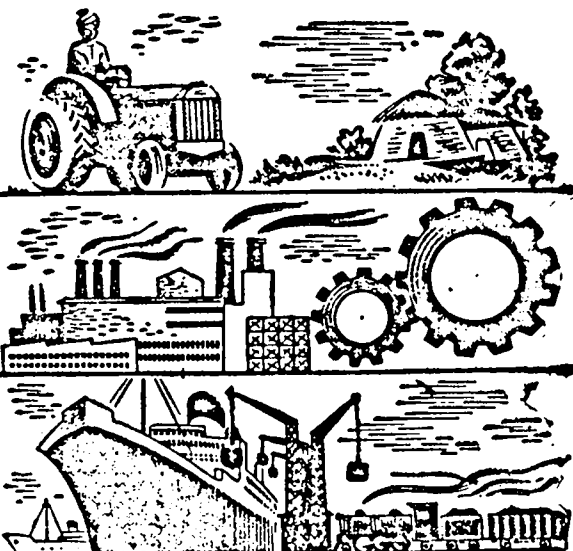
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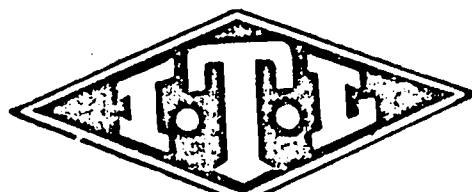
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costs of concentration and equipment, etc. The introduction of Dowtherm-vapour heated evaporators for dehydrating the 50 per cent lye has been another improvement and with standards evolved by the ISI and packing material of required specifications becoming available, this branch of production may be considered as having come to full maturity.

PROBLEMS FACING INDUSTRY

Production itself in 1956 recorded a 15 per cent improvement and this was despite the fact that schemes of expansion were only under way and shortage of power supply often interfered with both production and the plans for implementing expansion of manufacturing capacity. In 1957, the expectation is that production would touch 50,000 tons and if this should be so, it shall represent a 25 per cent improvement over the previous year's. Problems of co-operating import with indigenous production, the price and quality of salt, the availability and the cost of power, the supply of wagons for transport of coal, caustic soda lye and hydrochloric acid and the dearth of indigenous facilities for the manufacture of plants and components have been present in varying degrees. These are receiving the attention of both the industry and the Government, but the problem of utilisation of co-product chlorine arising in the electrolytic process of caustic soda manufacture may perhaps be particularly detailed. While this has been one of the industry's major problems, some important developments have taken place which indicate that this question is being actively studied by manufacturers.

Some of the chlorinated products now being produced are hydrochloric acid, inorganic chlorides and bromides, bleaching powder, active earth, dicalcium phosphate, B.H.C., D.D.T., and chlorinated organic compounds other than B.H.C. and D.D.T.

BLEACHING POWDER REQUIREMENTS

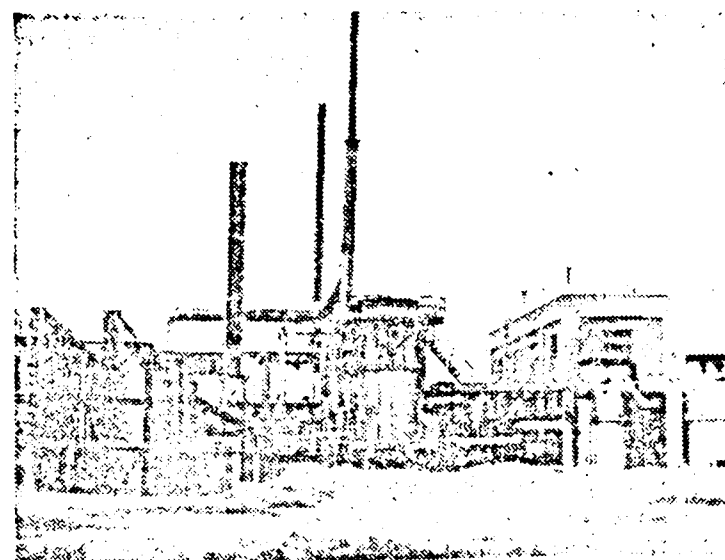
The bleaching powder requirements of the country are currently placed at 8,500 tons but productive capacity among the three units is already 14,640 tons. One of these has been producing since November 1955 stable bleaching capacity—33 to 37 per cent chlorine content—and the production of bleaching powder as such in 1956 reached 4,657 tons against 2,689 only the year before. In the bleaching of vegetable oil for Vanaspathi, however, bleaching earth is needed and a firm engaged in production of caustic soda by the electrolytic process has been producing activated earth by utilising their own hydrochloric acid. The same plant has undertaken to manufacture ossein and dicalcium phosphate. These activities will provide an outlet for their hydrochloric acid and facilitate gradually the earning and saving of foreign exchange by promoting exports of gelatin and curtailing the import of sulphur.

Bromides of all sorts are also now produced by the country and such manufacture is from sea water. The production of B.H.C. needs special mention in the chain of chlorine utilisation by industries because the chlorine here just adds on to the benzene without raising hydrochloric acid, which has only limited use and would therefore be difficult to be disposed of. The rate of chlorine utilisation is also high, being 72 lb. per lb. of B.H.C. produced. Installed capacity for B.H.C. having expanded from 2,000 to 2,500 tons in 1956 is therefore to be greatly welcomed and the expectation is that production in 1957 might reach well over such capacity, at 2,700 tons. Another insecticide, utilising chlorine in process, is D.D.T. for which the plant at Delhi in the public sector draws chlorine from an adjacent caustic soda plant. Production of this plant in 1956 was 500 tons but its capacity is soon being stepped up to 1,400 tons while a second plant of equal capacity at Alwaye, also in the public sector, has already gone into trial runs.

Other chlorine consuming industries are ammonium chloride, ferric chloride (solid and liquid), potassium chloride, zinc chloride, chloral hydrate, ethyl chloride, etc. There is organised production of all these, and in 1956, their respective output in terms of tons were 4,700; 93 and 47 (for solid and liquid); 2,276; 900; 28,573; 28,573. In most of these, production capacity is spread between more units than one and production itself has been well below capacity, regulated entirely by demand.

Expansion in the activities of the Indian Rare Earths (Private) Ltd., and the setting up of a rare earth factory at Trombay under the same management should further help to absorb some chlorine.

Continued on page 128



The 75-ton sulphuric acid plant of EACIS, Alwaye.

RISING CONSUMPTION OF
SULPHURIC ACID

By S. Nallaperumal

SULPHURIC ACID manufacture is an important basic industry and many chemical industries depend on it. For the production of fertilizers, textiles, explosives, iron and steel, rayon and dye stuffs sulphuric acid is required. The per capita consumption of sulphuric acid in India is only 0.63 lb. which is 1/70th of that of U.K. and 1/200th of that of U.S.A.

The growth of this industry in India is of recent origin. During the first world war a number of small plants were established and they were working fairly well. But after the war there was a setback in production. An impetus for production was given only during the Second World War. At present there are 45 plants (20 Chamber plants and 25 Contact plants) in India, with an annual capacity of two lakh tons. The actual production is about 1.5 lakh tons per annum. The two lakh tons capacity is the largest in the First Five-Year Plan and the target is met in time. Taking into account the consumption of sulphuric acid in the various industries and providing for expansion especially fertilizers, iron and steel, and rayons, the production target for this vital chemical is about 4.8 lakh tons at the end of the Second Five-Year Plan which would entail an additional capacity of 2.8 lakh tons which means setting up of some 20 new units of 50 tons per day capacity.

Because of the small consumption of acid in the early stages of

trend has been to replace chamber units by contact units.

For the manufacture of superphosphate sulphuric acid of about 60 per cent strength is required. For this purpose it may be worthwhile to examine the installation of modern chamber plants, especially if we are going to make use of pyrites as raw material for the production of sulphuric acid. The rough capital cost of a 25-ton plant, 50-ton plant and 100-ton plant using elemental sulphur as raw material will be Rs. 15 lakhs, Rs. 25 lakhs and Rs. 40 lakhs respectively.

RAW MATERIALS

The three important raw materials from which sulphuric acid could be manufactured are sulphur, pyrites and gypsum. In India elemental sulphur is the only raw material used for making sulphuric acid and sulphur is imported mainly from U.S.A. Due to the Korean War there was a shortage of sulphur supply to India from U.S.A. and India imported small quantities from Italy and Japan. Costs of Japanese and Italian sulphur are much higher than that of American sulphur; whereas sulphur from U.S.A. costs around Rs. 320 per ton Italian or Japanese sulphur costs nearly double. The present annual consumption of sulphur is about 80,000 tons and the demand in 1960-1961 is expected to be 1.6 lakhs of tons of sulphur.

Iron pyrites containing about 45 per cent sulphur is being used on a large scale in the Continent for the manufacture of sulphuric acid. In those countries the price of pyrites is comparable to that of elemental sulphur, with the result the manufacturers can use either elemental sulphur or pyrites for the manufacture of acid depending upon availability. There the plants are designed to use either sulphur or pyrites. The possibility of manufacturing sulphuric acid from pyrites has been investigated both by the Government of India and private manufacturers. But no decision on the use of pyrites is taken because of the absence of information as to the extent of local reserves of pyrites.

CONTACT PROCESS

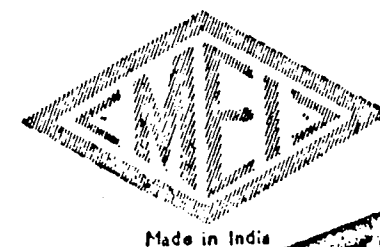
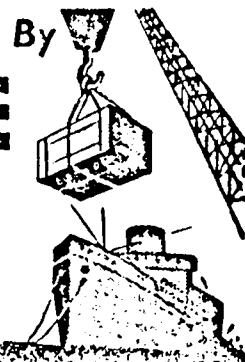
Early units in India were all lead chamber units, but slowly lead chamber units are being replaced by contact process, and 70 per cent of the acid produced in the country is by contact process. In order to bring down the cost of production of sulphuric acid, now licences are given for plants having a minimum capacity of 25 tons per day and in the case of plants forming part of superphosphate plants, 50 tons of sulphuric acid per day has been fixed as the minimum capacity. In the contact process since the introduction of vanadium catalyst some 25 years ago there has been no fundamental change in the process, excepting changes in housing the plant and size. One of the major innovations has been the introduction of "out door" type construction. The plant is completely exposed to the weather. Usually the control room blower and feed water pumps are enclosed.

The saving in building cost has proved substantial. Another trend has been the installation of larger and larger single units. Larger units result in greatly decreased capital cost on a per ton basis. Labour requirements for the larger units are not more than that for the smallest units. Maintenance cost per year on a larger unit represents only a small percentage increase over that of smaller units. Thus the cost of manufacture decreases as the unit size increases. The latest contact sulphuric acid unit designed by the Tennessee Copper Company produces 650 tons of acid per day. Recently the Chemical Construction Corporation of U.S.A. have adopted radical changes in the design of the plants. The result has been a marked efficiency in conversion a reduction of 90 per cent in cooling water requirements, a greatly simplified plant as far as operation flow-sheet and layout are concerned. Investment and physical size have decreased and it has become possible to build plants of smaller capacity than was economical in the past.

Designs of the Chemical Construction Corporation, Quench Converters and Drum absorbers are the novel features in any new plants that are to be built in India. These improvements deserve careful consideration. Except in very small units all contact plants have waste heat boilers, which serve the dual purpose of cooling the combustion gases and providing pre-heated steam. A 50-ton acid plant will produce about 50 tons steam. In the chamber process in other countries there have been improvements such as Mills Packard water cooled towers and Harry Pauline's tower. However, in India, as mentioned above, the

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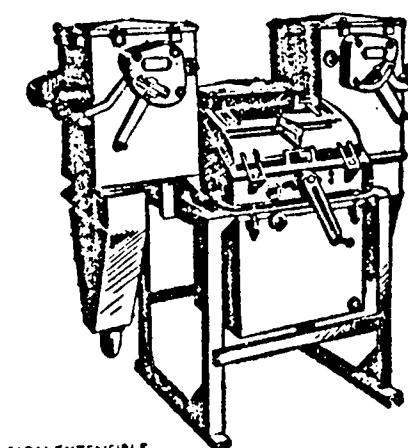
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In India till the local mines are developed it might be necessary to import pyrites from Norway, Portugal, Australia, etc. If sulphur supplies are short. But then the cost of sulphuric acid will be higher because (1) the price of pyrites will be higher in comparison with the price of sulphur and (2) the residue left—iron slag—should bring a price to make the production economical. In India, a major area in Bihar contains pyrites deposits which are promising, but the exact extent of the deposits is not known. If enough quantities are available, it will be worthwhile exploiting these reserves for the production of sulphuric acid.

USE OF GYPSUM

Gypsum can be used for the manufacture of sulphuric acid. In the process, using gypsum as raw material, sulphuric acid and cement are produced approximately in equal amounts. Large deposits of gypsum occur in Rajasthan, Saurashtra and Tiruchirappalli. Gypsum sulphuric acid plant involves heavy capital investment. A rough indication will be, say, if the capital investment for a plant utilising sulphur is 1, the capital investment for a plant using pyrites will be 2 and that for a plant using gypsum will be 3. The operating charges will also be higher in the case of pyrites and gypsum.

PROCESS OF MANUFACTURE

The plant for the manufacture of sulphuric acid is a standardised one and the process is also simple. Sulphur is melted by means of steam coils in a melting tank. The molten sulphur is pumped and sprayed into a sulphur burner which is merely a combustion chamber for the burning of molten sulphur. In the burner, the sulphur is burned to sulphur dioxide with excess of air. The products of combustion, viz., sulphur dioxide, oxygen and nitrogen leave the furnace and pass through a waste heat boiler. The gases after passing through the waste heat boiler are filtered from any dust and admitted into a converter. The conversion of sulphur dioxide into sulphur trioxide occurs inside the converter in the presence of vanadium pentoxide (catalyst). The converted gas is cooled and passed into an absorption tower where it is absorbed in 98.5 per cent acid. The acid made is cooled and collected in storage tanks.

Oilum containing 10 to 60 per cent S₂O₃ can be prepared if necessary in the same plant by the installation of additional equipments like absorbing tower, pump, boiler with subcooled acid pump, together with equipment for gas and oilum cooling. Oilum is obtained in the contact acid plant by circulation of concentrated acid over sulphur trioxide when sulphur trioxide is absorbed producing fuming sulphuric acid. The consumption of oilum at the end of the Second Five-Year Plan is expected to be about 6000 to 7000 tons per annum.

The biggest sulphuric acid plant installed in India has a capacity of 75 tons per day and in the Fertilizers & Chemicals, Travancore Ltd., Alwaye, there are two such plants installed side by side (with a common control room) producing 150 tons of sulphuric acid per day. Another larger plant of capacity 100 tons per day is also being installed near these units. The picture at the beginning of the article gives a view of the two 75-ton per day acid plants. In one of the plants, there is provision for the manufacture of oilum upto 25 tons per day. About eight tons of oilum are required for the manufacture of D.D.T. by the Hindustan Insecticides (Private) Ltd., at Alwaye and this is supplied by the Fertilizers & Chemicals, Travancore Ltd. Similarly oilum required for the D.D.T. factory at Delhi (about eight tons per day) is supplied by Delhi Cloth Mills.

"PACKAGE" PLANTS

"Package" plants ranging in capacity from 10 tons to 200 tons per day are available for import. But there are manufacturers in the United States and U.K. who are interested in the sale of their catalysts and who are prepared to supply drawings for the complete fabrication of the acid plant locally. By fabricating plants locally not only can we reduce the capital investment but we can also get experience in design and fabrication of chemical plants. Messrs. National Rayon Corporation, Dharampur, Morarji Chemicals and Delhi Cloth Mills have installed sulphuric acid plants of capacity 30 tons, 30 tons and 50 tons respectively by fabricating plants themselves. Only speciality items like sulphur pumps, air blowers, control instruments and catalysts have been imported. This is a very welcome development in sulphuric acid industry in India.

Prospects for Dyestuffs

IN the beginning of the 18th century India was one of the largest exporters of dyestuffs. Of course, these dyestuffs were of vegetable origin like indigo. Lot of textiles dyed with vegetable dyestuffs also used to be exported and India had a very firm grip on European markets for vegetable dyestuffs.

However, with the advent of synthetic dyestuffs in Britain, vegetable dyestuffs could not compete with the same, as the synthetic dyes were found to be cheaper and easy in their application. The synthetic dyestuffs industry originated in Britain when in 1868 Perkin made the first synthetic dye. But the main advantage of this discovery was taken by Germany, which developed a vast organic chemical industry and dominated the entire dyestuff industry till the First World War. In the year 1918 the British Dyestuff Corporation came into being with the active help of the Government of U.K. which also imposed a ban on the import of foreign dyestuffs. In this corporation, the Government of U.K. subscribed a sum of £2 million out of the total capital of £5 million. Subsequently, Parliament voted for a further sum of £2 million for the development of the synthetic dyestuff industry. In the year 1935, the Imperial Chemical Industries came into being and the British Dyestuffs Corporation was merged in it. The Government of U.K. purchased shares worth £1.7 million out of the total capital of £6 million. Thus, with the help of the Government, the synthetic dyestuffs industry was established in U.K.

During the same period, the U.S.A. also started to develop a dyestuff industry. The Government of America levied very heavy import duties on imported dyestuffs; whatever dyestuffs were imported, they had to bear a duty of 60 per cent on the cost of similar dyestuffs, thereby making it practically impossible for any outside country to push the goods in U.S.A. Japan also followed a similar course for developing an indigenous dyestuffs industry.

IMPORTS BY INDIA

The synthetic dyestuff industry developed all over the world, and India, once one of the largest exporters of dyestuffs because of the largest importers of synthetic dyestuffs, because the textile industry and other industries which are using the synthetic dyestuffs were growing very fast. In the years 1940-1953 the average yearly imports of dyestuffs in India was to the tune of Rs. 12 to Rs. 15 crores. During World War II, and immediately afterwards, the scarcity of dyestuffs was felt very much, as the manufacturing countries were unable to send out the goods to India in view of this necessity was felt that a dyestuff industry should be established in India. Mr. Kasturba Lalbhai decided to establish a dyestuff industry in India. With the collaboration of the American Cyanamid Company of U.S.A., Atul Products Limited was floated in the year 1947. Previous to this some rapidized and rapid fast types of colours were being manufactured in India on a small scale. However, regular establishment of a dyestuff industry started when the manufacturing plants of the Atul Products Limited went into production in 1952.

TARIFF COMMISSION'S RECOMMENDATIONS

The Government of India also realised the necessity of developing the dyestuffs industry in the country, and appointed a Tariff Commission to inquire into this. The Tariff Commission, after a long inquiry, came to the following conclusions:

(1) Protection to the dyestuffs industry should be granted for a period of ten years, i.e., upto 31st December 1965, subject to periodical reviews by the Tariff Commission of the working of protection and the quantum of protection. (2) The duty on acid dyes, direct dyes and sulphur black be amended and raised to a protective duty of 20 per cent. (3) The duty on Congo Red and fast colour salts, rapid fast colours and other dyes be also raised similarly. (4) The standard rate of duty on specific intermediates be reduced to 10 per cent ad valorem. (5) The Government of India should examine the possibility of setting up a coal tar dyestuff industry in India and (6) Plants for expanding production of inorganic heavy chemicals should also be examined and necessary plants may be established.

Since the establishment of the dyestuff industry in the year 1951

Continued on page 125

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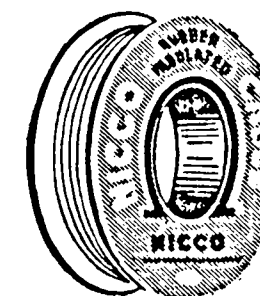


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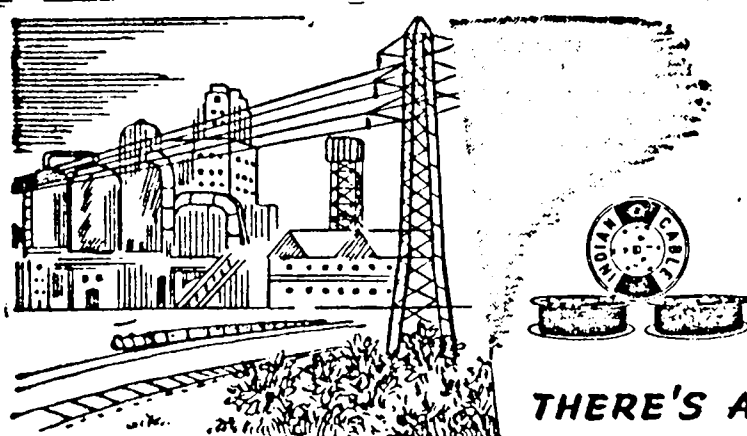
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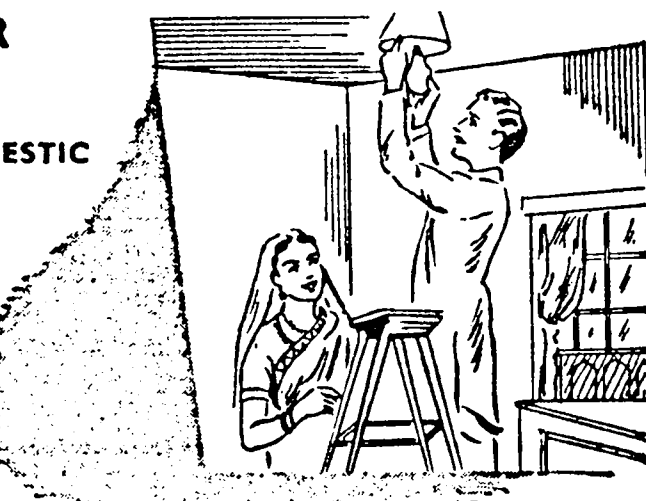
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PRODUCTIVITY IN TEXTILE MILLS

By Arvind Bhai Lalbhai

(Chairman, Ahmedabad Millowners' Association)

THE Second Five-Year Plan lays emphasis on the need for large increase in productivity. This will ensure economic utilisation of the available resources. A team from the International Labour Office, visited India about four years ago and it confined a part of its activities in the study of productivity in textile mills in Bombay and Ahmedabad. It demonstrated clearly to the management as well as the trade union officials that, given adequate supervision, it is possible to secure significant improvements in productivity with the same plant and equipment, provided some training is provided in productivity techniques. In the textile industry they had estimated that productivity can be increased from 6 per cent in certain jobs to 36 per cent in other jobs.

The subject of productivity has been engaging the attention for the last three years and more. The introduction of automation which led to increased productivity in several countries and adoption of modern devices of production along with the possibility of utilising atomic power are two factors which have focussed more attention on increased productivity. Many persons are under a certain misunderstanding that productivity means man-hour output. When ever the subject of productivity is mentioned, the workers are apprehensive of increased workloads for them. Productivity does not necessarily mean higher workload. It only implies maximum utilisation of all factors of production. Man-hour output is a convenient index for measuring productivity but the subject of productivity is very much wider. According to a recent definition, productivity represents ratio of goods produced to the total resources required to produce it.

The productivity of an Indian textile worker is low and this can

the Continent have visited the United States, and they have published the following reports which give illuminating information on the subject of productivity in a textile mill: (1) The report of the British Cotton Textile Mission to the U.S.A., known as the Platts Report, (2) Reports of productivity teams on cotton spinning, cotton weaving and cotton yarn doubling of the Anglo-American Council on Productivity and (3) The report of the French cotton spinning and doubling productivity team.

These teams devoted their study to several aspects of the industry and studied the managerial set-up, labour relations and working conditions, costing, mills economics, technical processing and groups also visited the research institutes and technical schools. After a complete study the British teams and the French team came to the conclusion that the important features of the American practice were:

- (1) Good Labour relations; (2) Keenness on the part of the management to increase efficiency; (3) The use made of time study in the assessment of workloads; (4) Flexibility on the part of labour permitting deployment of large complements of machinery; (5) Good working conditions; (6) Care and attention given to control of humidity; (7) Importance attached to quality control, mill testing and research; (8) Adoption of costing systems; (9) The adoption of bigger card cans, bigger packages in spinning and mechanical handling; (10) General adoption of high productivity achieved in spinning and warping.

The actual comparison of the sizes of packages adopted in England, U.S.A. and a progressive mill in India is tabulated here below for comparison:

Process	Nature of package	Net wt. of cotton in lbs.	A progressive Indian Mill
Blowing Room	Lap	42.8	45.3
Card (20s)	Can	2.2	12.0
Silver Lap m/c	Lap	9.8	15.4

be borne out from a comparison of the output per man-hour in this country and in countries like the U.K., U.S.A., and Japan. Even from the point of view of machine attendance, the performance of an Indian worker is not comparable and this can be evident from the following table:

	Number of spindles handled by one operative	No. of looms handled by one operative	U. K.	France	Germany	China	India	Pakistan	Japan	U.S.A.	Canada
United States	1,500-2,100	60 automatic	313,791	157,205	183,000	80,000	207,811	22,519	363,448	369,144	15,718
Japan	1,600-2,000	30-40 automatic	46,372	71,265	50,161	20,000	13,740	16,605	63,744	309,144	15,601
Britain	800	14-15 ordinary									
Indian	350 (average)	2 ordinary (average)									

It may be argued that conditions of work including machine maintenance and quality of materials used in the manufacture of cotton cloth and yarn are not on par with those in other countries, with the result that the productivity of the worker remains low in spite of his best efforts. This may be true where working conditions are not suitable, but even in the well equipped and ventilated mills, the productivity has continued to remain low. This can be improved by standardising work-loads and duties of workers, on a scientific basis. Reassessment of workloads will naturally entail improvement in the conditions of machinery, quality of raw materials, standard of lighting, ventilation, humidification and other factors affecting the output.

Several productivity teams from the United Kingdom, France, and

This goes to show that automatic looms have been adopted in the Western countries more and more progressively, firstly because they improve the quality of cloth, and secondly because of the factor of reducing the cost of cloth.

It can be gathered from the above, that the productivity of the Indian worker is low and there are many reasons for the same. One of the primary reasons is the experience of the employer that the labour is not ready to co-operate due to fear of exploitation. In the advanced countries of the West, the work assessments are fixed on the basis of time taken for various component parts of the job, with an agreed allowance for relaxation. When new machines, processes or methods of work are introduced, the employer has a right to change

the workload or assessments and prepare a scientific work analysis including time studies. The managements in practice explain even small changes to the operatives and the workers are in the know of their proposed duties, job assignment and expected earnings. Where technological changes are involved, the question of wages looms large. If some additional skill is required or working conditions have been adversely affected, care is being taken to ensure that the wage level does not fall out of line with the wage levels for the jobs immediately above or below the particular job involved. If there is no alteration in the skill required and the working conditions, it is hard to justify any increase in wages. The willingness of the unions and the workers to accept changes in work assignments has led to high productivity in the West particularly in America leading to lower operating costs.

The report of the Indian productivity team to Japan goes on to confirm that in a developing economy the increase in productivity can be a powerful element to the national policy designed to increase national wealth and raising the living standards. The report has stressed that in Japan great interest is being evinced in the field of productivity. The delegation found that Japanese industrialists were quality conscious.

MANAGEMENT TECHNIQUES

It cannot be gainsaid that modern management techniques and practices have been employed in the West and in Japan with the idea of increasing productivity and improving the standard of living and they had a good measure of success. Devotion to principles of scientific research, systematic quality control, proper selection of raw materials, quality control, cost control and maximum utilisation of man and power should be the primary considerations for our management. Without these no contribution can be made to the problems of productivity and organisation.

EXAMPLE OF GERMANY

Germany has been a classic example of economic revival. Starting from total destruction and from a low level of productivity her manufacturing output made startling progress. Her productivity rose by an average of 8 per cent per annum. Productivity promotion in Germany is not new. Even during Hitlerite Germany production was on the increase. In Britain also the British Productivity Council, successor to the Anglo-American Council is engaged in an extensive programme of publicity to raise productivity and top executives are being trained for the necessary work. Regional productive executives are started under the guidance of an expert consultant and these try to probe into weak spots of industrial units. The National Union of Manufacturers in England was set up in 1953 and renders the role of consultants at very nominal charges. The process of increasing productivity is assisted in Britain by the Department of Scientific and Industrial Research which helps institutions in devising new materials, new equipment and new processes. The real problem obstructing productivity is shortage of finance and to finance such concerns both in Germany and in England the Governments are issuing loans through certain organisations. Managements in India should also emulate the other countries in the West and try to provide management with training and take advantage of advisory services in improvements of techniques of production and should take further loans from the National Industrial Development Corporation and see that the modern equipments are installed.

In the West, the Union representatives and leaders are prepared to adopt modern techniques involving large deployment of labour, because they believe that outdated methods of production cannot survive. Survival of the textile industry in India will be dependent on the courage that the labour leaders can display in their readiness to adopt more modern techniques which only can reduce costs. The unwillingness of labour so far in these matters has been supported by the Government which have so far been moulding their industrial policy on a vague ideal of larger employment based on an anti-machine philosophy. It is necessary to overcome this great obstacle and it should be done as rapidly as possible. If this cannot be done, there will be no real progress in industrialisation and also in the application of recent trends in industrial practices. If delay occurs, the cotton textile industry will stagnate in comparison to other countries as well as to other centres which had benefits of starting these industries at a later date.

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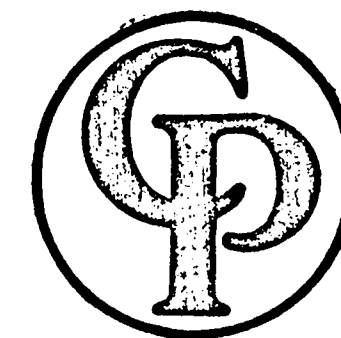
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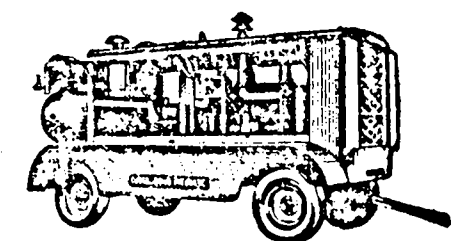
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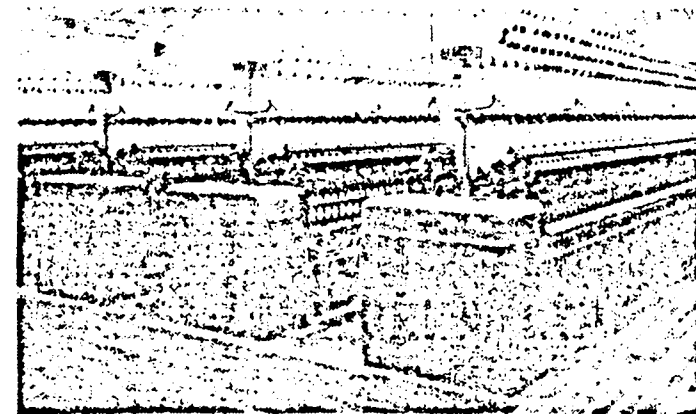
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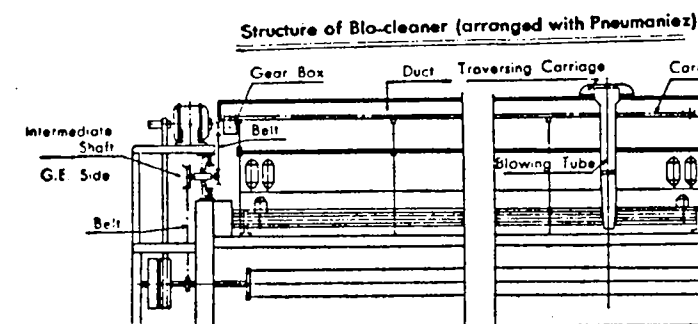


Blo - Cleaner

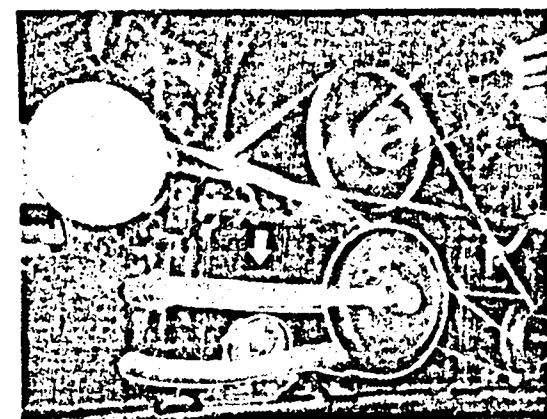
Preface: This is an equipment to blow-off fluffs falling on Ring Spinning Frame or Winding Machine. To make blowing air, independent fan driven by 1/8 H.P. induction motor is used, but if the frame is equipped with Pneumatic Clearer, exhaust air from motor blower can be utilized, and on latter case no additional fan or motor is required. **Construction:** The blowing air from the wind source transmits to the inside of the duct horizontally arranged on the shelf over the silver bobbins and enters into Traversing carriage having nozzles made of Vinyl. The nozzles traverse to and fro along the rail over the duct and blow from well-designed angle toward the portions of every important parts frame which requires constant cleaning. The amount of air to be released and blowing direction are decided very carefully and therefore it is no fear of affecting the yarn or causing unnecessary yarn breakage. The construction is very simple and cost of equipment is quite low and constant cleaning can be done in the most ideal way.

Advantages:

- (1) Least consumption of power: Vinyl nozzle blows off within nearest range from the portions of frame which require constant cleaning.
- (2) Least labour charges: As the reel, top board, Drafting Parts, Lappets etc. can be kept always clean, and the fluffs accumulating on clearer roller decrease, labours for cleaning can be reduced considerably.
- (3) Yarn quality improved: The end-downs from the sticking of fly cotton to the silvers will be extremely eliminated, and yarn gets better evenness and its quality improved.
- (4) Better efficiency: For the reason stated in (3), yarn breakage can be reduced and moreover, the temperature and moisture prevailing in the spinning room will be evened by the sucking and blowing forces of the Blo-cleaner. Besides, sweeping the floor becomes easier.



Structure of Blo-cleaner (arranged with Pneumaneiz)



Moreover, the durability of the card clothing is shortened due to the over-load. From this point of view, the ordinary stripping is usually done in every 2 hours or so in most mills. ACS works to keep cylinder fillets always clean and neat automatically, and consequently serves to eliminate the troubles of ordinary stripping.

The advantages of A.C.S. are as under:

- (1) Stripping operation is continuous and brush stripping is required only once in a week or so depending upon local conditions.
- (2) More uniform sliver is produced, as stripping is continuous and consequently the yarn is more even. In the case of brush stripplings, just after stripping the hank sliver will be finer, which tends to increase the irregularity of the yarn.
- (3) As the Carding Engine is not stopped often for stripplings, the efficiency is increased by 6%.
- (4) There are less number of piecings in the sliver due to the elimination of brush stripping. This assures better quality and reduction in soft waste.
- (5) As the Stripped cotton is fed back to the laps, there is 0.75 to 1.5% saving of cotton.
- (6) Neeps considerably reduced.
- (7) Great saving in labour.
- (8) No extra power is required to drive the ACS.
- (9) These are individual units, which have definite merits over central plants.
- (10) Life of the Card Clothing is increased as there is no harsh treatment as would happen during brush stripplings.



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PNEUMANIEZ

Introduction: Our Pneumaneiz is being marketed in order just to meet the demand from spinning mills who are always keen in rationalization and modernization of their equipments. Due to the following merits, our Pneumaneiz is fully receiving the satisfaction of all the customers:

- (1) Least consumption of power and almost no increase of temperature in the department.
- (2) Serves to increase production (5-8%).
- (3) Increase of reusable cotton from yarn-breakage.
- (4) Appearance of Ring Frame gets better.
- (5) Extremely decrease of nep and gouts of yarn due to lint and fly.
- (6) Ballooning yarn-breakage gets none.
- (7) Reduced yarn breakage.

Yarn-breakage gets lowered at about 40%. For instance, while 20-25 yarn-breakages are in case of Pneumaneiz not installed, we find only 12-14 breakages with Pneumaneiz for spinning 30's of 400 sp's.

Construction: A complete set of pneumaneiz consists of Filter Box, Motor Blower, Duct, Rubber Socket, Flute with supporting metal, Magnetic Switch etc.

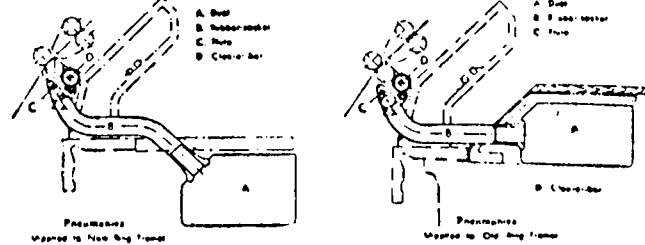
Rubber Socket: In order to prevent choking-up, the inside of the socket is specially finished. Especially the connecting portions with Duct where choking is apt to take place are of special rubber socket in order to perfectly ensure absolutely no-choking-up.

Flute: This is the most important item in Pneumaneiz set. The main advantages of our flute are as under:

- (A) Diamond shaped suction hole: The efficiency in suction is best and highest when the hole is of diamond shape as shown in the sketch hereunder. If the hole is round, the portion lined in the sketch will not be effective for sucking and may be regarded as mere loss.
- (B) Egg-shaped Cross Section:
 - 1) This ensures no-choking up.
 - 2) Due to sufficient space between the back side of flute and front roller, maintenance & handling of flute are very easy and simple. Further it is very convenient to fix supplementary clearer.
 - 3) It is very much convenient to set the flute as close as possible to front roller.
 - 4) The flute is made of Aluminium plate and specially machined and finished so as to prevent choking completely.

Fixing metal for flute:

Being firm fixing type, it is not necessary to make adjustment of angle while fixing and it is quite convenient to take out flute from metal.



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To enable Carding Engine to perform its function at high efficiency, it is essential to maintain the wires sharp, the gauge proper and the card clothing always clean.

If the Card is kept on operating the impurities and neeps in card web and eventually in sliver and yarn will gradually increase according as the length of time operated.

The perfect Carding action is effected at tip and also by side of wires of card clothing, but according as the time passes, the short fibres and impurities tend to deposit between wires thereby the better carding action is disturbed which results in increase in nep count and lowering in quality of sliver.

DYNAMIC PROGRESS OF SUGAR INDUSTRY

By M. P. Gandhi

THE Indian Sugar Industry which have already started and which owes its growth to the others will start during the grant of protection to it since next one or two seasons. The establishment of some of these co-ops from other protected industries of native factories has been delayed India. It is unique in its link machinery.

It should also be remembered that India is the largest sugar producing country in the world, taking into consideration the production of white sugar as also gur and khandasari sugar. With this introduction, let us now see the progress of sugar industry during the last three-four years. There has been a phenomenal large increase in the production of sugar during this period and internal consumption has also expanded considerably after the discontinuance of control over the distribution and price of sugar. It was felt a few years ago that the internal consumption of sugar in India would only be of the order of 11 to 12 lakhs tons per year. But the statistics of sugar consumption after 1951-52 show that there has been a remarkably large increase during the last four years. As a result, however, of the large increase in the excise duty on sugar imposed on May 16, 1957, namely Rs. 11.25 per cwt. instead of Rs. 5.62 per cwt., internal consumption is bound to be curtailed to some extent. In one sense, it will enable the industry to export larger quantities of sugar to foreign countries and thus earn valuable foreign exchange to help the Government in its implementation of the Second Five-Year Plan. The Planning Commission also felt that the capacity of the industry should be augmented and to that end recommended a production of 22.5 lakhs of tons by the end of the Second Five-Year Plan.

The production of sugar in the year 1956-57 has reached a level of 20.25 lakhs of tons and, if all change, there is wide scope for further progress of the industry which can be secured by co-ordinated development in both industry and agriculture. The importance of this wide-spread industry in the national economy of the country need not be over-stated.

UTILISATION OF SUGARCANE

Season	Total cane crop ('000 tons)	Percentage utilised for			
		Gur manufacture	Khandasari	White Sugar	Chewing Planting and other uses
1951-52	60,680	53.39	2.74	25.34	18.32
1952-53	50,190	53.52	3.39	25.36	17.73
1953-54	43,873	55.82	3.24	22.19	18.75
1954-55	56,923	50.63	3.00	28.00	18.37
1955-56	57,949	47.62	2.65	32.68	17.05

The next table gives the estimated consumption of sugar from 1947-48 to 1955-56.

ESTIMATED CONSUMPTION OF SUGAR AND PER CAPITA CONSUMPTION (ALL KINDS)				
Year	Quantity '000 Tons	Sugar, lb.	Gur, lb.	Total, lb.
1947-48	1,045	7.3	22.2	29.5
1948-49	1,182	9.0	17.5	26.5
1949-50	1,185	7.0	17.2	24.2
1950-51	1,195	7.6	21.5	29.1
1951-52	1,227	10.0	16.4	26.4
1952-53	1,634	11.0	15.0	26.0
1953-54	1,850	11.0	17.0	28.0
1954-55	1,850	12.0	16.0	28.0
1955-56*	2,032			

* Estimated.

hardly be stressed. For, it should be remembered that it has made the country virtually independent of sugar imports; it is supporting no less than 20 million agriculturists whose interests are indissolubly linked with the future of this industry; it has provided a channel for investment of indigenous capital estimated at about Rs. 100 crores, has been responsible for finding employment to not less than 3,500 University men, 125,000 labour-skilled and unskilled—and has made the country self-sufficient in respect of sugar.

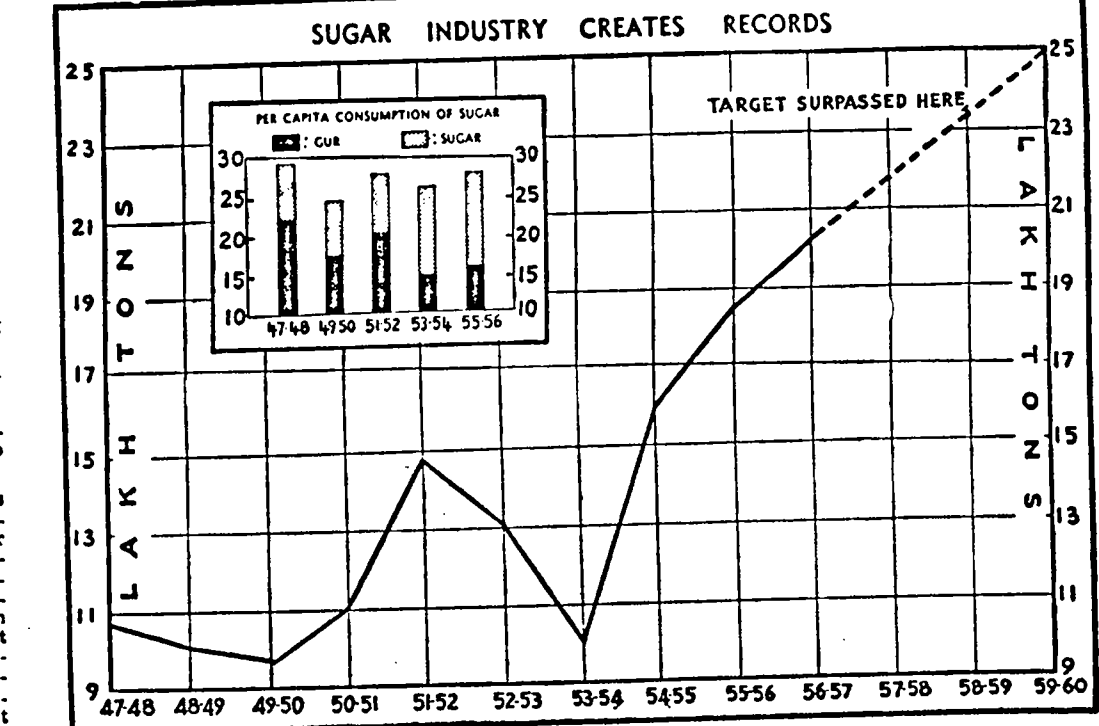
valuable article on the dietary of the millions of the country—and promises to develop further during the second and third five-year Plan period, an expansion which can ensure valuable foreign exchange by export to the extent of two-three lakhs of tons of sugar annually.

The industry also promises a far field for development of co-operative enterprise in respect of establishment of further capacity. Out of the 54 factories licensed during the last two years, as many as 39 are to be established by growers' co-operatives, some of

NO DEARTH OF RAW MATERIAL

As is well known there is no dearth of the raw material, viz. cane, which grows in abundant quantities even at present. The factories are able to consume only about 32 per cent of the total cane crop in the country, the balance being used for other purposes.

The percentage of cane utilised for gur, khandasari, white sugar, and chewing and planting from



the year 1951-52 to 1955-56 is given along with the total cane crop.

There has been an increase in the acreage under cane due to the fairly remunerative price of cane fixed by the Government of India. Similarly, there has also been an increase in the quantity of cane produced due to improvement in agriculture. Even so, the total average yield of cane per acre in India is remarkably low and there is room for considerable improvement in the yield of cane by better cultivation, expansion of irrigation, eradication of cane diseases, provision of better seeds, etc. What is more, the industry can help itself by increasing the per acre yield considerably by intensive sugarcane cultivation during the Second Plan period.

It should be remembered in this context that the yield of cane per acre in Hawaii is as large as 62 tons, in Peru 41 tons, and in Indonesia 45 tons as compared with the average yield in India, which is only 13/14 tons on an average acre.

The average yield of cane per acre in 1948-49, the average yield of cane per acre achieved in the development zones during 1952-53, and the target yield of cane at the end of 1955-56 are given in the table for the various States of India.

The all-India official estimate of acreage under sugarcane for 1956-57 is 50.2 lakhs as compared with 48 lakhs in the previous year and the estimated production of cane is 670 lakh tons as compared with 600 lakh tons in 1955-56.

This shows an increase of 10 per cent in the acreage and 12.8 per cent in yield over the previous year. It is proposed to raise the quantity of 780 lakh tons of cane from practically the same acreage during the Second Plan by obtaining higher yields with an improvement in the methods of cultivation, intensified manuring, etc. The total estimated expenditure on sugarcane development schemes in the Second Five-Year period is of the order of Rs. 10 crores.

The principal problem confronting the industry, however, is the

problem of reduction of cost of production. This can only be solved by increasing the per capita production of cane from the present level of only 14 tons to at least 25 tons during the next decade and by rationalisation of the methods of production. It will not be possible easily to release more land from the country for cultivation of sugarcane in view of the extreme necessity of production of more and more food-grains for meeting the requirements of the increasing population of the country. The only method by which, therefore, the industry can help itself is by increasing the per acre yield considerably by intensive sugarcane cultivation during the Second Plan period.

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AVERAGE YIELD OF CANE PER ACRE

	1948-49*	1952-53†	1955-56‡	Targetted yield in 1955-56
Tons				
U.P.	12.7	17.0	20.8	
Bihar	12.0	18.4	20.9	
Bombay	31.0	(1) 40.0	34.1	
		(2) 34.7		
Madras	25.0	32.8	34.8	
Andhra	25.0	30.3	34.0	
Punjab	12.9	18.8	26.0	
W. Bengal	16.1	19.0	23.0	
Mysore	18.8	..	N.A.	

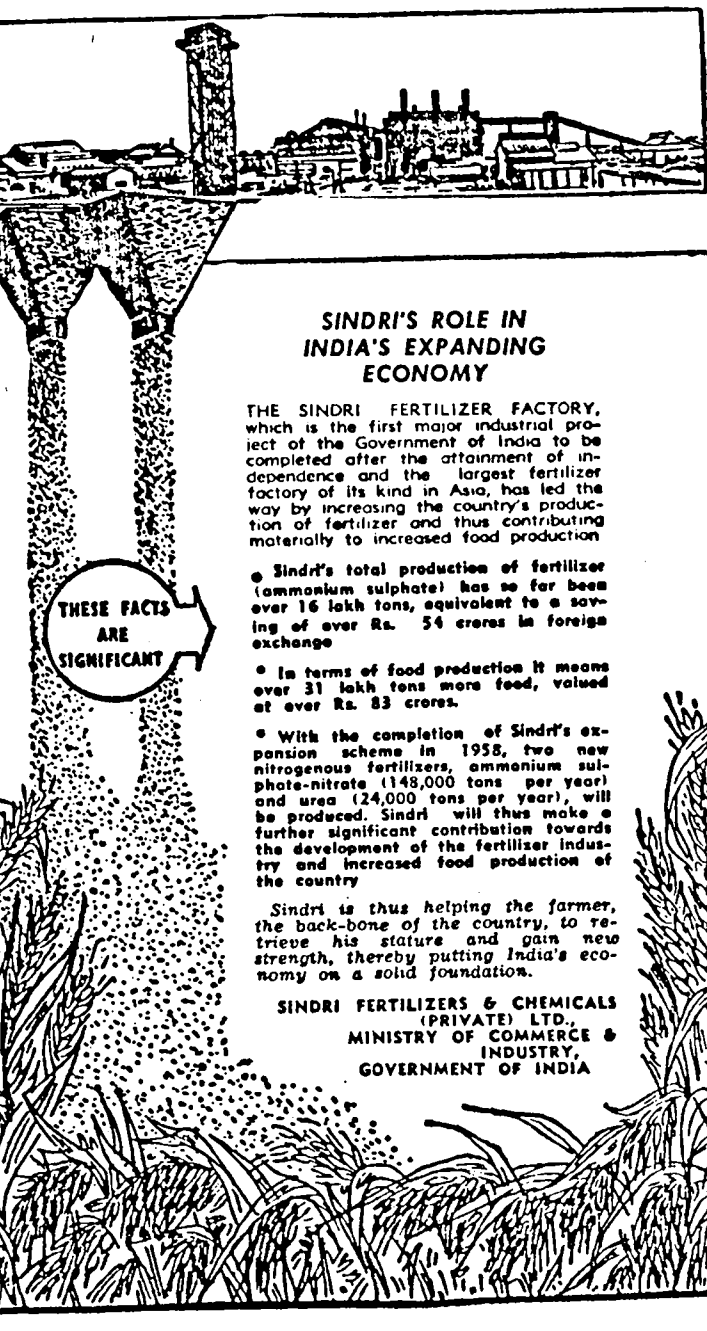
(1) For Deccan Canal area only.

(2) For Kanakalak area.

N.A.: Not available.

† In development Zones.

‡ At the time of commencement of the development scheme before the first Plan.



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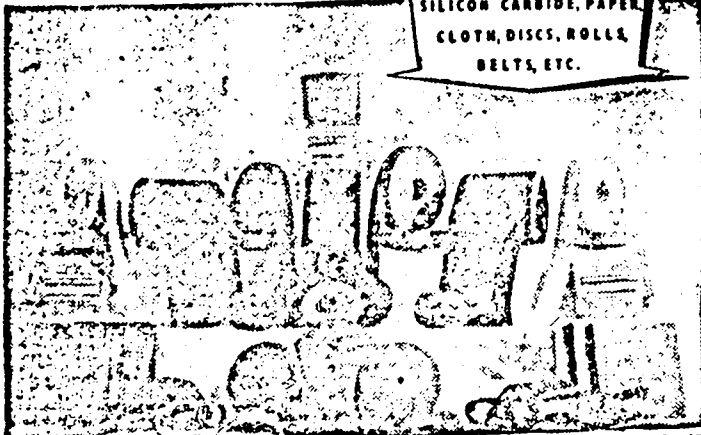
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EXPORT POSSIBILITIES
FOR CANNED GOODS

By N. V. Eswar

PRESERVATION of fruits and vegetables is not anything new to India. This has been known and practised by every housewife. But this was not developed into a paying industry on commercial lines. It had remained mainly a culinary art.

In recent years, because of the live contact with the Western system of life, this purely kitchen art also has assumed the proportions of an industry. Of course, canning has not become a major industry. It is still on the level of a cottage industry, needing nursing. The Government of India has recognised this aspect of the industry and has allocated a total of Rs. 5,00,000 for the development of this industry under the Second Plan, on an all-India basis.

It does not of course mean that there are no large factories in India engaged in the canning trade. There are large-scale factories, canning fruits and vegetables, in Bombay, Calcutta, Amritsar, Nagpur, Bangalore and Trichur, followed by those at Mathura, Lucknow, Allahabad and Delhi.

Under the Second Five-Year Plan it is proposed to set up two large sized units in Andhra Pradesh and Mysore at a total cost of Rs. 14,00,000. Besides these two factories, 52 small units are also to be started in the Southern Zone, consisting of Andhra Pradesh, Madras, Mysore and Kerala States. An outlay of Rs. 5,20,000 has been earmarked for these small units to be set up in the Southern Zone. Five large units and about 148 small units are also to be set up in the other States of India during the Second Plan.

Besides the present unit working in Trichur, Kerala will have two units at Parassala and Vettilapara. While a total of Rs.

35,80,000 is to be spent by the Government of India in developing present units and adding to them in the other States of India, under the Second Plan, an additional amount of Rs. 50,00,000 is also to be spent by the Government of India on an all-India basis for the development of horticultural schemes, which will result in the cultivation of more fruits and vegetables.

With the increased production of fruits and vegetables all over the country, the canning industry is certain to obtain a great fillip. While the present production is about 20,000 tons a year, it is estimated that, as a result of all these developmental plans, the industry will ultimately be in a position to turn out a total of 50,000 tons of preserved fruits and vegetables.

All these developmental plans have been drawn up because the canning industry is a good foreign exchange earner. It is essential that all possibilities of exporting essential commodities should be explored and marketed overseas are created now itself, so that India can slide into a manufacturing country by the time the Second Five-Year Plan is through.

Indian factories can fruits and vegetables at an annual cost of Rs. 20,00,000. Domestic needs themselves account for an internal offtake of nearly 80 per cent of the total output. Out of a total of 20,000 tons of canned fruits and vegetables, only 1,278 tons were exported during 1956. There is a great demand for these products specially from the South-East Asian countries and if regular supplies are maintained, this demand will grow still further in volume.

The European markets have marked a preference for chutneys and pickles, followed by good quantities of preserved fruits and other vegetables. These are the chief items on the

export list. Mango chutney is the most favourite item on this list. Incidentally, chutney has been a favourite item in the foreign market and the export of this item has been a regular feature over the last few decades.

The Indian canning units manufacture a variety of squashes, jams, pickles and chutney. Oranges, limes, mangoes, pineapple, guavas, apples, pears, amlas and peas are the chief fruits and vegetables that are canned. Almost the entire quantity of squashes manufactured by these factories is consumed by India's own cold drinks industry which, a few years ago, depended entirely on Australian imports for this article.

To see that the industry worked on healthy lines to attract and maintain substantial foreign markets, the Government of India brought into force the Fruit Products Control Order in 1955. This order prohibited any one from manufacturing or marketing canned fruits or vegetables, unless he has obtained a licence from the Central Government for that purpose. The authority, in its turn, granted licences only after a number of conditions were satisfactorily fulfilled by the applicant. In addition to proper processing, packing and marketing and labelling of the product. These conditions were modelled more or less on American lines.

Fulfillment of these specifications directly put the Indian products on a level with those imported from other foreign countries. This is an essential, because there are Indians even to-day who would prefer to even the best that is turned out in India. The special inspection staff of the Government of India maintain a strict check over the hygienic manufacture of fruit products in all the factories. Also, samples of products from the various factories are periodically examined by the Central Food Technological Institute at Mysore, to ensure that there is no deterioration or deviation from the specifications laid down.

The Government of India is soon setting up five regional research stations to advise growers and packers on the latest and improved methods to increase production and clean and hygienic selling to the market.

DYNAMIC PROGRESS OF
SUGAR INDUSTRY

Continued from previous page

only 14 tons in this country. Provision should be made by the Government of India for liberal expenditure on research work in consultation with the Indian Central Sugarcane Committee, the like of other principal cane producing countries like Hawaii, Cuba, Australia, etc., from the large income derived from the excise duty on sugar. The future progress and prosperity of the sugar industry hinges on the success it achieves in reducing its cost of production. In this context, it will be useful to remember that the largest possibility of reduction of the prime cost is in the raw material, cane, which constitutes about 55 per cent of the price of sugar.

It is a matter of great satisfaction to the industry that it has come to the help of the Government at a critical period by enabling export of sugar to the adjacent markets. The sales of sugar for export achieved by India from 1st November 1956 to the end of August 1957 amounted to about 170 lakhs of tons. Out of these sales actual exports up to the end of July 1957 were of the order of about 63,000 tons. Out of these, West Asian countries took 36,000 tons. Far Eastern Countries, including Malaya 14,000 tons, Burma 6,000 tons, Ceylon 8,000 tons and the U.K. 1,000 tons. The remaining quantity of 87,000 tons would be exported during the next two/three months as the contracts for this have already been entered into and shipments will be made as soon as tonnage is available. With a greater drive for exports and, if necessary some concession in the matter by the Government, e.g. by remission of cane cess, it should not be impossible to export about 2 lakh tons during the next and subsequent seasons, particularly as the quantity of sugar produced in the country will show a further rise in view of the addition to the crushing capacity and the larger acreage under cane in the close vicinity of sugar factories. As India is not a member of the International Sugar Agreement, she can have a free exporting policy, the only problem being the clause of participating countries not to import from non-member countries beyond a certain quantity.

The current year was a very suitable one for the export of sugar because, due to a variety of factors, there was a great rise in the price of sugar in the various markets of the world. It will be of interest to see that while the price of sugar in August 1956 was 3.39 cents per pound, it went up to 6.37 cents in January 1957, and 6.85 cents in April 1957. Then there was a sudden drop reaching 4.85 cents in May 1957. It must be explained that the great rise in the price of sugar during 1956-57 was against the background of considerably reduced surplus stocks in the sugar producing and consuming countries of the world and the "incident" in which caused almost every importing country of the world to quicken its acquisition of sugar.

The following weekly "spot" quotations on the world open market (per lb.) from November 1956 to August 1957 will be of interest here:

FLUCTUATIONS IN WORLD
PRICES

	cents	per lb.	cents	per lb.
1 Nov. 1956	3.25	11 Apr.	6.15	
15 Nov.	3.55	11 Apr.	6.15	
22 Nov.	4.25	18 Apr.	6.70	
29 Nov.	5.00	25 Apr.	6.47	
6 Dec.	4.75	3 May	6.15	
13 Dec.	4.70	9 May	6.30	
20 Dec.	4.85	16 May	5.95	
27 Dec.	5.10	23 May	5.75	
3 Jan.	5.10	30 May	6.10	
10 Jan.	5.40	6 June	5.95	
17 Jan.	6.30	13 June	6.17	
24 Jan.	6.35	20 June	6.30	
31 Jan.	6.80	27 June	6.13	
7 Feb.	5.95	4 July	6.10	
14 Feb.	5.95	11 July	6.10	
21 Feb.	6.75	18 July	6.15	
28 Feb.	6.25	25 July	4.65	
7 Mar.	6.20	1 Aug.	4.40	
14 Mar.	6.15	8 Aug.	4.30	
21 Mar.	6.05	15 Aug.	2.85	
28 Mar.	6.15			

Vide The Australian Sugar Journal, August 16, 1957.

One cannot easily predict what turn the price of sugar will take in the following year but there is a reasonable possibility of the price now assuming an upward trend. Besides it is clear that the world sugar consumption at today's world price would be considerably higher than if the price

Continued on next page

PROGRESSIVE RISE
IN PAPER OUTPUT

By A Special Correspondent

INDIA'S paper industry has made outstanding progress under the First Five-Year Plan since independence. There has been a substantial increase in production. The total output of paper and paper boards has increased from 1,31,916 tons in 1951 to 1,39,404 tons in 1956. In the first six months of 1957 production amounted to 1,01,800 tons as compared to 94,884 tons in the corresponding period of 1956. The following table shows the trend in production in recent years.

TREND OF PRODUCTION IN 1956-57. (In Tons)

Year	Printing & Writing	Wrapping	Special varieties	Boards	Total
1950	70,152	14,516	5,196	18,848	108,812
1951	79,200	25,468	3,120	24,048	131,916
1952	91,428	21,540	2,820	21,720	137,508
1953	95,628	21,144	3,420	19,512	139,704
1954	1,02,876	24,156	4,788	13,508	145,228
1955	1,10,146	28,320	5,604	31,494	184,884
1956	1,21,908	30,824	5,772	33,720	193,404

The present demand for paper in India is estimated at about 2.5 lakh tons per year. The pattern of demand shows that writing and printing papers account for 60 per cent and specialities five per cent, pulp and paper boards 13 per cent and specialities five per cent. The industry at present has a capacity of about 2,10,000 tons per year without taking into consideration the capacity of newsprint mill which is about 30,000 tons a year.

The paper industry is now engaged in implementing an ambitious programme of development under the Second Five-Year Plan. The production target to be reached by 1960-61 is placed at 3.5 lakh tons for paper and paper board while the capacity is expected to rise to about 4 lakh tons. For achieving this target the existing units have been given licences for substantial expansion and a number of new units are also being brought into existence. But it is reported that the industry is confronted with many difficulties which stand in the way of the expeditious implementation of its expansion schemes. The availability of adequate finance and foreign exchange is one of the major problems confronting the paper mills.

EXPANSION PLANS

The Government of India have so far given licences for setting up 22 new paper mills. These are being located in Orissa, West Bengal, Bihar, Assam, Madhya Pradesh, Bombay, Mysore, U.P. and Madras. Many of these units will use bamboo as the major raw material while others would depend on bagasse supplied by sugar mills and other materials. All the units would be producing different grades of paper and paper boards.

The new paper mill that is being erected in West Bengal, namely, Western India Match Co., would depend on pulp obtained from outside sources and specialised in the production of match paper and kraft paper while Messrs. Dorab Paper Mills, Poona, would specialise in the manufacture of grease proof paper. This unit would use locally available cereal straw and grass and also pulp from outside sources. The small units that have been licensed would depend on waste paper and locally available agricultural raw materials like straw and bagasse. These units would also produce boards as well as cheap varieties of packing and wrapping paper. The annual capacity of the small units varies from 936 tons to 3,000 tons while that of the big units ranges between 10,000 tons and 20,000 tons.

The expansion schemes of the existing units are also making steady progress. Messrs. Orient Paper Mills, for example, have recently commissioned one of the two new paper machines and it is reported to be working satisfactorily. The erection of the second machine has "substantially advanced" and it is expected to go into production shortly. The Board Manufacturing Plant is also reported to be progressing satisfactorily. The Company is taking the necessary steps for acquiring the land for erecting its new mill near Amtal Railway Station in Madhya Pradesh. Other industries like Titagarh, Rohas and others have also been making rapid progress in implementing their expansion programmes.

It may be pointed out that even under the First Five-Year Plan many of the existing units were able to increase their installed capacity considerably by modernisation as well as expansion. Thus Bengal Paper Mills increased their capacity from 11,000 tons in 1951 to 14,000 tons in 1955-56. Similarly, Rohas Industries from 11,000 tons in 1951 to 29,000 tons in 1955-56. Orient Paper Mills increased their capacity from 11,000 tons in 1951 to 15,000 tons in 1955-56.

In this connection the following observations made by an official report are relevant. It says that the paper industry has made satisfactory progress in correlating its production with the needs of industrial consumers and in meeting the demand for special varieties of paper. Except for kraft paper of the standard required by the paper industry, which is not yet manufactured indigenously, almost all other varieties of paper are being produced in sufficient quantities. In fact, in regard to cigarette paper it has been possible to develop an export market. It is expected that during the Second Five-Year Plan the paper industry will record more encouraging progress in this direction.

There is, however, the problem relating to the supply of raw materials for the supply of raw materials for the manufacture of paper. The existing information as regards the availability of bamboo in different parts of the country is both inadequate and contradictory. The country's entire resources of bamboo are of the order of 1.8 million tons on a rolling cycle of four years. These are distributed mainly among the States of Madhya Pradesh, Orissa, Madhya Pradesh, Bombay, Mysore, U.P. and Madras. Many of these units will use bamboo as the major raw material while others would depend on bagasse supplied by sugar mills and other materials. All the units would be producing different grades of paper and paper boards.

AVAILABILITY OF BAMBOO

Bamboo is the most important raw material for the manufacture of paper. The existing information as regards the availability of bamboo in different parts of the country is both inadequate and contradictory. The country's entire resources of bamboo are of the order of 1.8 million tons on a rolling cycle of four years. These are distributed mainly among the States of Madhya Pradesh, Orissa, Madhya Pradesh, Bombay, Mysore, U.P. and Madras. Many of these units will use bamboo as the major raw material while others would depend on bagasse supplied by sugar mills and other materials. All the units would be producing different grades of paper and paper boards.

Besides, the problem of the supply of raw materials for the manufacture of paper is also a matter of concern. The existing information as regards the availability of bamboo in different parts of the country is both inadequate and contradictory. The country's entire resources of bamboo are of the order of 1.8 million tons on a rolling cycle of four years. These are distributed mainly among the States of Madhya Pradesh, Orissa, Madhya Pradesh, Bombay, Mysore, U.P. and Madras. Many of these units will use bamboo as the major raw material while others would depend on bagasse supplied by sugar mills and other materials. All the units would be producing different grades of paper and paper boards.

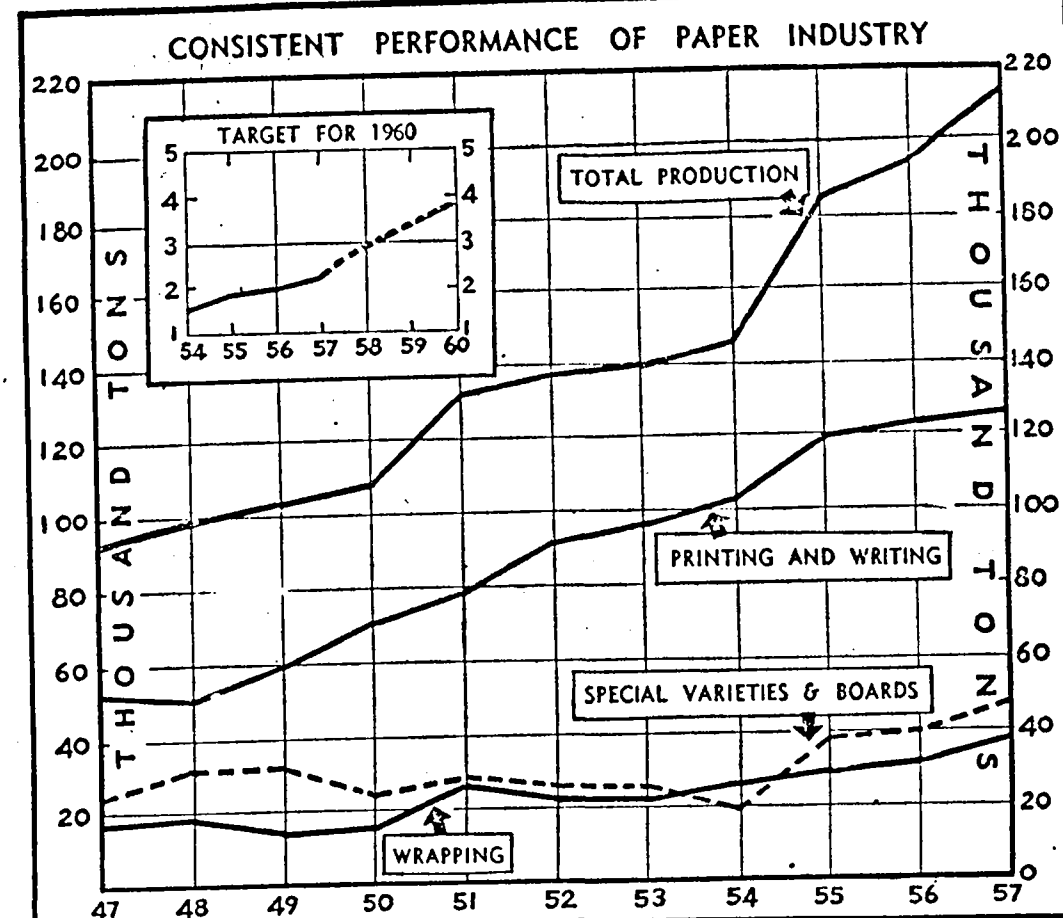
The Government of India have appointed a Sub-Committee for assessing the raw material resources for the paper industry. The Sub-Committee consists of the administrative heads of the forests of Assam, Madhya Pradesh, Orissa and Kerala and also representatives of the paper industry. It is hoped that the Sub-Committee will examine all the relevant issues in a proper manner and that its recommendations will prove helpful to the paper mills to obtain regular and adequate supplies of raw materials in the coming years.

In this context, mention must be made of the efforts by the Government to encourage the establishment of exclusively pulp mills. Paper mills in India, unlike those in other countries, are integrated units producing both pulp and paper. Recently, the Government has approved a scheme in Assam to set up a mill solely for the production of pulp. It is believed that other parts of the country will have many advantages in respect of transport, technical personnel and in other matters.

Apart from bamboo, utilisation of other raw materials like sabai grass, bagasse, waste paper, fibres and rags should be actively encouraged. There have been set up by the Council of Scientific and Industrial Research in various parts of the country should be able to help the paper mills in finding out new types of raw materials for the manufacture of paper. At the same time it is also necessary to bring about proper co-ordination between the national laboratories and the Forest Research Institute at Dehra Dun, which is already doing good work relating to the development of paper industry.

The production of machinery for the paper industry is another important problem facing the country. India has made little progress in regard to the manufacture of paper machinery. Apart from a few small units which are now produced in India, the rest of the machinery is imported from abroad. The Second Five-Year Plan envisages the production of paper machinery to the value of about Rs. 4 crores by 1960-61. But this target seems to be too modest. It is, therefore, necessary that vigorous efforts must be made to accelerate the manufacture of paper machinery. In the meantime, arrangements must be made to enable the paper mills to obtain the machinery and parts from foreign countries on reasonable terms.

The provision of transport facilities for the paper industry is also an important problem. Paper mills are frequently complaining that the allotment of wagons is very irregular and that the number of wagons for them to obtain timely supplies of bamboo and also to despatch their finished goods is not adequate. It is reported that in the case of one paper mill in Bihar against the indent for 41 wagons over a period of 45 days, only 160 wagons. It is not only necessary to increase the number of wagons but also to provide for the requirements of the paper mills. At present it is reported that because of the high priority given to the movement of coal, the transport of bamboo is affected. Though the transport of coal is of considerable importance to the economy, the movement of paper is no less important. It is, therefore, necessary for the Railway Board to evolve a suitable policy by which it would be possible to provide transport facilities for all the sectors of the economy.



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DYNAMIC PROGRESS OF
SUGAR INDUSTRY

Continued from previous page

bad continued in the 6 cents range, as well as the high prices there would have been, restriction of consumption in many countries of the world. It is also increasingly evident that Russia and other countries desire to supply a greater amount of sugar to their people for improving their present standard of living.

During the next year, Cuba is likely to have only a small exportable surplus. Similar will be the case with Puerto Rico, Hawaii is not likely to have any carryover in 1957 and the 1958 production will also be less than the previous year.

Luckily for India, the stocks with the sugar factories in August 31, 1957, were about 7.5 lakh tons and the production of sugar next year might well be the same as in 1956-57. Thus the supply position will be very satisfactory. In brief, it can be reasonably believed that the world sugar position next year will enable India to export sugar in at least the same quantity as it has done this year, although the exports will have to be at a slightly lower price than this year, as the ruling price in countries to which we can export will enable us to sell our sugar only at Rs. 20 fob. as against the minimum realisation of Rs. 27 per maund that must be paid to the manufacturer taking

DYNAMIC PROGRESS OF
SUGAR INDUSTRY

Continued from previous page

into account the present cost structure, freight and after allowing for the rebate on excise duty and cane cess. There will thus be a net loss of Rs. 7 per maund, i.e., as much as 25 per cent. In the face of this it is the duty of the Government to give the maximum assistance by reducing the burden of cess on cane, by reduction of freight, extension of credit facilities, etc. in order to promote exports for the purpose of earning vital foreign exchange.

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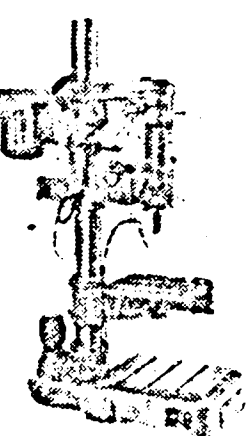
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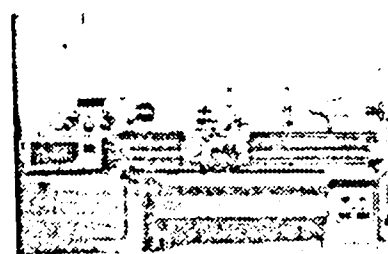
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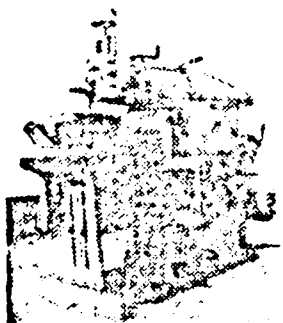
61, Golf Links Area, Steelcrete House,
NEW DELHI. Dinsha Wacha Road,
BOMBAY-1.



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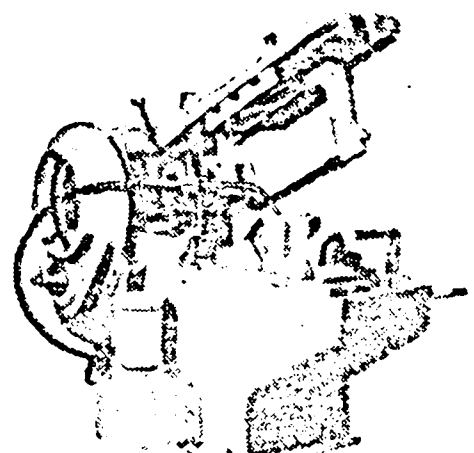
Lathe



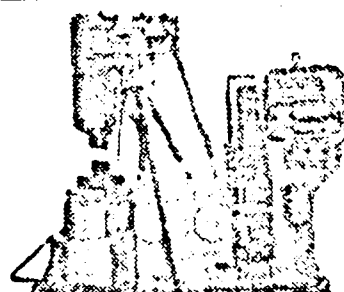
Shaping Machine



Slotting Machine



Alternative Saw



Pneumatic Hammer

STABILISATION OF SERICULTURE

By A Special Correspondent

THE Indian silk industry is, for a large part, a cottage industry, and only to a limited extent factory-centred. In this basic fact lies at once the strength and weakness of this industry. The strength lies in the excellence of the products turned out by the industry, such as plain twills, satin, crepe, georgette, woven and knitted fabrics for garments, parachute components, fishing lines, elastic webs, sieves for flour mills, insulation coils for telephone and wireless receivers and tyres for racing cars, and a score of other varieties. The elegance of the products and the fineness, as in the case of all material where the skill of the craftsman is involved, give an assured status to the industry. In addition the scope for employment in the rural and semi-rural areas where the dividing line between unemployment and under-employment is very thin, is great in this industry. The industry gives frequent scope for the agriculturist, sericulturist, who is himself a mulberry cultivator, holds a high place. Mulberry cultivation and raising of cocoons are gainful occupations for the cultivators in areas where such cultivation is possible. In the Madras State, for instance, the agriculturist who is himself a mulberry cultivator raises nearly five to six silk-worm cocoon crops in a year along with the raising of food crops like ragi and chulam, and sells in the green state the cocoon crops every time for reeling purposes. The industry gives frequent scope for the agriculturist. Some five million people are engaged in this primary stage of production throughout the country and so the human element involved is very great. Besides, those engaged in mulberry cultivation, there is a large number of handloom weavers engaged in silk weaving. The industry is estimated to contribute about Rs. 7 to 8 crores in the nature of income to the cottage workers. In the State of Madras alone the industry supports about 20,000 families at one end and a number of handloom weavers at the other end.

The strength of the industry, however, ends here and the weak spots now show themselves up. The unorganised nature of the industry is at once evident, as in silk cottage industries, so also its invariable corollary, the high cost of its products, their non-competitive character and their inability to withstand the fierce onslaught of near-silk products such as art silk, rayon, nylon and other synthetic fabrics, now increasingly produced within the country and imported from abroad.

EXAMPLE OF JAPAN

Unfortunately, however, the progress is not appreciable and leaves much to be desired. Being an industry in the hands of the cultivator class, sericulture cannot flourish without State help and its progress and stage of development in any country have been directly proportionate to the help it has received from the State. Progress is dependent on research, experiment and organisation. Japan is the wonder of the world in this field because of the elaborate and extensive arrangement for research and experiment in improvement of mulberry and its cultivation in every district and research station, including schools and colleges.

In India, however, the story is different. The industry thrives well in places which have an altitude of about 2,000 feet above mean sea level with an annual and equitable rainfall of over 30 inches. The initial cost of planting an acre of rainfed mulberry is roughly about Rs. 150. The life of a bush type plantation, which is the common type, is about 10 to 12 years.

AREA UNDER MULBERRY CULTIVATION

In India, the area under mulberry cultivation in 1956-57 was about 1,38,700 acres in the four States in which this is extensively grown, namely Bengal, Assam, Jammu and Kashmir, Mysore and Kollegal area of Madras. This itself is a substantial improvement on the figures for the earlier year, but even the extended acreage cannot be considered adequate for the needs of the country. Production of raw silk is about 17,00,000 lbs. while production of silk waste, a by-product, from pierced cocoons loose fluffy silk filaments torn from the rejected portions of the cocoons, is about 900,000 lbs. The latest available figures of raw silk pertaining to the year 1956 are 3,413,245 lbs. of which the production from mulberry is 2,351,606 lbs. and that from non-mulberry 1,061,639 lbs. Mysore, the major producer of silk, accounts for over 70 per cent and of raw silk output in India, which is roughly five times of what Japan will be judged.

mill and Kashmir produces. There are in the country some 5,500 di-lure basins. Mysore alone has more than 2,500 di-lure basins and over 5,000 country charkas. Some 50,000 families are known to be engaged in sericulture in the State of Mysore. In the Madras State, the annual estimated output of raw silk is about three lakh lbs. valued at about a crore of rupees.

The industry received a stimulus during the Second World War when there was a large demand for parachute cloth, and under its impetus production was given to the industry first up to 1949, then extended to the end of 1952 and further extended to the end of 1953. The pre-war consumption of silk products was estimated at 10 million lbs., now very much more, and this gives an idea of the demand that exists for the products of this industry. As against this demand, the indigenous production was about 1.5 million lbs. The war time high was reached at 2.1 million lbs., but since then the industry has been rather in a bad way. To make up the shortfall in supply of raw silk, imports came to be permitted, first in small quantities, then in larger and in more appreciable lots, and the foreign countries that were out of the field for the duration of the war, particularly Japan, have now been able to regain their hold, mainly because of their price and quality. Their prices were in many cases lower than the cost of production of Indian raw silk. Under these circumstances many mills, particularly in Mysore, had to close down owing to labour unrest and other troubles and the industry was generally in doldrums. A large quantity of raw silk and waste silk was permitted to be exported for some time because they could not be profitably consumed by the indigenous mills and factories engaged in silk weaving.

The peculiar position of the industry was recognised and an All India Silk Board was constituted in 1949 charged with the responsibility of developing the primary and secondary stages of the industry, but the actual progress in terms of concrete results would appear to be little. In the initial period in the grants made to the Board could not themselves be fully spent, due no doubt to the inherent problems in drawing up workable programmes and schemes. The Second Plan has provided for a more ambitious and comprehensive development programme covering raw silk production, spinning, weaving and marketing. An allotment of Rs. 5 crores has been made for implementing this programme, most of which would lie strictly in the sphere of sericulture proper, apart from Rs. 1.5 crore provided for development in the silk weaving sector. Besides these allotments the Government of India have sanctioned grants to six States engaged in the industry totalling about Rs. 9 lakhs, the chief beneficiaries being Mysore (Rs. 6,07,400), West Bengal (Rs. 1,64,000), Madras (Rs. 84,000), Assam (Rs. 48,000), and Uttar Pradesh (Rs. 25,000), all of which is intended to be utilised for the extension of mulberry cultivation and organisation of marketing societies and co-operatives among the producers and weavers. The industry in Jammu and Kashmir is well organised and is worked and managed by the State. The production of raw silk from these two places amounts to about 200,000 lbs. a year, and the quality although fairly good suffers from the absence of a conditioning house. There is also room for improvement in the grading system.

REELING

Silk, thus, is capable of being developed through scientific efforts and organisation and in a way and on a scale not possible in the case of most other crops. So then, sericulture proper forms the first stage of the silk industry, beginning with the cultivation of the mulberry and rearing of the worms and ending with the disposal of the cocoons. Reeling is the second stage. The process consists in unwinding of the unbroken filaments of the cocoons and threading them into raw silk or net silk, used in the manufacture of silk goods. For this purpose the cocoons are boiled in a basin until the gum holding the filaments together is softened, and the filaments thus loosened pass together to form a thread. The number of threads vary directly with the thickness of the thread desired. Reeling has to be done with the help of a machine, but there must be a reeler, man or woman at each basin to manipulate the cocoons and the filaments. The demand for raw silk is in large lots and for uniform thickness and quality which cannot be achieved unless reeling is carried out in a central place under export supervision. For this reason reeling, to be successful, must be a factory industry using suitable machinery and engaging preferably 100 to 200 workers. Without such factories, commonly called filatures, raw silk cannot be produced which can be expected to come to recognised grades fit to compete in international markets or to enable high class goods being manufactured. An efficient reeling industry therefore forms the pivot of the silk industry affording ready market for the cocoons on the one hand and supplying the raw material for the industry on the other. Reeling and sericulture go hand in hand, and these together are known as the 'raw silk industry'. For the products of this industry there are two outlets. One is export of raw silk to countries where sericulture does not exist, but silk weaving is practised. The other is manufacturing silk goods which have a market both at home and abroad. Such manufacturing operations form the third and the final stage of the industry.

For effecting improvements in the industrial sector proper, a Development Council has been set up in 1954 under the Industries and Regulation Act. The work of this Council will largely lie in the sphere of introducing modern techniques of production such as factory methods, and power looms in the cottage sector where production is now carried on with hand looms. More than these, attention will also have to be devoted to the organisation of the reeling section of the industry which for all practical purposes may be considered to be non-existent in the country. For, in India about 90 per cent of the reeling is done by charakas, manipulated by hand while in Japan automatic reeling is the rule rather than the exception. The Mysore Silk Filatures factory is being put on its feet again, and a reeling factory in West Bengal on modern lines is fast coming up, but obviously many more factories will have to be established particularly in the South, which accounts for 80 per cent of the silk production of the country. Two decades of protection have not produced any appreciable degree of progress in the stabilisation of the industry, and how fast to make up the lacuna whether by a phased programme of rationalised production or any other method of development Council, or even of the Development Council, to the extent it shows progress its usefulness to the industry is roughly five times of what Japan will be judged.

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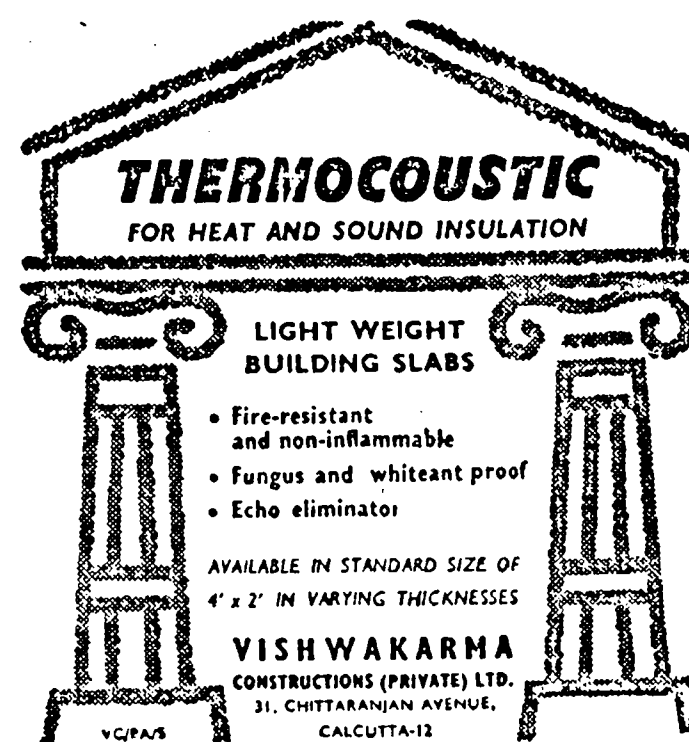
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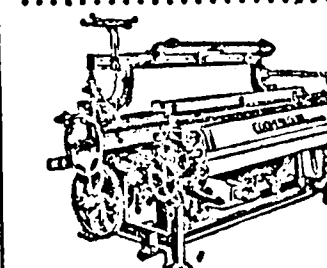
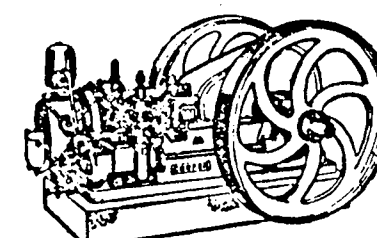
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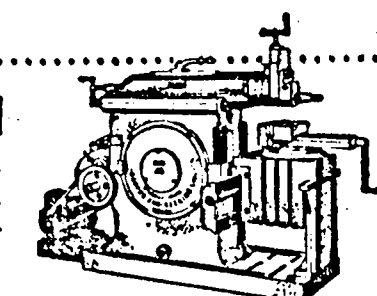


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Telegrams: 'ALUM', Bangalore.

Telephone: 4387.

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Palace Gutta Halli,

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Phone: 5535.

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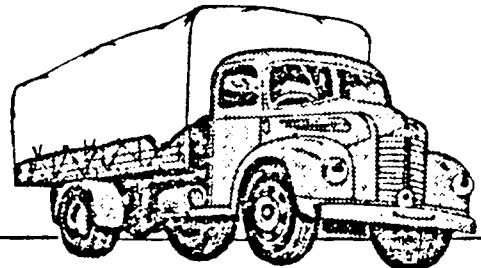
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**VALUE OF INDUSTRIAL
ADVERTISING**

By Subrata Sen Gupta

Director, Clarion Advertising Services Private Ltd.

WHEN you go past a Department Store and a cardigan or sports shirt catches your fancy, it's quite possible that you will walk in and buy the article (if it's not too late in the month!). But when you see a tractor or diesel engine in a showroom, you are not likely to make an impulsive decision and walk out with a neatly packed machine under your arm! This apt comment by an advertising man sums up the essential difference between industrial buying and the purchase of consumer products. The one is invariably a "cerebral" act, the other can often be prompted by impulse.

We hear of motivation research in Western countries. To the uninitiated, this frantic exploration of the mental mechanics of buying would seem to border on the ridiculous. Lately, advertising intellectuals have embarked on an serious study of subconscious influences on the buying of consumer products. An example of its application is the naming of a message on the cinema screen so quickly that it leaves an impression only on the subconscious. Thereby, we are told, the public are irresistibly conditioned to buy "X" Toots Paper or "Y" Toots Paper.

Whatever the virtues of influencing the buyers' sub-conscious apparatus in regard to consumer products, such techniques may yield unfortunate results when applied to industrial buying. When selling to technical directors, works managers, production foremen or industrial purchasing officers.

A definition by the National Industrial Association's Association (NIAA) of the U.S.A., underlines the distinctive nature of industrial advertising which is "advertising and marketing to industrial, technical and professional fields." It is advertising to a highly intelligent, discriminating and cost-conscious market.

Industrial advertising in India cannot be regarded as new. But both in regard to specialised media and a recognised study of the industrial market, it is much behind consumer advertising. It is some consolation that even in the U.K., industrial advertising, according to a Financial Times survey, is "a decade behind consumer advertising." In a discussion of industrial advertising there seem to be more questions than answers. Some preliminary observations are presented here as notes, in the hope that there will be many more contributions on the subject.

FEATURES OF THE INDUSTRIAL MARKET

The industrial market has its seasons and cycles and its size and nature reflect the basic economic structure of a country. The U.K., for instance, after World War II, had to grapple with manpower shortages, increased American competition and the loss of several colonial markets. British industry was and is pre-occupied with modernisation and mechanisation; and the task of industrial advertising in the U.K. is to make known new inventions, new techniques, new materials and new concepts of blending man-power and machine power in a general drive for increased production at lower cost with more economical uses of manpower resources. (Sir Miles Thomas in a speech in 1950).

In India after Independence, with a Plan structure to guide the economy the industrial market has its own character. One of its primary features is the shift in industrial purchasing from imported to indigenous supplies. Simultaneously, the market for industrial equipment and stores is growing very rapidly as evidenced by the targets of some important producer goods industries: production of diesel engines during the second plan is scheduled to rise by 300 per cent; machine tools by 2,000 per cent; aluminium ingots by 1,000 per cent etc.

It is also relevant that the output of technically qualified personnel in India is on the increase. The number of technically qualified students will rise to nearly 15,000 in 1960-61, or three times the figure for 1950-51. Various incentive and training-within-industry schemes are calculated to raise technical skill at many levels in industry. This sheer tide of technical knowledge implies that where-

as, in earlier times, it was enough for advertising to reach a few top personnel, to-day it must also reckon with buying influences at junior levels. As a corollary, the dispersal of industry and electric power has opened up markets for industrial stores and equipment in new areas and among new sections. A ready example is the official encouragement to small manufacturers and artisans to purchase improved equipment and raise their standards of production. Here, a completely new market for vendors of industrial lubricants, for instance, of belting and bearings, of tools and finishes and a dozen other items. The owners and operatives in this sector probably do not read English. Industrial advertisers are already faced with the problem of reaching such a market through media that will reach it, and in a language it understands. Recently, an industrial advertiser found that language versions of technical leaflet addressed to rice millers went over the heads of many of his readers. His problem now is to present his technical sales story in a language suited to this new type of audience.

Two interesting results can be expected from such situations. Industrial advertisers are likely to devote time and money to the development of a "basic" technical vocabulary in major Indian languages which will lend itself to advertising purposes. Secondly, technical journalism in Indian languages, now in its infancy, may reach notable progress. The Press Commission Report listed 16 scientific, engineering and technical journals in Indian languages. The "NIFOR" Directory, published later, lists 23, mainly in Hindi and Marathi. Doubtless, there is much scope for improving the editorial contents of such publications but their very existence testifies to the potential readership in this field.

INDUSTRIAL BUYING PRACTICES

When advertising to the organised sector of Indian industry, we are faced with other problems. Above all, we need to know, with some accuracy, the decision making factors in industrial buying. Where do enquiries originate? Who decides the makes to be considered? What sources of information are habitually consulted? Who makes the final purchase decision? Buying practice varies from old to new, from large to small enterprises, from light to heavy industry. The cost of the purchase also determines which personnel will have a decisive say. In a technologically developed plant, buying decisions may extend from the Board of Directors down to a skilled worker. As one Technical Director of a bicycle manufacturing enterprise pointed out, "For the older generation of workers, knowledge was a father-to-son affair. But the younger generation is definitely educating itself."

Industrial salesmen of big companies in India have acquired valuable experience of buying practices of their customers, but their knowledge, unfortunately, has not quite percolated to the counsels of industrial advertising. In any event, much more must be done to chart this field; meanwhile, we must reconcile ourselves to a large measure of hit-or-miss in our advertising for the industrial market. A cursory survey of some enterprises in Calcutta, Asansol and Jamshedpur, undertaken for the Advertising Club, Calcutta, bears out that in medium-sized and large modern enterprises, production and maintenance technicians and supervising engineers have the weightage in purchase decisions. A Director of a night engineering concern was emphatic in his statement: "All our purchase decisions emanate from the shop floor." For the genera run of items," said one Purchasing Officer, "it is the stores and purchasing personnel who decide." For equipment and components, decisions are invariably made after reference to technical personnel. It must be emphasised again that the decision-making factors in industrial purchasing vary according to the size and nature of the enterprises concerned. It is only size he experience and study that can enable us to generalise.

Even small enterprises according to the above mentioned survey subscribe to technical and trade journals. The number varies from one in the smallest firm to several in the largest. Employed 250 workers to some-

thing above 450 (in the largest firm surveyed which has about 50,000 personnel, to-day it must also reckon with buying influences at junior levels. As a corollary, the dispersal of industry and electric power has opened up markets for industrial stores and equipment in new areas and among new sections.

Well-organised firms may issue a Technical Digest for their own personnel comprising extracts from journals received. In a large metallurgical plant it was found that 150 journals were circulated, and read by nearly 1,500 people. Almost all the interviews revealed that good technical journals are read with interest by practical engineers, the men who have much to say about industrial purchases. A perusal of the Technical Digest issued by the metallurgical plant referred to above, showed that very rarely were Indian technical publications quoted. Interviews also revealed that technically qualified personnel depended primarily on foreign periodicals for specialised information. A small number of Indian technical publications are, however, read with interest.

READERSHIP VALUE OF TECHNICAL JOURNALS

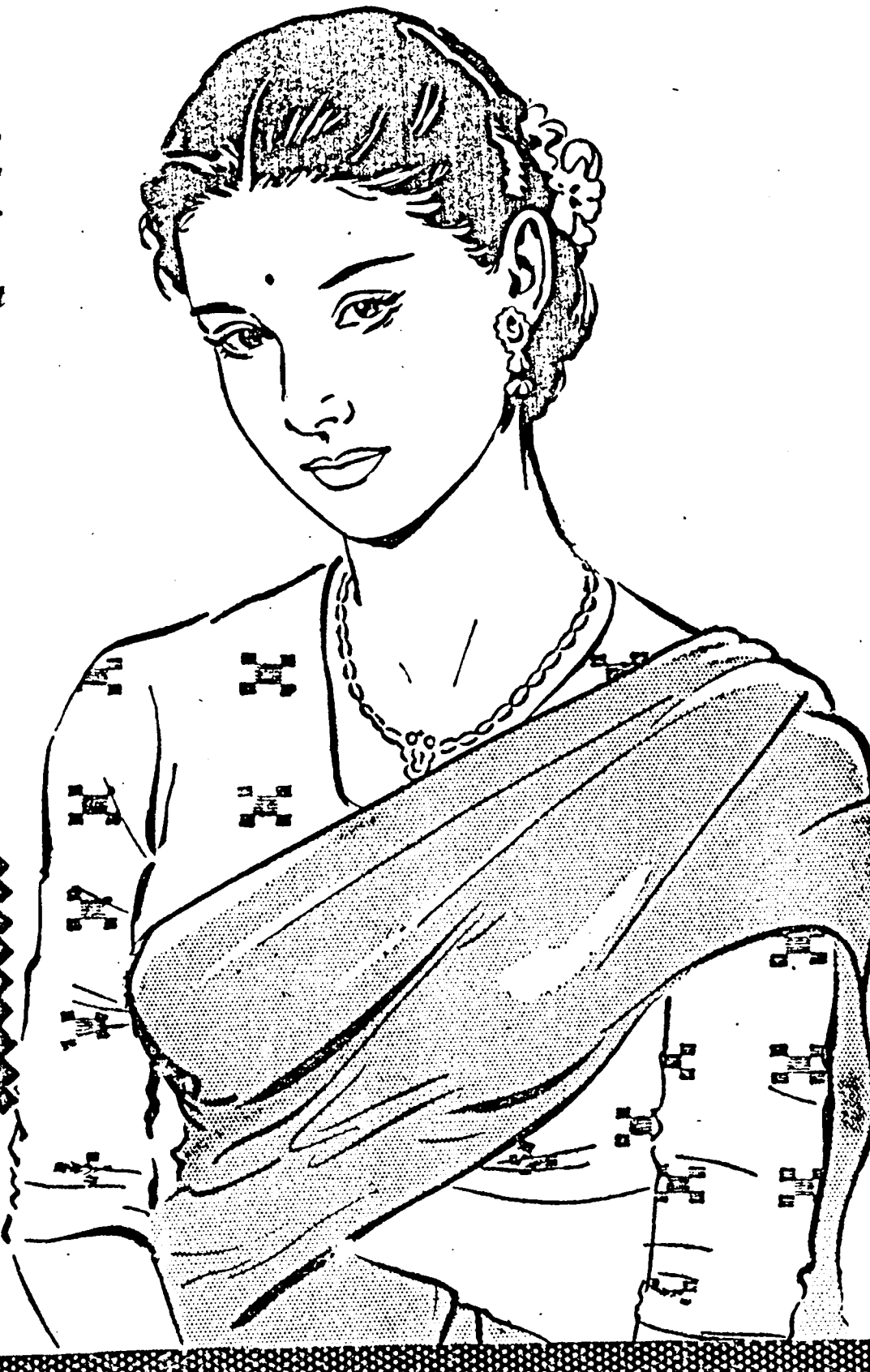
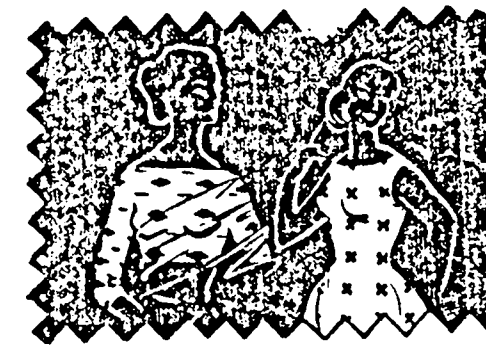
Editorial information, it was found, often led to inquiries and a subsequent purchase. This is both an index of the readership value of good technical journals and a pointer that informative technical contributions (not "turbos") are an important aspect of industrial sales promotion. The national dailies remain an important medium both for classified and display advertisements, of stores, equipment, etc. They are very useful for reaching purchasing personnel, Technicians and engineers appear to value newspaper supplements which have genuine editorial interest resulting from informative and original contributions.

Are industrial advertisements read? This was the crucial question in the survey and the answer was, in most cases, an emphatic "Yes." The point is, of course, that the advertisement must be inside a journal which is read! Several case histories of purchases showed that advertisements had prompted the original inquiry. By and large, technicians and purchasing officers confirmed that they were constantly on the lookout for information regarding processes and products and they regarded industrial advertisements as a source of practical information to help them deal with specific problems. A Mining Superintendent went so far as to say that he had such literature bound and circulated as reference material. A Director of a bicycle factory cited an instance of direct mail literature from suppliers of Indian equipment which led to orders of several lakhs of rupees being placed by his firm.

Advertising material, whether as press advertisements or printed literature, is likely to have a high readership score if it avoids the usual clichés and gives the engineer a demonstration of practical value. Good, clear photographs of the product in use are universally appreciated. It would not be rash to say that designers and copywriters of industrial advertisements would gain much from a study of well produced and edited technical magazines. It will often be found that the photographs of a product reproduced in the editorial columns are more effective and telling than those used by the advertiser. Industrial photography, like industrial copywriting, can hardly be effective unless one is able to dramatise the essential function of the product. Some examples of industrial photography from Britain, recently on view at a Kuruk exhibition, are models for industrial advertisers.

The editorial headings and write-ups in good technical magazines are usually compact and newsworthy. By comparison advertisement copy of the same product is often "corny." Good industrial advertising is made by keeping in mind the reader first, and the product second. It should be a "skilful combination of information and imagination." A few words here too often the language of industrial advertising is a repetition of well worn phrases saving nothing specific. Thus an earth-mover tyre is a "pneumatic drill and a nut are all "extra tough," "specially designed" and "reinforced for greater strength".

Continued on page 126.

Arvind's woven BUTTAS**First in loveliness, First in India**An entirely new range of fabrics,
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Sambhal Patel & Co.
76, East Market Street,
MADRAS.M/s. Nagjee Purshotam &
Co Private Ltd.,
Big Bazar, KOZHIKODE.M/s. Ajithal Jyantilal
Sambhal Patel & Co.,
Gudivadawani Street,
VIZAGAWADA.M/s. U. N. Sharma,
Chickpet,
BANGALORE CITY.M/s. Ganeshmal Pratapmal
& Co.,
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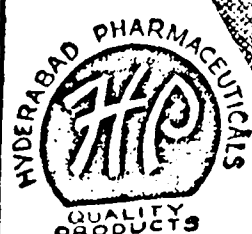


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The Hyderabad Chemical & Pharmaceutical Works Ltd.
HYDERABAD DN.

SPORTS GOODS SURVIVE PARTITION

Contributed

AMONG the millions who came across the border from Pakistan in 1947 were a few hundred from Sialkot, the place which in undivided India, had acquired a reputation for the production of sports goods. These people—manufacturers as well as skilled workers—settled down in Jullundur in the Punjab. Meerut in Uttar Pradesh and to a smaller extent in Delhi. A smaller number settled in other known industrial centres in North-West India.

The story of the growth of the sports goods industry in India since Independence is, to a large extent, the story of the successful manner in which the industrious people of the Punjab have, with a large measure of Governmental assistance, set themselves up again in business or industrial undertakings. Before August 1947, the entire sports goods manufacture in India was concentrated in the areas which now form part of Pakistan.

The progress made by the industry in India in the last ten years can be described as remarkable. To-day, the industry has a total output exceeding Rs. 1 crore per year in terms of money value. While a few items have still to be imported, particularly tennis balls, the value of the imports is roughly equal to the foreign exchange earned by the export of India-made sports goods. Thus, in the first five months of 1957 sports goods worth Rs. 4,11,013 were imported as against exports worth Rs. 3,70,887.

The industry has been organised for the major part on a small-scale basis. There are nearly 300 units—employing over 5,000 people—engaged in the manufacture of different items of sports and games and equipment for physical culture. As many as 150 different items are being turned out by these units. Among these are almost the entire range of equipment required for games like football, volleyball, basketball, rugby, base-ball, cricket, hockey, badminton, golf, fishing, billiards, snooker, table-tennis, etc. For outdoor tennis, all items except tennis balls are also manufactured, as well as about 20 items of physical culture.

Tennis balls are among the few items which are not manufactured in adequate numbers. Lately, however, an Indian firm in Calcutta has begun production in collaboration with a British firm.

BENEFICIAL GOVERNMENT ASSISTANCE

The sports goods industry has benefited to a considerable extent from the assistance provided by Central and State Governments for the development of industries in the small-scale sector. The assistance has taken the form of loans on easy terms for working capital, technical guidance at the factory level and provision of common facilities which individual units cannot afford to maintain on their own. In the Punjab and Uttar Pradesh, work centres have been opened by the State Governments and artisans are given stipends during the period of training. The Central Government has set up an Extension Centre for the sports goods industry in Meerut headed by a technically qualified officer with other staff to assist him. The technical staff pays visit to the manufacturing units to help them in solving technical and other problems of production and guide them in adopting improved manufacturing practices. A similar extension centre is in the process of being established at Jullundur. In Delhi, a scheme estimated to cost over Rs. 12 lakhs is under consideration.

A survey of the present position of the industry has been carried out under the guidance of Dr. Eugene Staley, an American Economic Consultant, whose services were made available by the Ford Foundation. The recommendations made by the survey team are being implemented by the Central and State Governments. Foreign experts are proposed to be invited to impart training in the manufacture of special items. A small number of skilled workers will also

be sent to the United Kingdom and Australia on a study-cum-training tour.

The Indian Standards Institution has also evinced interest in the growth of this industry. Specifications for the manufacture of standard products, which has an important part in their marketing not only within the country but also in markets abroad, have been laid down for a number of sports goods. Among them are foot-ball, volleyball, basketball, hockey and cricket balls, hockey sticks, cricket bats, shuttle cock and snooker balls. Standards for more items are proposed to be prescribed. The Uttar Pradesh Government, which has introduced its "Q" quality marketing scheme for the products of decentralised industries, has extended it to the sports goods industry.

Other States like West Bengal, Madras, Mysore, Orissa, Jammu and Kashmir and the Pithura Administration have also taken interest in the development of the sports goods industry. In some of the States production-cum-training centres have been started while in Kashmir a medium-size factory for the manufacture of cricket bats has been established at Miranpur.

SUPPLY OF RAW MATERIALS

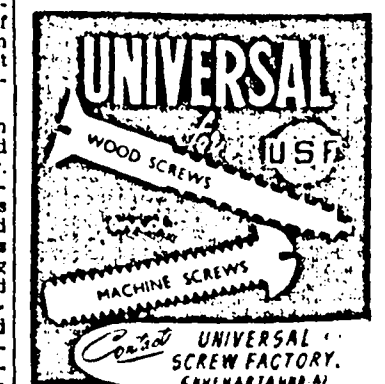
In the two principal manufacturing States of Uttar Pradesh and the Punjab, some attention has been given to the question of raw materials for the industry, particularly Mulberry and Willow timber. Planting of these trees has been undertaken in the forest areas in these States.

There is no doubt that considerable amount of research, organisation and technical assistance will be necessary for developing the industry to a level where it will not only meet the growing home demand but also take an increasing share of the overseas markets. The rise in the standard of living and increasing emphasis on physical culture the prospects for the sports goods industry are indeed bright.

PROSPECTS FOR EXPORT

As mentioned earlier, the industry has already acquired an export potential. If greater attention is paid to this aspect, the industry will not only be able to make a contribution to the earning of foreign exchange—a valuable thing in itself—but also the prospects of increased exports will help in the stabilisation of the industry and improvement of the living standards of the workers. A recent report by the Commercial Secretary of the Indian High Commission in Colombo, indicated favourable prospects for the sports goods industry in the Indian sports goods. Already, India is the sole supplier to that country of such sports goods as cricket stumps, carrom boards, hockey sticks and balls, tennis, volleyball and badminton nets, foot-ball and volleyball. The report pointed out that, with the improvement in the manufacture of Indian goods, there had been an increase in the off-take in Ceylon, which the report made, were improved publicity, attractive packaging and uniformity of designs.

Some of these aspects will be kept under constant study by an Export Promotion Council for Sports Goods which will shortly be set up with its headquarters in Delhi. Like the nine Councils already in existence for different exportable commodities, this body will study marketing conditions in foreign countries, carry out marketing surveys and disseminate information of interest to the manufacturers. Sports goods have been included as items of export from India in India's Trade Agreements with a number of countries.



THE MATCH INDUSTRY

From a Special Correspondent

THE conflict of interest between the centralised and the decentralised or the cottage sector in the match industry, arises as in the case of the textile mills versus handloom industry, from the fact that the cottage sector affords larger scope for employment, and that the manufacture of matches is eminently suited for development as a cottage industry. The sharpness of the conflict is heightened by the unfortunate fact that the organised sector of the industry is controlled by foreign interests, thus perhaps adding another element to the conflict.

The organised sector consists of two units, the Western India Match Co. and the Assam Match Co., owning and operating a chain of eight factories spread throughout India, including the Andamans, all of which come under A class factories with a capacity of over 500 gross boxes per day. The working capital in 1952-53, India, however, was valued at about Rs. 6 crores, of which the foreign percentage is about 30. Providing employment to some 8,500 persons, they account for 22.8 million gross boxes or nearly 65 per cent of India's total production of matches. The remaining 35 per cent of the capacity is accounted for by some 234 smaller and cottage units which are classified as B, C and D class factories, depending on their production capacity. More than 25 gross boxes or less than 20 gross boxes per day. By the end of 1953-54, there were in the decentralised sector, 104 factories employing about 53 of the European manufacturers, owned by B class, 77 of C class and 53 of D class or in 234 factories. The D class factory is a recent creation consequent on the implementation of the Committee recommendations, and these factories have sprung into existence throughout the country with the active assistance of the All India Khadi and Village Industries Board, which has been made responsible for the organisation and development of the match industry.

ASSISTANCE FOR DEVELOPMENT

A target of 1,000 such D class factories is set before the Board, and those that have so far come up are now functioning in Madras, Uttar Pradesh, Bombay and Assam. Among the measures of assistance rendered for its development is the establishment of a laboratory, production-cum-training centres, marketing of cottage matches through the Khadi Bhandars, provision of subsidy equipment for new cottage units, and a rebate on excise duty on the production from these units. All of which are calculated to improve its competitive position vis-à-vis the large-scale manufacturers. The cottage sector is providing employment for about 16,000 persons, and this number is expected to increase in the years to come. The State of Madras with its concentration of match industries in Sattur, Sivakasi, and Kottaiam, and with its specialisation in the production of different varieties for normal consumption and for festivities leads in this respect both in employment opportunities and organising methods, as well as in the capital invested.

The rated capacity of all the units together has been estimated at 35.3 million gross boxes of 60 sticks, at which level it has practically remained stationary for the last four years, but production is to the extent of 90 per cent of capacity at around 32.0 million gross boxes. The progress of production during the last six years in million gross boxes of 60 sticks

1950-51	27.1
1951-52	28.9
1952-53	31.9
1953-54	29.3
1954-55	31.1
1955-56	32.0

The fall in production which started in 1953-54 has been steady and progressive in the organised sector, in the subsequent years too, such increase that were noticed being accounted for by the cottage sector. The full capacity of 35.3 million gross boxes is expected to be reached by 1960-61. The 10 per cent margin between the present production and the full capacity being the allowance for the possible increase in the demand. Since there is to be no increase in the present rated capacity, it is to reach its saturation

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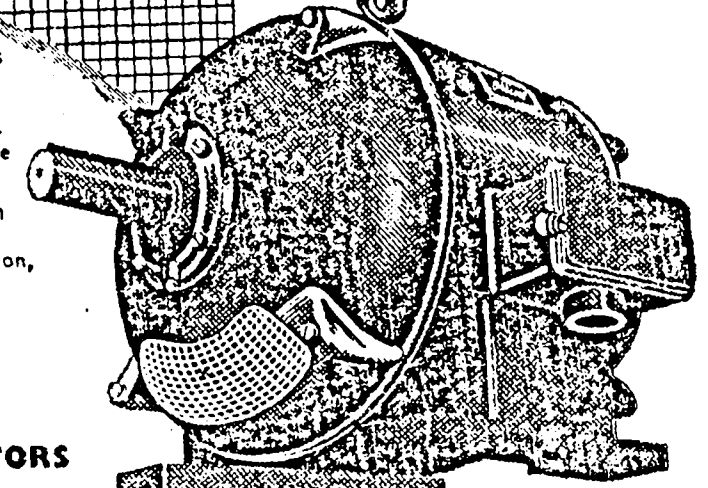
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SOME MINOR INDUSTRIES

By M. S. S.

IN a fast developing economy, the distinction between a major and a minor industry is rather thin. Neither the size of the capital sunk nor the extent of the labour employed in it can alone determine its character. There are ever so many minor industries that arrest attention by their growth in recent times.

The starch industry, though a minor industry at present, holds forth every promise of becoming a major and independent industry with a status of its own. It is an important finishing material for the textile, lace, paper, cosmetics, pharmaceuticals and glucose industries, most or all of which are in a fairly advanced state of production. The textile industry requires about 35 to 38,000 tons now, but with the increased production of cloth, the demand is expected to increase to 45,000 tons, and ultimately, by 1960-61 to 75,000 tons. Increased production of paper means larger consumption of starch from the present level of 2,000 tons, possibly to 6,000 tons. The lace industry, even if it were not to increase its output, can maintain its present consumption capacity of 3,000 tons. Compared with these major consumers, the demand from the cosmetics and glucose industries is small indeed.

As against a total demand of 45,000 tons at present, and a potential demand of 1,00,000 tons by 1960-61 including a provision for an export of 10,000 tons, the present production is just about equal to the current demand. The present rated capacity of the ten factories that are in active production is 77,800 tons though their actual production is only upto 60 per cent only. Allowing for their production to full capacity, the shortfall will be only of the order of 25,000 tons. The Pamba River Starch Co. sponsored by Parry & Co. in collaboration with the Government of Madras Ltd. is permitted to establish a factory in Kerala with 10,000 tons capacity to operate on topioca tubers as raw material. A major portion of its production is earmarked for export, and with the Lakshmi Starch Factory and the Agricultural and Industrial Uplift Central Co-operative Society all operating on tapioca, there will be a substantial addition to the industrial wealth of Kerala. The Anil Starch and the Maize Products of Ahmedabad already in the field will, between them, increase their capacities by about 11,000 tons.

The peculiarity of this industry is that it can entirely be free from dependence on imported raw material. Tapioca starch opens out large possibilities, as it has no alternative uses as an edible article. Already a brisk trade is carried on in this commodity in the Madras and Mysore States. With the complete ban on the import of foreign starch, and a phased programme of expansion and improvement, the Indian Starch Industry has a prominent place in the industrial map.

POWER ALCOHOL

The importance of power alcohol industry arises directly from the fact that it utilises an important industrial waste—molasses, the throw-out from the sugar mill. The Sugar industry even at the end of the First Five-Year Plan period was having a total stock of about 6,00,000 tons of molasses every season, the storage of which had always been a problem. With the expansion of production to 22½ lakh tons, the expected supply of molasses is estimated at 9,00,000 tons of which at least eight lakh tons will be available, enough to make about 40 million gallons of alcohol.

The uses to which alcohol, both industrial and power alcohol, is put are varied. Mixing of alcohol with petrol to the extent of 20 per cent for use as motor fuel is known to be a possibility, and when fully developed the entire molasses could be so converted, and there

scarcely a drop of molasses, while mills along the coast find it profitable to export molasses. A trade that had rather suddenly developed in this item. Another limiting factor is the divergence in the excise rules and regulations from State to State.

Notwithstanding these restrictive circumstances, no less than 31 distilleries spread over different States were engaged in 1953-54 in producing 10.4 million gallons of power alcohol and 5.2 million gallons of industrial alcohol. To cope with the increased demand expected during the Second Plan period, an additional production of 613 million gallons is envisaged. Eight factories already engaged in production have been permitted extensions up to a total of 3.79 million gallons while three new units, one each in Andhra Pradesh, Bihar and the Uttar Pradesh, have been licensed to produce 2.34 million gallons. All these schemes are in varying stages of completion and when completed the capacity of the industry is expected to increase to 20 million gallons of power alcohol and 14 million gallons of industrial alcohol.

COATED ABRASIVES

Coated Abrasives, a generic term used to denote a large variety of abrasives such as sand, glass, flint paper and cloth, emery paper, water-proof abrasive paper, garnet paper, garnet cloth, aluminium oxide paper and the like, are essentially consumer articles extensively used in almost all industries and handicraft work for grinding, polishing or sharpening tools and implements. Engineer-

ing, automobile and leather industries, railways, furniture makers progress was assured. Since then the industry can be said to have stabilised itself, with foreign collaboration and assistance.

The raw materials, at least a large part of them, required for the industry are available within the country. Quartz, garnet, corundum, emery cloth, vulcanised fibre, hide glue, technical gelatine and synthetic resin are some of the materials required and these are freely to be had. For certain specialised items, however, raw materials like silicon carbide and aluminium oxide grains and special types of kraft paper have to be imported but the quantity so brought in is small. The industry enjoyed protection till the end of 1953, and during this period the industry has not only progressed but also stabilised itself. Besides many small producers working on a cottage basis, there are four major producers, including one in Madras, who are engaged in this industry. Their combined installed capacity is 150,000 reams of abrasives, though the actual production even in the best year approximated to about 50 per cent of capacity only. From 32,700 reams in 1950-51, the production steadily rose to 41,700 reams in 1953-54. In 1953-54, 59,900 reams in 1953-54, 72,700 reams in 1954-55 and 80,000 reams in 1955-56. Expansion schemes to a limited extent have, however, been permitted and fully implemented by two units, the Carborundum Universal, an existing unit situated at Hyderabad, and the Hindustan Abrasives of Salem, a new unit, which together will enhance the rated capacity of the industry to 255,000 reams per annum.

When the Tariff Board decided to grant protection to the Found-

ry of the leather industry in 1950, its progress was assured. Since then the industry can be said to have stabilised itself, with foreign collaboration and assistance.

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LARGE-SCALE FOOTWEAR

By A. L. Cooke

are employed and the uncertain nature of their work which must result in a feeling of insecurity and a distaste for saving or building for the future. Our historian might well study the development in other countries and he would think of England in the 14th century. The small-scale and cottage industries gave place to large-scale industry, because enterprising men saved and built their enterprises without help from Governments. Our historian would look to America where the pace of industrialisation was much more rapid and he would see that the change-over from small-scale to large-scale industry was quicker than in England. Again, the Government did little to assist or retard the development of the small-scale industry. In Russia where a monolithic Government imposed large-scale industry and actively suppressed small industry, because they were convinced that this was the only way in which to achieve economic progress quickly.

LARGE UNITS MUST BE TAKEN INTO ACCOUNT

The problem, therefore, before our State and Central Governments was to decide, with these various examples before them, the policy they will follow to rapidly achieve economic improvement in India. In making plans they must take into account the existence of a few large units in Kanpur, Calcutta and Madras. These units did not come into operation due to Government action, but were established by foreigners who thought that they could be more efficient and could accumulate the necessary capital and plant. When these businesses were established, the opportunities were greater than today, but the risks were also great as to-day. If we envy a few large successful concerns, we should also remember the number of enterprising men, both Indian and foreign, who failed because they were unlucky shoe-makers. We should also consider whether these large concerns are an asset or a liability to the country, and it would be wise to ask our economist, because we are talking of economic progress. He would point out that these large concerns provide employment on a continuous basis at better wages and under better working conditions than the small units. He would also point out that the income of the Central and State Governments is almost entirely derived from large concerns who can be made to pay excise duties, sales tax and other levies. Our economist would probably also warn us that there is a limit to the burdens which even the largest concerns can carry.

One suggestion is that large industrial units should utilise the services of the small units and cottage industry to provide them with and if, therefore, the hides are

themselves of poor quality the resultant leather can only be of poor quality. The small-scale tanner preserves the hide by a simple tanning process and sends it abroad, where it is of so little value that neither he nor the leather finisher in England can make a profit. The large-scale tanner endures by every modern technique to turn a bad hide into a good piece of leather but unfortunately "silk purses cannot be made from sows' ears."

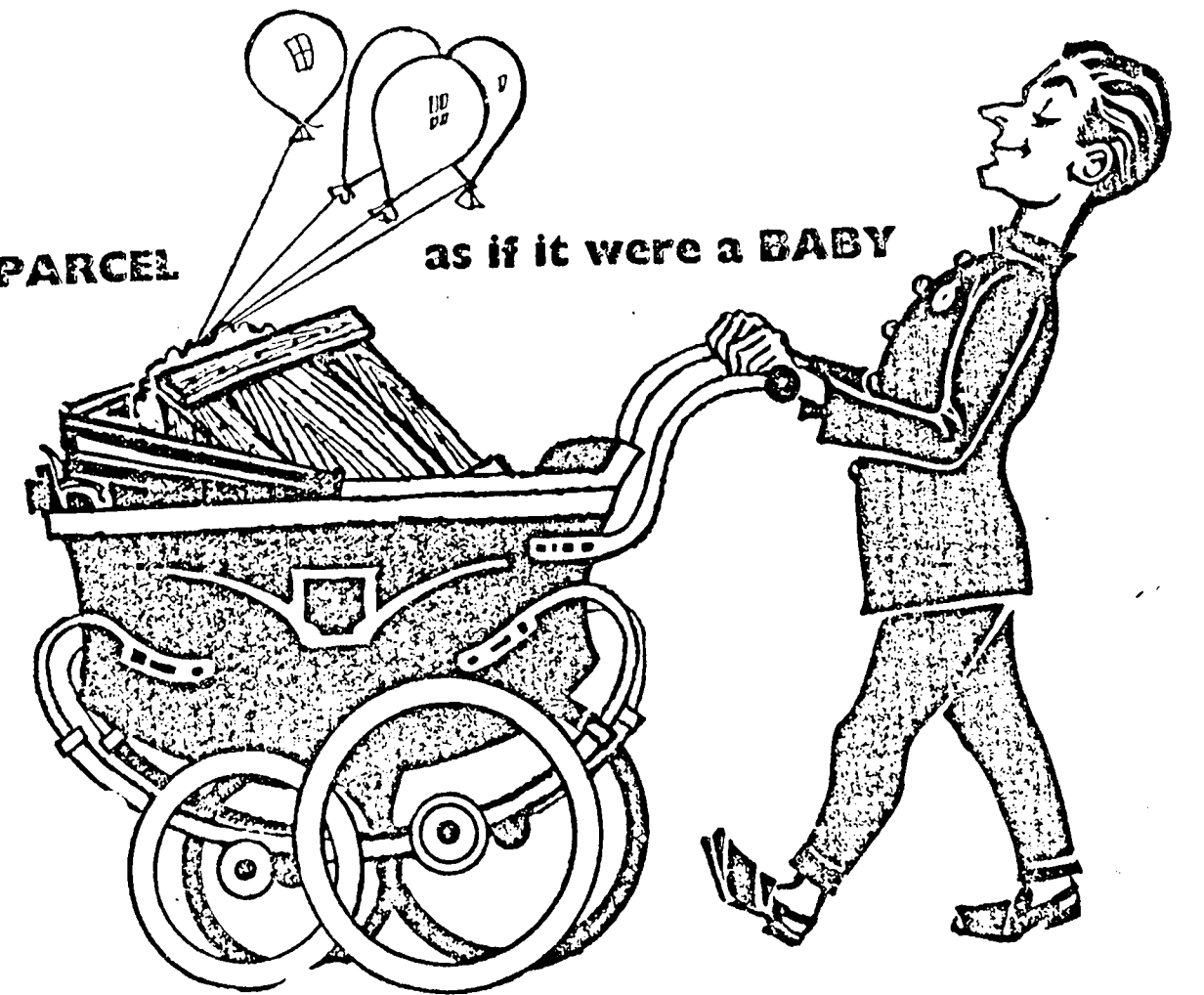
FUTURE OF TANNING INDUSTRY

The experience in 1957 is that the tanning industry of India, based largely on export of partially finished and finished leather, was doomed because the basic raw material has deteriorated to a large extent. The only future for the industry is to produce leather shoes for the vast Indian public. To do this new techniques are essential and the Government and the States must decide whether these new techniques can be operated by the large-scale industry, or the cottage small-scale industry. If the Government continues to impose burdens upon the large-scale industry it will shut down. This leaves the only solution as the conversion of the small-scale and cottage industries from their present methods to a modern standard of efficiency. Facilities, which can be imported or created for this purpose are woefully inadequate for the problem. Small-scale and cottage industry workers do not readily accept new methods and compulsion is seldom successful. Temporary assistance leads to a slackening of their effort and if the Government is to convert the small-scale and cottage industry workers from their present state of impecunious independence to the role of a consumer, they will indeed be creating a problem from which they will have no means of escape.

If economic improvements by the Five-Year Plan are to be our goal we must allow the large-scale industry to get larger and the cottage and small-scale industry to be slowly absorbed. Let us examine the impact of this proposition. Firstly, those merchants, who have bought and sold cottage industry shoes, will be obliged to divert their attention to other more remunerative trades. The small manufacturer who is efficient will be able to expand and sell his products profitably. Unfortunately, the number of small manufacturers who are efficient is extremely limited and the majority of the small manufacturers have little place in a modern system. The most important factor for the impact on the small units is the impact on the dependent worker. If the large units of the industry are expanded the small workers can obtain employment in the factories. If the Government kills the large-scale industry, then even the efficient worker will be unable to earn a living in the shoe and leather trade. There must remain a class of workman who has a distaste for factory work and is incapable of changing his hereditary methods.

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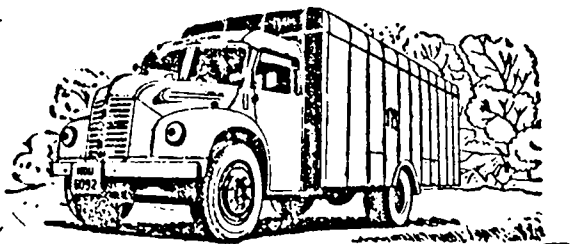
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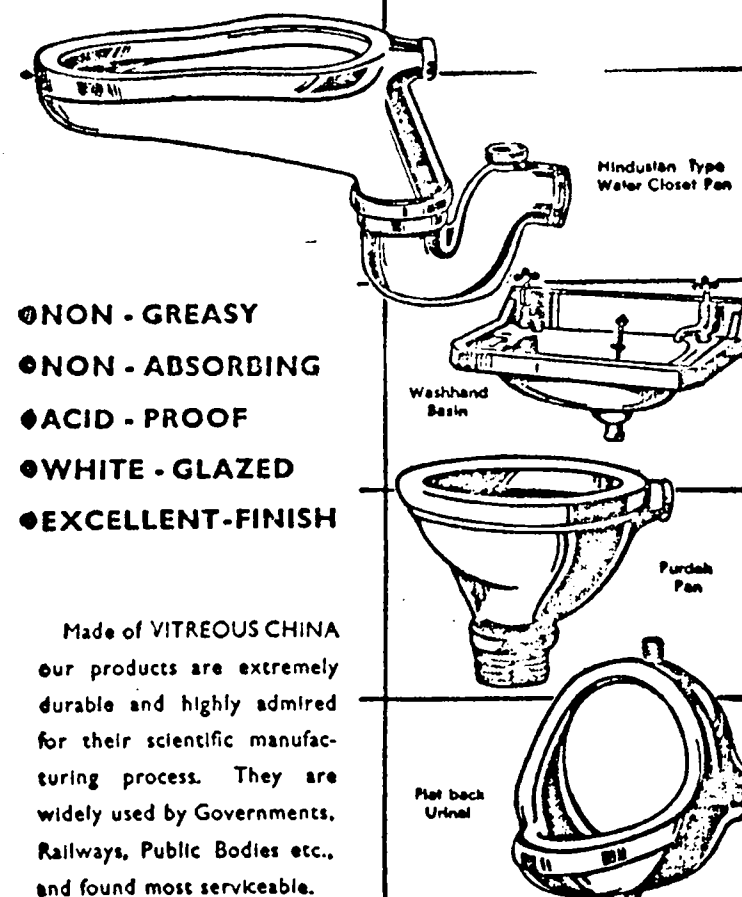
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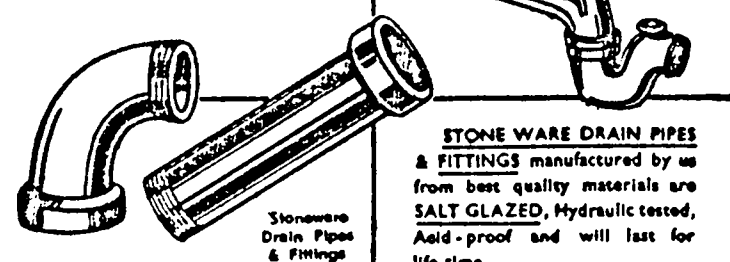
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TEA INDUSTRY PROBLEMS

By P. R. Sen Gupta

CONDITIONS in the tea market have for sometime been causing anxiety to the tea industry and trade all over the world. Production has been rapidly increasing in all the principal producing countries while consumption has been failing to keep pace. The consequent excess of supply over consumption which has been a regular feature since 1954 onwards appears to be increasing in volume so that there are apprehensions in different quarters that another major slump in the tea market may be round the corner. During the three years, 1954-55, 1955-56, and 1956-57, the total world supply has increased from 1,211 million lbs. in 1954 to 1,396 million lbs. in 1956, that is, by 155 million lbs. while absorption has increased during the same period from 1,249 million lbs. to 1,338 million lbs. that is by 89 million lbs. Such an excess of supply over the total requirements of the world necessarily means that some tea produced somewhere in the world will have to remain unsold. Another corollary of such a situation is that even teas that are actually sold fetch lower prices than they would have fetched had supply and demand been more balanced. Naturally, teas of inferior quality as well as teas which are costlier than teas of comparable quality produced in other countries suffer the most and that is precisely the predicament in which the Indian tea industry finds itself to-day.

INCREASING CONSUMPTION IN HOME MARKET

Production in India has increased from 664 million lbs. in 1950 to 668 million lbs. in 1956 of which about 127 million lbs. is accounted for by South India. During the same period, production in Ceylon has increased from 506 million lbs. to 560 million lbs. Production in Indonesia and Africa is also increasing, but while increased production in the case of Ceylon, Indonesia and Africa has been accompanied by gradually increasing exports, in the case of India, the level of exports has not appreciated correspondingly. It is true that consumption within the country has been increasing steadily in the last few years so that a part of the increased production has been offset thereby, but no established upward trend in exports is yet discernible. Exports from India which were nearly 443 million lbs. in 1950-51 declined to 429 million lbs. in 1951-52 and 427 million lbs. in 1952-53. The figure went up to 471 million lbs. in 1953-54 but again declined to 459 million lbs. in 1954-55 and 404 million lbs. in 1955-56. In 1956-57, it recorded a rise to about 514 million lbs. The average for the last 5 years, 1952-53 to 1956-57, is about 455 million lbs. against the average of roughly 430 million lbs. for the previous five years. In 1957, however, exports from India during January to September are again lower by about 31.2 million lbs. than the exports during the corresponding period of the previous year. While U.K. alone accounts for nearly 37 million lbs. out of the total decline, our exports to other countries, e.g. U.S.A., Canada, West Germany, Australia, Egypt and other Middle Eastern countries, have also declined. It can be argued with reason that the decline is more apparent than real in the sense that, during 1956-57, we had exported a large quantity of tea carried-over from 1955-56, a year during which total exports from India were only 404 million lbs. If the carry-over of 1955 teas exported during 1956-57 is taken out and so also the carry-over of 1956 teas exported during 1957-58, the resultant exports during April to September of the current year will in fact be found to be higher at 141.1 million lbs. than the corresponding figure for 1956-57 which is 130.1 million lbs. Nevertheless, the decline in exports in absolute terms is something that must necessarily cause some anxiety and there is no doubt that steps have to be taken to halt the decline and, if possible, to push our exports further up. This, however, is more easily said than done, as numerous are the factors that affect the competitive position of Indian tea in the world markets.

HIGH COST OF PRODUCTION

The major difficulties in the way of expansion of exports of Indian tea are stated to be high cost of production, high export duty, increasing competition from other producing countries as well as the fact that about half of the total Indian production consists of so-

called common teas which are available in plenty from other sources at much cheaper rates. As a result of the introduction of the Plantation Labour Act, the provision fund scheme as well as various other amenities to labour, labour charges, which form more than 60 per cent of the cost of production, are inelastic. There are taxes levied by State Governments, the Assam Road Tax or the West Bengal Entry of Goods Tax, which also add to the cost of production. On the other hand, with an increasing excess of supply over the total world requirements, prices of teas are not ruling at satisfactory levels. In fact, they are in many cases below the cost of production. With the cost of production touching or even exceeding prices, Indian teas, particularly medium and common teas, are finding it increasingly difficult to hold their own in foreign markets. Common teas produced in Africa are available at London (which is the principal market for tea in the world) at much cheaper rates than common teas produced in India because the cost of production is much lower in Africa. In addition, African tea is exported free of any export duty. Again, although the current level of export duty that Indian tea has to bear, viz., 38 per cent, is lower than the export duty on Ceylon teas which is 65 cents per lb., Ceylon teas are reported to be cheaper than comparable grades of Indian tea. Indian tea thus suffers from a number of handicaps. As a result, there is an increasing tendency on the part of the principal tea consuming countries of the world to obtain more and more of their supplies from countries other than India.

INCREASING OUTPUT OF AFRICA

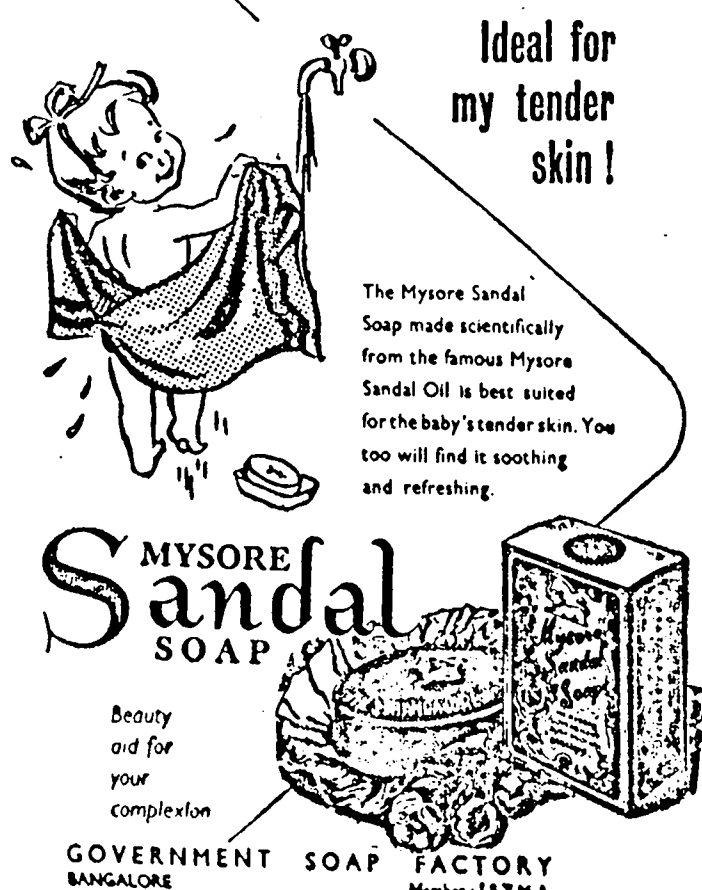
It has been stated earlier that the total world surplus was 71 million lbs. in 1954, 21 million in 1955 and 28 million lbs. in 1956. Production in Africa, which stood at about 71 million lbs. in 1956 is reported to be increasing at the rate of 10 million lbs. per year. Large-scale extensions of tea plantations are also envisaged in different parts of Africa so that, in the near future, Africa is likely to become a more important exporter than Indonesia and a major contestant for the tea markets of the world. Tea plantations have also been opened in Iran and Argentina. The former has already entered the world markets as an exporter, though on a small scale, while the latter is expected within the next three years to be in a position to export about 29 million lbs. per annum. When these possibilities come to fruition, the position of Indian tea will become all the more difficult.

The situation in which the Indian tea industry finds itself has, on certain occasions, been sought

to be remedied by regulation of production and adoption of finer plucking. To the extent finer plucking improves the quality of tea, it is, no doubt, a very desirable practice which should be followed not merely in years in which difficulties are apprehended but also in other years as a matter of routine. Regulation of production, on the other hand, is merely a palliative and not a remedy as it does not remove the basic reasons for unfavourable market conditions. On the other hand, it creates an additional problem for the producers by increasing the cost of production per lb. which the weaker sections of the industry cannot very well bear. Moreover, regulation or production in any particular year may engender among the producers a desire to produce more in the next year in order that the shortfall during the regulation year may be wiped off. This naturally results in coarser plucking and decline in the quality of tea produced. Such a step, which is sometimes encouraged by favourable prices during the early part of the year brought about by the regulation of crop in the preceding year, may bring down upon the producers the very misfortune that they tried to avoid. Thus, though regulation of crop may be a handy device to keep the market stronger in any particular year, it cannot, in the long run, be a solution to the problems that the tea industry is beset with. Further, the object of regulating production by one particular country may be frustrated by increase in other countries so that a country which regulates its crop may suffer both due to its smaller size and also due to the prices being lower as a result of over-supply caused by increased production in other countries. The International Tea Agreement which has been in force since 1933-34 and the last term of which was for the period April 1950 to March 1955 has not yet been renewed for another term. There is, therefore, no machinery for co-ordinating the production and export programmes of the tea producing countries. In the absence of such an agreement and a machinery for its implementation, unilateral action to regulate crop by any particular country is likely only to affect its own interests by reducing the quantities of saleable teas at its disposal without bringing about any improvement in prices.

The remedy for the situation has, therefore, to be sought elsewhere. Some of the measures that will improve the competitive position of Indian teas in world markets are finer plucking, better manufacture, improved farming practices and increased utilisation of developments in science and technology all of which are

Continued on page 122



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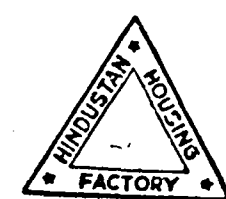
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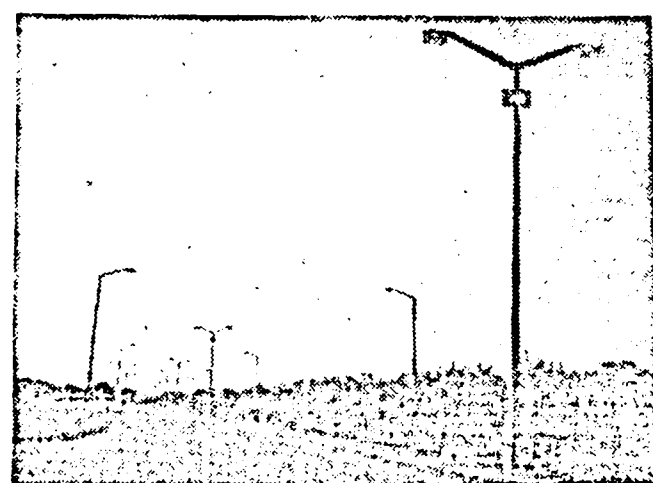
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PROBLEMS OF TEA INDUSTRY

Continued from page 120

directed towards improving the quality of tea. Abolition or reduction of the export duty has also been suggested by some sections of the industry and trade. The export duty on Indian tea is not a fixed amount but varies according to the world price of tea. So long as this price is between Rs. 2.50 and Rs. 4.00, the duty is 38 np. As a matter of fact, since February to December, 1957, it has never exceeded 38 np and has been only 25 np for the months of May, June and July. The export duty on Ceylon teas which is a fixed rate is much higher being 65 cents per lb. It cannot, therefore, be contended with cogency that the present level of export duty is higher or that abolition or reduction of the duty will help to increase our exports considerably. It has again been suggested in certain quarters that the same rate of export duty on both good quality teas and common teas adversely affects the prospects of export of common teas. If the export duty must remain, the rate for common tea may be somewhat lower than that for quality teas. The Tea Board is fully conscious of the difficulties that common teas have to face and have been trying for some time to evolve a suitable formula on the basis of which some relief can be granted to common teas. It has, however, not yet been possible to accept the suggestion for a lower export duty on common teas for the simple reason that no precise definition of common teas is available. However, the matter is still engaging the attention of the Tea Board which is examining the question from different angles.

SUPPLY AND DEMAND

The problem of common teas is essentially a problem of supply and demand and since supply is now more than demand, the solution lies only in increasing the latter. Steps to increase demand for Indian tea have, therefore, to be taken both within the country and in foreign markets. We have already seen the odds against Indian tea in foreign markets. Consumption in India has been rising over the past decade and at present is of the order of 210 million lbs. But in an undeveloped country like India where the per capita annual income is only Rs. 272, a spectacular increase in consumption of tea over a short period does not appear to be likely. Sample surveys conducted by the Statistics Branch of the Tea Board in different towns and villages of India reveal that only 40 to 50 per cent of the families take tea either at home or at shops and that among the tea drinkers, roughly 50 per cent do not take tea because they cannot afford it. Among other reasons for not drinking tea are medical reasons, dislike of tea, absence of habituation and unwillingness to form a new habit, preference for coffee, milk or other drinks, etc. Thus, consumption of tea in India will have to grow gradually with the growth of population, increase in national income, improvement in the living standards and progressive urbanisation of rural areas.

However on a long-term view some hopeful signs are nevertheless discernible. During the period 1952 to 1955 consumption of tea in India has increased from 170 million lbs. to nearly 200 million lbs. as an increase of 30 million lbs. This period more or less coincides with the period of the First Five-Year Plan which brought about an increase of 10 per cent in our per capita income and 18 per cent in our total national income. During the Second Five-Year Plan period, the national income is expected to increase by 25 per cent and the per capita income by 18 per cent. It seems, therefore, reasonable to expect that consumption of tea in India may increase by another 50 million lbs. during the Second Five-Year Plan period, thus reaching a level of 250 million lbs. per annum. The achievement of this target will, however, not be a natural process but will have to be brought about by directed and consistent efforts towards that end. It is hoped that the propaganda activities that the Tea Board is undertaking within the country for this purpose will succeed in bringing about the expansion of consumption as envisaged above.

Similarly, although there are difficulties in the way of increasing our exports to foreign countries and there is a tendency on the part of some major consuming countries of the world to turn

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IMPORTANCE OF RUBBER SELF-SUFFICIENCY

By Valale L. Chacko

AMONG the industries of India, rubber has had a late arrival, a plantation of rubber about 55 years ago and manufacturing only about 37 years ago. India is fortunate in being one among the very few countries having an indigenous rubber producing industry to ed its factories and an almost unlimited field for the expansion both.

The rubber manufacturing industry to-day represents a capital investment exceeding Rs. 13 crores and the producing industry over Rs. 20 crores. The entire rubber industry employs very nearly 10,000 persons of which under 1,000 are engaged in the manufacture of rubber goods. An interesting study of the rubber industry's progress during the last ten years has not yet been attempted but it is clear that the progress of the industry has been rapid. The ounce of the product on which it has been founded. In about 20 years after the first tyre factory was opened in the country, India is already the largest manufacturer of rubber goods both in range of goods and volume.

Any other country in South-East Asia, in fact, she exports a wide variety of rubber goods although her country's domestic requirements are rising at a faster rate than the increase in the margin of surplus production. We have not been able to increase our exports anywhere near the extent to which production has been rising. The raw rubber industry is concentrated in Kerala State although attempts were first made to plant rubber in Belgaum and Ratnagiri in the old Bombay Province. Today about 95 per cent of India's rubber is grown in Kerala and most of the remainder in Madras State. Rubber is best grown on a plantation scale but the high pressure of population along the rubber belt of Kerala is against any future development by way of large holdings. As far as small growers are concerned the number is rapidly increasing along with all the problems of small holdings, such as inadequate finance, poorer production techniques, inefficient management and marketing, poorer selection and lower yields.

LOWEST YIELD PER ACRE
To-day large holdings form about 30 per cent of the total acreage under rubber and it is undergoing gradual diminution. For a rubber growing country, India's yield per acre is one of the lowest in the world. Raising this level is one of the biggest problems facing the rubber growing industry. Last year the area under selected high-yielding rubber was under 20 per cent compared to Malaya's 46 per cent. The Rubber Board has initiated a replanting scheme which has two major defects. The scheme is too small to make any impression on the supply position and it leaves out of its scope new planting with the result that there is no control over the material widely used in new planting or over the kind of land brought under rubber.

Till 1936 almost the entire quantity of rubber produced in India had to find a market abroad. From that year onward a change occurred with the establishment of a tyre factory in India. Internal requirement of rubber rapidly rose and in 1945 there were only 844 tons left over after internal consumption. From then on production began to lag behind demand until it reached 8,000 tons in 1956 although production had risen to 23,444 tons. The Association of Rubber Manufacturers of India conservatively estimated India's requirement at 60,000 tons by 1961. Nearly half that need will have to be met by imports at a cost of about Rs. 7 crores per annum provided the world price is around Rs. 100 per 100 lbs.

There are many problems facing the rubber planting industry which stand in the way of its expanding to the point of meeting India's needs. It is believed 100,000 acres planted with high yielding clones would within ten years meet the country's prospective need for rubber. As rubber takes about eight years to reach productive maturity all the needed supply may not be available till well into the '70s. The setting up of Rs. 20 crores synthetic plant is based on this argument. The growers are of course opposed to the idea altogether for quite intelligible reasons. It is nevertheless possible for the Government at this stage to call a Conference of Plantation representatives and discuss the measures required for a rapid increase in India's output.

At present there seems to exist no solution to this very serious problem unless the Rubber Board, the State Government and Labour provide greater co-operation to the industry. Where detection had taken place the extraordinary length of time taken for securing sentences given had not encouraged the planters to believe that there is any escape from the present situation. A possible solution may lie, as it did in Malaya recently in the Labour Unions in the industry taking a stand against rubber thefts. Although squatters and a good many licence dealers are the main suspects in this illicit trade in rubber, outsiders could not really succeed in pilfering rubber from estates without the active connivance or collusion of labourers on the estates. It is for this reason that in Malaya Trade Unions took the initiative in standing against this most disturbing factor in the industry's affairs.

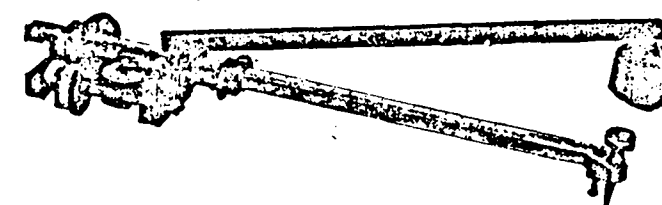
India's status as a country manufacturing rubber goods is likely to rise at a greater pace than the amazing rate of progress maintained during the past ten years or so. It is not only in the volume of production but in its range and quality that the industry has advanced. Raw material supply would cause some difficulty but India is becoming increasingly self-sufficient in many items. Apart from the measures required for a rapid increase in India's output

Continued on page 125

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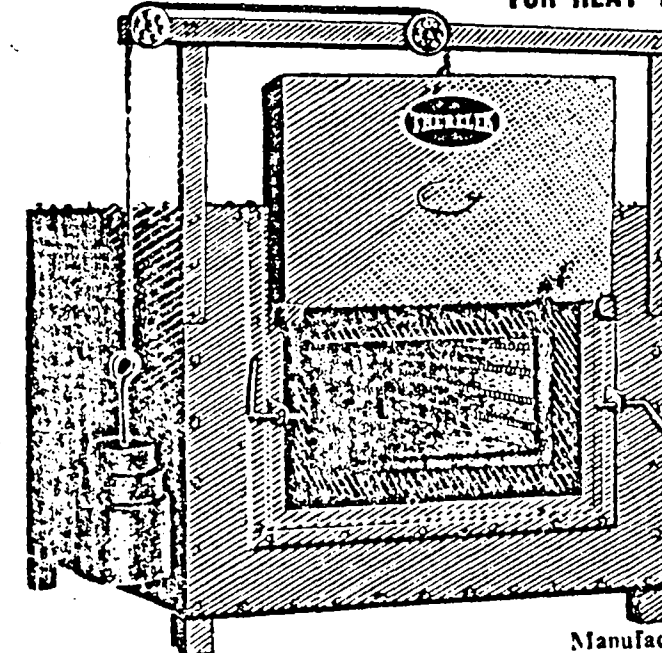
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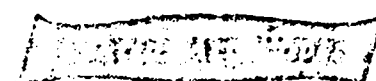
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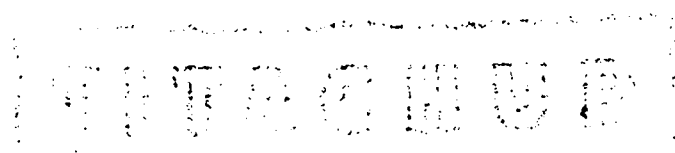


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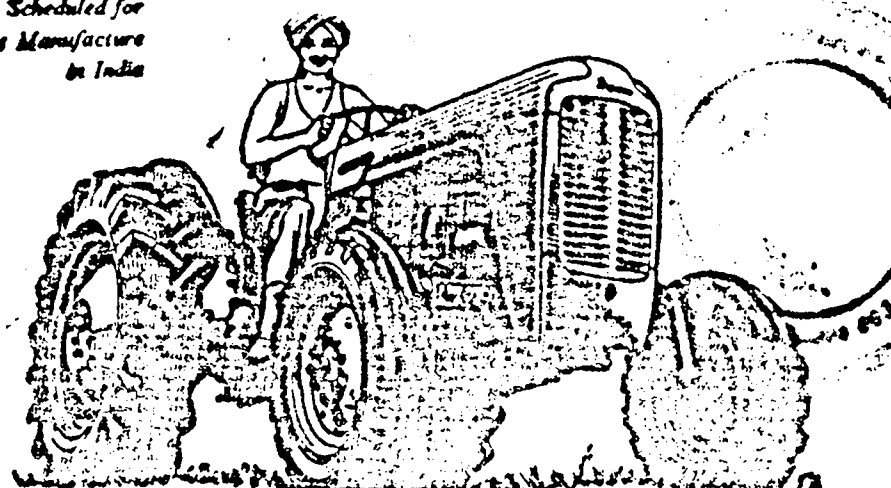


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INDUSTRIAL PROGRESS IN BOMBAY STATE

By M. H. Shah

Bombay has acquired the reputation of being a leading State in the country, it is mainly due to the tremendous industrial progress made by it over all these years. Bombay State is predominantly known for its textile industry. The old Bombay State, was one of the important textile centres of the world with a large number of cotton textile mills having an aggregate of 61,28,194 spindles and 1,30,537 looms producing 2,24,14 million yards of cloth and 80 million lbs. of yarn in the year 1935. Though the state has been reorganised, bringing in the areas of Saurashtra, Kutch, Vidarbha and Marathwada, the place of place that Bombay had in regard to textile industry remained unaltered as in 1956, the new Bombay State had 33,21,912 spindles and 1,40,019 looms producing 3,69,21 million yards of cloth and 8,0 million lbs. of yarn. The State produces more than 52 per cent of the total yarn and about 68 per cent of the total cloth in the country.

The textile industry is not the only industry which has brought the State to the fore. There are a number of other industries like engineering, chemicals and pharmaceuticals, which have sprung up during the last 50 years. There are about 9,500 factories working in the new State.

Though industries form the Central subject, the State Government has also played its role in assisting industries in a number of ways by granting financial aid and concession facilities. It also took a leading part in industrial research training and establishment of industrial estates. In addition to the assistance to industries under the State Aid to Industries Rules, the Government has set up the Bombay State Financial Corporation to provide finances to medium and small-scale industries. The Corporation, which was established in 1954 with an authorised capital of Rs. 2 crores, has rendered financial assistance to the tune of about Rs. 1,90,000 till November 1956. The Corporation has since been reorganised by amalgamating the Financial Corporation of the State of Saurashtra with it. The new Corporation will have an authorised capital of Rs. 4 crores. Through the establishment of industrial estates the Government seeks to assist the industries in developing certain select areas equipped with facilities like water supply, transport and electricity. Government has decided to establish as many as 15 new industrial estates all over the State and has earmarked an amount of Rs. 160 lakhs for the purpose in the Second Five-Year Plan of the State.

ESTABLISHMENT OF OIL REFINERIES

The establishment of two oil refineries in the State marks another major step in the industrial advancement. Of these, Stanvac Refinery with the annual crude oil intake capacity of 1.2 million tons commenced production in July 1954 and since then till August 1955, it has processed about 8.5 million barrels of crude oil. The Burmah-Shell Refinery commenced its production in January 1955 and has a capacity to process crude oil at the rate of 2 million tons per year.

Sugar industry forms one of the main industries of the State. Production of sugar in the State has increased from 1.58 lakh tons in 1951-52 season to 1.98 lakh tons in 1955-56. At present, there are 14 sugar factories working in this State. Very recently, the Government of India has approved 16 new schemes, 12 of which on co-operative basis, two private and two for substantial expansion with a total crushing capacity of 13,150 tons of sugar-cane per day.

The establishment of a rayon factory is another important development. The factory, which started production in 1951, produces nearly 7.5 million tons of artificial silk rayon by viscose process.

Chemical and Pharmaceutical industries have also made rapid progress in the State during the last two decades. The engineering industry has taken up a number of new items of manufacture.

In recent times, mining has become an attractive industry in this State. An idea of the very rapid progress made by this industry can be had from the fact that the production of manganese has increased by about 14 times during the last seven years, i.e. from 20,000 tons in 1949 to 2,87,000 tons in 1956. This works out at over 10 per cent of the country's production and represents about 3.3 per cent of the world's production.

mineral deposits are being explored in Gujarat.

In the old Bombay State, the annual total limestone production was 0.8 million tons and about 800 lime kilns were working. The production of limestone in 1955-56 is estimated at 8,29,845 tons as against 5,00,000 tons in 1951-52.

The Government of Bombay proposed to start a Department of Minerals to intensify the development of mineral resources of this State. It may be mentioned that some of the finest manganese ores occur in Nagpur and Dhondara districts of Vidarbha. This region has also deposits of iron and coal. Recently there has been a spurt in iron ore extraction activity in the Rajnaguri district and particularly in Kedi village of that district.

Besides these, deposits of gypsum, limestone, clay and building material are also available in the new areas of the State. These minerals can serve as starting points for some of the important industries like heavy chemicals and cement. It is also likely that when the Kovva scheme is completed the bauxite deposits in the Kolhapur region can be utilised for aluminium industry. Lignite deposits of Kutch can also be of much use as the region has potentiality for heavy industries.

Special mention has to be made of the increase in salt production of the State. Compared to 245 lakh lbs. of salt production for the old Bombay State, the figure for the new Bombay State is 529 lakh lbs., which accounts for over 65 per cent of all India production.

To develop new lines of industrial expansion to which private enterprise may not ordinarily feel attracted, the Government has decided to promote and, if necessary, subsidise the setting up of pilot plants. For this purpose the Government has sanctioned grants of Rs. 19,000 and Rs. 55,000 for two pilot plant schemes viz. (1) recovery of sulphur from sulphate (in sea water) and (2) crushing of oil seeds. Further, a grant of Rs. 6,700 has been sanctioned for the manufacture of cotton spinning machine and grant of Rs. 8,400 sanctioned for conducting experiments for designing silver making and spinning machine for four spindles.

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