

ENGINEERING INDUSTRY IN INDIA —
— GROWTH, DEVELOPMENT AND ITS FUTURE.

By

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INTRODUCTION

The second world war has effectively impressed upon the minds of all that only industrialised nations that can cope up with the demands of the modern mechanised war would ultimately become victorious. A country that wants to survive as an independent 'Nation' can ill-afford to connive at this axiomatic truth. Apart from war supplies, industry has to play a very important role in the economic frame and progress of a nation during peace time. The economic development of a nation must be dynamic in its nature and progressive in its achievement. The moment it becomes static, its resources limited and potentialities poor, the national economy starts degenerating to bring in its train unemployment with signs of general slump. I feel that salvation of our country can only be assured through planned industrialisation. The conference of Provincial Ministers held in Delhi in 1938 has precisely felt the urgency of industrialisation and passed the resolution that "The problems that of poverty and unemployment, of National Defence and of the economic regeneration in general cannot be solved without industrialisation." India is regarded as an agricultural country. The major portion of her population has to depend on agriculture, with the result that agriculture is overburdened. It is worthwhile noting that no nation has ever advanced through agriculture only. If the economic equilibrium is to be achieved more industries should be established creating a wider field for employment, to relieve the pressure on agriculture in consequence. Our per capita income according to Dr. Rao comes to Rs. 62/- (1931-32) only. A miserably low figure indeed! Dr. Rao has stated a tentative estimate of per capita income at Rs. 114, and in terms of price levels of 1931-32, it works out to be Rs. 69 only. It is felt that a well-planned expansion and growth of our industries would cause a rise in the per capita income.

ENGINEERING INDUSTRY DEFINED

In the general scheme of industrialisation Engineering Industries have an important place. Engineering Industries can be defined as the manufacturing industries of metal products. To-day in India, we have a number of important Engineering Industries. Before suggesting ways and means for the growth and expansion of this industry it would be in the fitness of things to take a bird's-eye-view of the development of this industry, since it is the central theme.

EARLY INDUSTRIAL ACTIVITY

The advent of the English Rule, slowly but surely, caused a conceivable change in the economy of our nation. Prior to the Company Rule and even after, for a considerable number of years, the village was the centre of our economy. Swift and rapid means of transport such as railways, post and telegraph services, use of steam and coal for power, shifted industrial activities to urban areas.

In the latter half of the 19th century, cotton and jute manufacturing and coal-mining were the important industries in India (*i.e.*, upto 1880). Incidental to the introduction of railways, there came into existence railway workshops and these alone can be claimed as the first "Engineering Shops." Iron & Steel form the important raw materials required for this industry. India was yet to make a bold entry into Iron & Steel industry. It can be said that the progress of Engineering Industry lay in the progress of Iron & Steel Industry.

IRON AND STEEL INDUSTRY

Historically speaking Iron & Steel Industry is not a new industry to India. There are unmistakable signs of the existence of Iron & Steel Age in India about 1000 B.C. or even earlier. The iron pillar erected at Delhi about 415 A.D. and the iron pillars at Dhar & Mount Abu demonstrate

the ability of ancient Indian metal workers to handle large masses of material, centuries earlier than in the West. History also makes mention that about the middle ages there were exports of Indian Steel to Persia and further West. But later on, this industry did not develop and eventually faded almost completely out of existence.

Later in the 19th century as early as 1825, attempts were made to introduce this industry on modern methods, mostly without success. "In 1825, Mr. Josiah Heath tried to establish Iron & Steel Industry in Madras. The charcoal furnaces installed by him at Porto Novo resulted in complete failure."

The credit for first successful attempt to manufacture Iron & Steel in India on a commercial scale goes to the Tata Iron & Steel Co. Ltd. and it is to the genius, perseverance and foresight of Jamshedji Tata that the industry owes its origin and development. Other important Steel works were subsequently started in Bengal and at Bhadravati in Mysore. No remarkable progress in the Iron & Steel Industry took place in India up to 1910. Tata Iron & Steel Co. produced the first pig-iron in 1911 and the first steel in the year 1912.

EARLY PERIOD: 1910-1925

The Engineering Industry could not make any remarkable progress up to 1910. The Industrial census of 1911 shows the number of people employed in the Engineering Industries as compared with other Industries in India.

INDUSTRIAL CENSUS 1911

Industry.	Persons Employed.
1) Tea plantations	703,585
2) Cotton	308,190
3) Jute, Hemp, etc.	222,399
4) Collieries	142,977
5) Railways Workshops	98,723
6) Machinery Engineering	23,147

The table shows that Textile, Plantation and Mineral Industries were making a rapid stride whereas Engineering Industry was yet to make its headway.

It can be seen that Engineering Industry did not at all flourish nor could develop satisfactorily during this period. Government policy, lack of initiative unskilled labour, dearth of enterprising spirit, lack of raw material, are some of the causes that hampered the growth of Engineering Industry. Our rulers treated India as the best and monopolised market for their finished goods and therefore they did not care for India's Industrial Development. But circumstances were changing favourably to the growth of Industries in general. The Swadeshi movement of 1908 and the popular slogan "Boycott British Goods" gave a filip to our Industries.

The first World War which broke out in 1914 encouraged enterprising and enthusiastic persons to expand or to start new industries. In the initial stage of the war, there was a kind of setback in the progress and development of Industries owing to shortage of machinery, Government restrictions and transport difficulties. But there was a brighter side also. Manufacturers in U.K. or U.S.A. were busy with the war demands and could pay very little attention to their export. Therefore, Indian manufacturers were free from competition. As a result, many new companies were floated during war time and the boom continued even till 1921-22.

Year	No. of Companies Registered.	Capital Paid-up
Till 1913-14	2,681	Nearly (76 Crores)
1918-19	2,713	(106 Crores)
1921-22	4,781	(223 Crores)

The employment figures also go to prove that there was a definite increase in Indian Industries.

FIGURES FOR 1925

Industry.	No. of Establishments.	Persons Employed.
1) Railway Workshops ..	112	147,358
2) General Engineering ..	260	44,255
3) Iron & Steel	007	37,375
4) Ordnance Factories ..	024	20,375

It was all a smooth track for Industries. Their products had a ready market. Confidence of the common people in Engineering Industries had also grown to some extent, as can be seen from the growing aptitude for investment in industrial shares.

The period from 1914 onwards marks a definite change in the outlook of the Government towards Industries. The attitude of the State throughout the earlier period was one of absolute *laissez faire*. Lord Morley was suspicious even of the creation of a Provincial Department of Industries. Tariff Policy was governed largely by the wishes of English Manufacturers and early labour legislation was prompted by them.

The war changed all this. . . . The war brought out in a striking manner, the industrial poverty of India and made Government realise the national importance of an all round industrial development. Indian public opinion was also clamouring for active assistance to be given to industries. At last the Government appointed the Industrial Commission of 1916, "Specially to enquire as to how direct encouragement to the development of industries could be given."

According to the Constitutional changes of 1919 industry became a transferred subject. The provinces established separate Departments of Industries to look after the growth and development of each Province. The Fiscal Commission was appointed in 1921 to determine the nature of the Fiscal policy. The Commission came to the conclusion that the industrial development of India had not been adequate and that the further development of Indian industries would be to the country's advantage. It also laid down that a protectionist policy was necessary to attain this end.

The period from 1908 to 1920 can be called as the Indian Industrial Renaissance period. But later many of the industries started during these years had to face critical circumstances and some of them actually went on rocks. Decadence had set in. It only became perceptible in the latter part of 1924 and in the beginning of 1925. The tide of depression was marching fast and concerns like Tata's had to apply for protection.

DEPRESSION PERIOD

I think there were definite reasons for this depression. The proverbial Government policy was a great hindrance. There was indifference and antipathy. Tatas were given protection but there were many anomalies in the policy of protection. Iron and Steel industries were given protection; but industries using Iron and Steel as chief raw materials were not given protection. In addition to this chief obstacle, there were other causes such as comparative high prices of raw materials in India. Again, by this time world conditions had improved and goods from all directions were being actually poured into the Indian market.

The period from 1925 to 1937 was a dark period. The Engineering Industry had fallen on evil days. This period did not witness any material advance in the industry. This was a period of utter depression and worst market conditions. It cannot be forgotten that political dependence has always been a serious type of impediment. The Government was "The biggest clog in the wheels of industry." Engineering Industry had just begun to assume some shape and form; and individuals had to strive hard to maintain their industries. Owing to cut-throat competition, managers of Engineering concerns had to cut down prices, had to reduce wages of

employees, had to reduce the number of workers, had to cut working hours and somehow keep their concerns running. It was really a sorrowful plight. The whole country was affected by the lowest ebb of this economic world depression. Every body became sceptic about the future.

A NEW PHASE FROM 1937

It was only after 1937 that Indian Industries began to assume some shape and form. What were the reasons for this ?

A careful study of the business and trade conditions in India and abroad would reveal to us the cause of this change over. Because of the modern means of transport and communication, and efficient and economic means of production, no country can afford to remain free from the economic impacts from other nations. Indian industrialists were becoming aware of the progress other nations were making. There was a growing tendency among young people to go in for Engineering Education, and leaders of public opinion also felt that the future prosperity of the country lay in the progress of Engineering Industries. In the year 1937, Congress came into power in eight out of the eleven provinces in India and the Congress as an administrative force tried to give motion to the wheel of Industry. Congress was quite aware of the national importance of the growth of Engineering Industries. In order to effect co-ordination of industrial policy in all the eight provinces, a meeting of the ministers for industries in all the eight provinces was convened at Delhi in October 1938 of which I have made mention at the beginning. Further the National Planning Committee was formed under the chairmanship of Pandit Jawaharlal Nehru but before the Committee could achieve fruitful results towards the working out of such a gigantic undertaking as National Planning it ceased to function owing to the resignation of the Congress Ministries.

CONTINENTAL CHANGES

After the year 1937 continental changes were shaping in a peculiar manner. War clouds were in the air. This expectancy of war created a sort of awareness in the minds of the Indian industrialists. The younger spirit that was buffeting with the cross currents of the economic world was watching with all diligence "Britain's vain efforts, Hitler's growing ambition and the inevitable result that would follow."

In September 1939, Great Britain once again geared up for greater war production and the factories worked full blast.

INDIAN-CONDITIONS:—THE YEAR 1939 TO JUNE 1940

The year 1939 happens to be momentous year to industrial world. The demands on the industry were bound to increase. Engineering Industry became a thing of primary importance so far as national defence was concerned. This ought to have been the first industry to attract State's attention. But the State did not very much care for it in the initial stage of the war. The Government was actually passive as regards the expansion or starting of new industries. It can be said with little hesitation, that the Government's attitude towards our industries was that of a step-mother. In England and Australia the Governments voluntarily provided machinery and other necessaries, and rendered advice of experts on intricate technical problems. There, the State took initiative in expanding and introducing new industries for National Defence.

In India the story reads quite strange. No orders were placed with the Indian manufacturers in the initial stage of the war. One would say that there was no necessity since the war theatre was far away from India. And there was no point even to purchase in India, what Britain could afford to manufacture. No doubt it was the old British policy not to give a single opportunity as far as possible, to Indians to expand or to start new industries. If India were to become a major war supply centre then India would be heading towards industrial improvement, the very thing which England abhorred so far. In fact, no encouragement was given to our industries. It will not be an exaggeration, one says that Indian Industries were studiously held back.

YEARS 1940 JUNE TO 1941 DECEMBER

In spite of all the intentions of Great Britain, its mouthpiece the Government of India were forced to launch a bigger scheme of industrialisation heretofore unseen in India. It was after the

fall of France in (1940) and the capture of Low Countries that the Government of India seriously started placing orders with Indian manufacturers and encouraged and helped to expand indigenous industries. The Government on its own initiative and for own safety started munition factories. As a result of the encouraging and sympathetic attitude of the Government many small industries were started and the old industries expanded. Along with bigger Engineering concerns these small Engineering shops spread all over India in great numbers. If one is to describe such a type of shop he would find that it consisted of a few lathes, two or three drilling machines, and twenty to twenty-five people working in the shops, manufacturing a few articles in large numbers (*i.e.* Grease-Cups, Sanitary fittings, Water fittings, Stationery, Press products, etc.) Some of the shops which planned on a bit large scale started their own foundries. More facilities by way of power, securing of requisite machinery and necessary permit for raw materials were given to those shops that were given contracts by the Government.

We have noticed that all along the attitude of the Government has played a very important part in the development of our industries. Engineering Industry in particular, as it involves many processes and positively demands more skill, had not attracted much attention of the public but during war time these industries definitely grew. American participation in war once again marks a change in the attitude of our Government. From 1940 June to December 1941 our Engineering Industry was pushed forward vigorously. They brushed aside the obstacles that came in their way. So far for nearly a year and a half there was an all round progress since H.M.'s Government was anxiously encouraging our Industries. From 1941 December again there came slackness in the Government's attitude, so far as Indian Engineering Industries were concerned. Government was loath to place orders or to give any sort of encouragement that would enhance the progress of Engineering Industries. From then onwards starts a new phase in the Industrial India (beginning of the year 1942).

DIFFICULTIES

Over and above the retrograde and antagonistic attitude of the Government our Engineering Industries had to face several other difficulties that definitely came in the way of their progress. Lack of raw material was one of the chief causes—larger portions of Iron and Steel were required by the Government for the munition factories. These are the basic materials required generally for Engineering Industries. The manufacturers had to pull on with whatever quota that was allotted to them. Transport was another unsurmountable difficulty. There are instances of some concerns closing their shops for a day or two or a week even for want of fuel.

India was no doubt making progress in Engineering Industries ; but India had to depend on her imports for machine-tools and various others accessories such as precision measuring instruments, small tools etc., required for the manufacture of various articles. At this juncture owing to war disturbances and shortage of shipping and to the enormous needs of Britain herself she could export very little and very little could reach India's shores ; and of that large a portion was required for the munition factories. Shortage of small tools was a handicap. Further, machine tools were not sanctioned for the parties starting new concerns. Only those manufacturers who could convince the Government about the place of their new industry in the national economy could get new machinery from the Government. It must be admitted that some machine tools etc. were allocated to old industries for their expansion.

GOVERNMENT AID

It was a good thing that Government could make some arrangements for the procurement of necessary equipment of our industries. But then, all these machine tools were practically monopolised by the Government Agency and they were sold at exorbitant prices. The agency charged anywhere up to 75% more than the landed cost *i.e.* small tools which formerly used to cost Rs. 5 only, were sold at a price as high as Rs. 40. In this way the manufacturers had to incur unnecessary heavy expenditure. The capital that was required for the investment in the industries was more than necessary, and it actually served as a drag on the manufacturers' productive resources. These exorbitant prices merely burdened our industries and sometimes actually prevented the addition of new machinery which would have effected economy in the production.

PROGRESS DURING WAR TIME

I feel that our industries have definitely made some progress. Those Engineering Concerns that were already in existence before the war had to expand their works and some new concerns also have sprung up. Of course, we have not been able to progress as much as we would have liked, under the circumstances. India was for sometime free from foreign competition. But the Government with full sagacity and shrewdness studiously held up all the channels that would have accelerated the pace of Engineering Industries.

I think India has made a definite progress in her Engineering activities. It is only during this period that many new Engineering Concerns for building machine tools were started. It is only during this period that factories for the manufacture of small tools and other various Engineering accessories were started. Many new plants for electric motors, for electric household appliances etc., were established. Articles like semi-rotary pumps and sluice-valves were manufactured on a large scale. The industrial population in organised industries has gone up from 1,750,000 in 1939 to 2,500,000 in 1944. Correspondingly, industrial output has expanded by 50%. The average number of workers in Engineering Industries subject to the Payment of Wages Act during 1944 is 2,65,000. This makes us feel that our Engineering Industries have progressed to a considerable extent.

Over and above numerical increase in the number of workers and the increase in their annual earnings, I feel, the experience and the confidence our concerns have gained during the war time is more precious. The acquired technical skill will go a long way in the future development of our industries.

THE NEED FOR PLANNING

One can see that during these years there was growth of our industries but there was no plan behind them. War emergencies did not allow us to pause and to plan. During this period the growth and expansion of Engineering Industries was largely determined by the exigencies of war. But when war's end was in sight, leading industrialists felt the need for planning the industries. Industrialists on their own initiative, published the famous Ten Thousand Crore Plan. There was the People's plan and the Gandhian Plan also. The Government of India also established the Planning and Development Department.

I also feel the urgent necessity of planning our Engineering Industries with definite aims and objects in view, on a nation-wide basis. What is planning, one may ask. The National Planning Committee has rightly defined it. The Committee says "Planning under democratic system may be defined as a technical co-ordination, by disinterested experts, of consumption, production, investment, trade and income distribution with the social objective set by bodies representatives of the Nation." In my opinion, planning conceives the idea of happy co-ordination of men and material resources of the country, aided by the Engineering craft, leading to the economic well-being of the community at large. Co-operation between the individual and the State is the essence of the whole planning.

GOVERNMENT'S ROLE IN THE DEVELOPMENT PLAN

As regards the future development of Engineering Industries I feel it should be in all directions. Before forging ahead in the matter, basic requirements of the country should first be taken into account. The development must be a planned one. It was thought to be a happy augury when the Government of India appointed as their planning member a man of no less an eminence than Sir Ardesir Dalal who is a signatory to the Bombay Plan. It was hoped that many good results would be arrived at by the Department of Planning. The Government of India appointed 29 Industrial Panels for investigating the present position and future lines of development of Engineering Industries. Out of these 29 Panels, 14 were to deal with various Engineering Industries. The Planning Member toured the U.K. and U.S.A. to negotiate with Governments and the manufacturers in the respective countries as to the help they would be able to render to India in her industrial planning. He also planned that Indian Students ought to be sent abroad for technical training to meet the future demands of Industries in India. The Planning Member then resigned. It is learnt that the Department of Planning had no scope nor power and most of the planning was done outside the Department. In fact, it is clear that the Government

again intervened and did not allow the Department to work efficiently. In my opinion, it is the bounden duty of the Government to plan the industrial growth of the country and the individual manufacturers must actively co-operate with the Government and should have mutual co-operation. The Government should take inventory of the mineral resources, both qualitative and quantitative of India and study the climatic conditions, estimate the needs of this country in a particular product or products, calculate the economic importance of the articles to be manufactured and thus place ready data before the enterprising individuals for information. At this stage, the Government should publish its policy regarding an industry or a group of industries and also state whether they want private enterprise to come forth, and if individuals come forth, what facilities would be provided to them. The Government of India and other provincial Governments have failed so far to pay attention to the collection of necessary statistical material for Engineering Industries. The statistical information should be collected and supplied by the Government to the individuals.

After fulfilling the preliminary needs the Government should declare a list of industries that would be protected. Unless the State declares its policy in simple and clear words about an industry or a group of industries regarding protection and other facilities it would be utterly impossible for private enterprise to come to the front and play its part. The Sugar Industry offers a unique example illustrating what protection can do for the progress of an industry. The enormous growth of an industry is obviously due to protection from the Government. If protection is not given to our industries in their initial stage, it will be very difficult for our manufacturers to bear the onslaughts of foreign competition.

If the Indian Engineering Works are allowed to work without protection then it will be a fight between the weakest and the strongest on the business front. The Government that has interest, affection and pride in their own industries would never brook such a handicap fight. *Laissez-faire* should be tabooed. The Government ought to be national in its outlook. The policy should reflect Indian opinion and it must not be in the interest of businessmen in London and Manchester.

Besides this tariff policy, it is incumbent upon the Government to declare other concessions. They should arrange facilities like power, gas, transport, communication, etc., at a cheap rate. In the initial stage of the industry the Government should not burden it with income-tax and such other taxes.

It will be worthwhile noting here how in England and in U.S.A. private enterprise coupled with State aid culminated in healthy development of industries congenial to the economic growth of the nation.

In England, the homeland of Engineering Industries, far back in the Nineteenth century, individuals made their head-way in the industrial field. The State did not levy taxes then. Naturally, the individual ploughed back the profits and increased the resources of his concern as we see it in U.K., U.S.A. and Germany. In India the case is quite different. We are starting the industries now and we are expected to pay the taxes equal to 100 year old U.K. industries. Here the manufacturer is burdened with taxes from the beginning. Consequently, he is able to invest very little in his own industry to enlarge it. Therefore, our industries could not stabilise themselves satisfactorily. In England or in America little capital was advanced by Banks or such other institutions on long term basis to any industry or group of industries in their initial stage. Even to-day there is antipathy to income tax. It is maintained that heavy taxation may increase Government revenue but it takes away the real substance and hinders the growth of industries. "British Industry depends almost wholly on profits earned and retained in the business to finance expansion, experiments and new development. The contribution made by the London capital market to industry's needs in the way of new long-term capital has always been negligible. When, therefore, income-tax on all trading profits was increased from five to six per cent. before 1914, to 25 and 30 per cent., and when in addition, the trading profits of privately controlled business (the vast majority) were subjected to a further surtax ranging upto 17.5 per cent., a dangerous inroad was made into the stream of funds available to re-organize, reconstruct and re-direct British Industry..... In short, it handicapped and delayed reconstruction of industry without which the recovery of depressed areas was impossible." (Foreign Affairs, April 1946, pp. 416). It will be noticed that industries in America, England and Japan sprung through private enterprise and were accelerated by sympathetic and benevolent action of the State. In India the State should adopt the same policy. Income-tax relief must be offered during the first ten to fifteen years of the life of a concern.

NATIONALIZATION

It is said that for rapid industrialisation of our Country industries should be nationalised. How far would it achieve the desired purpose? If the Government were to handle the industries, wiping off the private enterprise, it would certainly make the private activity static and the process of industrialisation too lethargic. It is only through private enterprise that industrialisation in England has achieved its present magnitude.

Very recently, Bombay's Minister for Reconstruction has outlined a policy of nationalisation of industries. It is the present trend of thought about industries. The aim of the plan is to develop the Province as a whole in the shortest possible time. The aim is quite ambitious and praiseworthy but one feels more apprehensive and less hopeful about the management of the State-owned industries. In Government concerns there is much of departmentalism and more of red-tapism. The Government machinery is likely to become static in its management. There is not so much of an incentive in the Government concerns since it is likely that an inefficient person will be taken to the top when his turn comes. Incentive and struggle for securing higher positions are the most essential things for the progress of any industry. The absence of these two things in Government concerns is obvious. Government-owned concerns are run only as a monopoly and therefore they are not required to face competition. It is the competition that urges and obliges one to make progress and in the absence of which, progress is bound to come to a standstill. Such concerns may prove a great drag on national income and on the nation's economy in the long-run. Competition is the life-blood of industry. It fosters skill and increases efficiency. There is hardly any Government concern run in competition with a privately run concern. So far it has never been demonstrated that a Government concern is run more efficiently than a privately run concern in competition with others. It will run under only monopolistic conditions. Our municipalities are public-owned bodies and managed by the public and I leave it to the readers to judge their efficiency and service. Likewise the food-grain procurement and distribution are nationalised at present and the readers could judge for themselves the efficiency of the Government management therein.

I think the Government, instead of wasting their money and energy in buying already established industries, should go in immediately for certain new ancillary industries which are lacking today in this Country.

Here this statement may appear in direct contradiction to what I have said so far. But I shall presently state why State should start industries and what industries should it start. Today our Engineering industries must develop. It means that many new Engineering concerns must be started. The individual enterprisers feel that unless there are ancillary industries they cannot start their industries. Others feel that they cannot start ancillary industries since there is no market for their products. Obviously, it forms a vicious circle which must be broken at some point. Whether it is economical or not, a beginning must be made by somebody. The responsibility falls on the Government to start such industries, and break the vicious circle. It is no point here whether Government machinery is efficient or not.

In my opinion, there is less objection for State ownership but there is opposition to the practical aspect of the question. So far as Engineering Industries are concerned private enterprise would prove more beneficial for their growth. In the manufacture of metal products due and careful attention for every operation at every stage, every day is essential. This type of industry requires day to day initiative. Therefore private enterprise is always superior.

SMALL ENGINEERING INDUSTRIES

In the reconstruction scheme the Bombay Government has already declared its intentions and policy about village up-lift and rural development. The Government is going to achieve these aims by promoting cottage industries. My suggestion would be that the Government should do every thing in its power to encourage individuals to start small Engineering Industries in small towns and villages. These industries require small amount of capital and minimum technical knowledge and an individual or a group of few individuals can afford to invest the amount necessary and acquire the little technical knowledge that is required. The establishment charges are small and therefore the overhead negligible. So these concerns can afford to sell their article or articles at moderate prices, leaving sufficient margin for themselves. In my opinion the Government should declare that concerns which will be started during a certain period and employing not more than say hundred

people should be free from income-tax for at least the first fifteen years. During this period the concerns should be compelled to plough back a certain percentage of the profits and thus assure the healthy growth of the concern. This concession will immediately attract enterprising young men to the rural areas and the village industry dream will come true.

In all the industrially advanced countries small scale industries form the real backbone of their industrial might. Industries on a larger scale cannot be started all at once. Just as farms are required to be cultivated for sowing so also Indian soil is to be cultivated for bigger enterprise. The masses would become trained. They become industrially minded. The economic conditions become improved. Leaders for conducting bigger industrial organisations get an opportunity for training themselves in these concerns. These concerns serve as tributaries *i.e.*, a small brass foundry concern can supply grease cups and brass rings to firms manufacturing pumps. The small concern can afford to sell the articles at a cheaper rate than the Pump factory can manufacture in its own shop. It has also a direct effect on the cost of finished article, and the management of the Pump concern can spare time to attend to the important technical and commercial matters. Village industries should be taken in this sense and there should be a net work of such industries.

These small scale industries would serve a great purpose even from the defence point of view. The principle of decentralisation will be incidentally followed in allowing these small factories to grow everywhere.

In England, America and Japan there are such small industries in plenty. There are not more than 1% of the concerns employing more than 500 people in U.K. We see biggest shops side by side with these small concerns. Never should fear be nurtured that with the beginning of large industries, these small industries would soon come to an end. The increasing number of these small scale industries in England and America, the leading nations of the world, only once again emphasises the point that these small scale industries have a definite place in the nation's economy.

RAW MATERIAL

In the progress of Engineering Industries in India manufacturers will have to face practical problems. Supply of cheap raw material is one of the chief difficulties. Steel bars are sold in England at Rs. 250-8 a ton and in India the price is Rs. 357-4 (1946) at present. Such instances can be multiplied.

Manufacturers in England get the advantage of these low prices. Consequently, imported material and articles from U.K. are bound to be cheaper than our own products. This has got to be changed. The Tariff Board should study all these conditions and should encourage Indian industries to lay their foundation on a strong footing.

At the same time it must be remembered that there are some raw materials required to be imported since they are essential in the manufacture of certain articles. Therefore such raw materials should be brought duty-free in India. While such raw materials are to be brought duty-free in India utmost diligence and discretion must be used. For it is worthwhile noting that finished products of one industry become raw material for another industry and therefore it demands intelligent interpretation. So also in protecting one industry it will never be advisable to kill other industries that are dependent for their raw material on the first industry,—*e.g.*, iron and steel were given protection but bolt, nuts and screws were not protected. Bolts and nuts manufactured in India from costlier Indian iron and steel, were costlier than imported bolts and nuts. Many factories started to make bolts and nuts had to close down because of this. Such instances can be multiplied (cloth *vs.* ready-made clothes, sugar *vs.* sugar-candy). In my opinion when protection was given to iron and steel industry the same protection ought to have been extended to those industries using iron and steel as main raw material. Otherwise it carries no importance and has no significance also. Such a state of affairs must not exist at all and if it does, the sooner it is removed the better.

TECHNOLOGICAL ASPECT

So far I have dealt with the political and economical aspects of the industries. It is not only political or economical reasons that have come in the way of the industries but technical deficiencies

also have hindered the progress. Technological aspect is very important in itself since the whole progress of the industry hinges on technological improvements. Therefore, it is urged that careful attention must be paid to this side of the industry. One may abuse the Government and point out economic reasons not very congenial to our industries. At the same time we must see whether we are doing the job in the right manner and whether we are paying due attention to the engineering side of the industry. It will be interesting, and instructive too, to see what Engineering Industries have developed so far, what kind of machinery is being used in the various factories, whether the machinery is suitable for the products manufactured, how far Production Engineering Technique is practised, what are the limits and tolerances observed and how does the cost-control department works; these are some of the most important points.

INDUSTRIAL CONCERNS:

Today in India we have a number of important Engineering Industries. There are industries for Farm Implements, Machine Tools, Builders, Electrical Machinery, Rolling Mills, Metal Pressing, Rice Milling and Flour Machinery, Hardware and Fastener, etc. This is a humble attempt to enumerate a few of the Engineering Industries.

OBSOLETE MACHINERY

It is not a happy thing to note that in many of the factories obsolete machinery is still working. The manufacturers think that so long as the machine is there in a working condition, it must be worked on. Here the production side and the modern manufacturing technique are lost sight of. Certainly there are reasons for this. In most of the concerns non-technical men are at the helm of affairs. These business men know little about the technicalities of the job. They are ignorant about the possible economies through the use of modern machinery and modern cutting tools. Sufficient reserves are not set aside for replacement of machinery. In some concerns, in trying to show that the concern is in a flourishing condition sufficient provision for new machinery is not made. In some concerns the manufacturers, in order to earn more profits do not set aside the portion of their profits by way of machinery-depreciation. In some places the concerns do set aside depreciation charges but in calculating the depreciation charges they follow the percentage laid down by the Income-tax Rules which is very low. Therefore the depreciation reserve is very poor. Again whatever amount is thus reserved is not utilised in purchasing new machinery. The result is that the concerns are deprived of using new and up-to-date machinery. The manufacturers pay less attention to the fact that the replacement by latest machinery increases the efficiency of their plant. In the future development of Engineering Industries replacement by the latest equipment should be attended to.

SUITABLE MACHINERY

This state of affairs gives rise to the question whether our factories are properly equipped with suitable type of machinery. The machinery must suit the product. To plan a factory the type of product and the quantity required must be determined first. Then suitable machinery in proper quantity must be ordered. It will be a hard job to design a product to suit the machinery that is already installed without any pre-planning. There is a definite type of machinery for every job, e.g. machinery of more accuracy is required for the manufacture of machine tools. In an Air Craft factory highly accurate type of machinery must be used. These accurate machines are unsuitable for manufacturing rough things like agricultural implements. It is uneconomic to use a highly accurate type of machinery for ordinary work.

It is a common belief that any machine tool will do for any job. It is forgotten by many and practised by few that there is a job for every machine and every machine has its own job. Addition of new machinery unless there is proper and enough work is uneconomical. It will not in any way add to its production. It will be burdening the industry. Machinery in our factories should be kept in balanced proportion as far as possible.

REPAIR SHOP TENDENCY

Another tendency which is universally seen in manufacturing concerns is to change their works into repair shops. One can understand a concern doing only repair works. But the mixing of repair jobs with the production work is highly detrimental to the concern itself. This idea of accept-

ing job orders and undertaking repair work has seriously undermined the growth of our Engineering Industries. It should be remembered here that the repair mentality is different from the production mentality. Production mentality will always aim at efficient qualitative and quantitative production. Repair work mentality will see the work accomplished. It will not take into consideration whether efficient method is used and whether suitable machinery is being utilised for the purpose. The repair work influences the production side of the concern. Sometimes an Engineering concern is forced to take a repair job through pressure. In a manufacturing concern one can only charge the direct cost plus overhead for the repair work, but one cannot charge for the loss the production has suffered. In my opinion repair work and production work cannot be efficiently worked under one and the same roof. Each one must be exclusive of the other.

SPECIALISATION

It is a moot point whether in India under the present circumstances too much specialisation is advisable—whether in a plant there should be single purpose machine tools? I think at this stage of the progress of our Engineering Industries too much specialisation is not possible. General purpose machines should be used as far as possible. But this should not come in the way of using single purpose machines, provided such machines are economically justified.

PRODUCTION ENGINEERING

To decide whether the use of a particular machine for a particular article is economically justified or not is the question that falls in the range of production Engineering that is overlooked so far by our Engineers. Production Engineering is a special branch in the modern Engineering world, and a separate book can be written on the subject. Limitations of space allow me to write only a few lines about it.

Many a firm somehow produce a few articles of a job and imagine they have established an industry. Less attention is paid to the economic manufacturing of the article. The Production Engineer has to look to the nature of work required to be done, has to look to the machinery at his disposal and at last must take decision as to the process to be followed. He must decide what machine to be used for a particular operation; for, all the operations must be efficiently done and must prove economic in the end. Production Engineer must study the articles to be manufactured, must know various processes, must be intimate with all the machinery that is at his disposal, and lastly he must be able to select the right machine for the right operation. He will have a proper schedule and a logical sequence of articles to be followed so that the assembly shop shall not suffer for want of a single article.

INSPECTION

Production on a mass scale has brought in the principle of interchangeability. The practice of the principle demands inspection in the shop. If the articles are not upto the limits specified it will go very difficult in the assembly shop. Much time would be lost and quality work cannot be guaranteed. Therefore to assure quality and quantity, inspection must be introduced.

Inspection is of two kinds—hundred per cent. inspection and a qualitative inspection. The first of the two means the inspection of every article after each operation. The latter means the inspection of only some pieces in a lot. The mass production technique needs both the types of inspections.

The inspection technique involves the use of limits and tolerances. Tolerances bring the dimensions within certain fixed limits. As an essential thing tolerances must be established first. Tolerances should be closer as far as possible. They should be up to the standard. Interchangeability is secured by observing closer tolerance; and this in turn makes assembly work easier and faster. It should be remembered that the range of tolerances must be fixed according to the nature of work. In concerns where less attention is paid to the observance of tolerances much time is lost in the assembly. At the same time it is to be noted that maintenance of closer tolerances demands the use of modern machine tools and cutting tools. On old machines the costs become prohibitive.

MECHANICAL HANDLING

The modern trend is towards mechanical handling. I feel that mechanical handling can only be undertaken where a single article is manufactured on a large scale; and each operation of various

parts is carried in a balanced capacity and in a continuous order. It is felt that mechanical handling would cause unemployment ; but this notion does not hold water. At the most, there would be a temporary unemployment which would disappear in course of time.

SELF-SUFFICIENCY

It is argued that our Engineering Industries try to make every thing themselves. Of course, it is a condition forced on them. Since there are no ancillary industries, every concern has to provide itself all the requirements of its products. As soon as the ancillary industries develop, this phase will vanish.

WHAT NEW INDUSTRIES

I think those desiring to start industries should start first manufacturing consumers articles, the raw material for which is available in our country. This does not mean that industries needed for our general economy and yet depending on imported raw material need not be started. Our Engineering Industries are yet to develop and for their growth they are badly in need of heavy ancillary industries like forging, malleable castings, die-castings, steel castings, etc.

COST ACCOUNTS

The most important department which must be scrupulously attended to in Engineering concerns is that of cost accounting. It is as much difficult to maintain as it is important to have it. In Engineering concerns the operations are varied. Often the operator changes and sometimes the machine changes ; and thus it goes very difficult to determine the exact cost. The function of the cost control is to find out the exact cost and then to suggest all possible means to control it. Many of the concerns have their own ways of fixing the costs. Cost Accounting serves as a sure guide in a competitive market. It enables the manufacturers to say exactly why a particular article is costly and how effectively the cost can be reduced. It gives one confidence in conducting one's own business. It points out to the manufacturer the moment the costs are going higher. It will clearly state the margin of profit in each article. It is a powerful weapon in the executive's hands. The maintenance of cost control will give the manufacturer a sure hold on his own concern and will enable him to take correct decisions.

TECHNICAL PERSONNEL

India feels today the need for technical personnel. The fact that there is dearth of technical men in India cannot be denied. During war time the demands on the Engineering Industries were multiplied as India became an important war supply centre. Civil demands also came in large numbers. Machines and materials could be secured by some means or other ; but to get energetic technical personnel was a serious question which every manufacturer had to face. The percentage of literacy in India is abnormally low. Almost all the workers are recruited from the illiterate strata of the society. Therefore they have very little inclination to learn their own job, much less something more. In India, with an area of 1.8 million square miles, a population of over 400 millions and more than a million people coming under factory legislation, there were in 1939-40, nine Engineering and Technical Colleges and 642 industrial schools. Very little information is available as regards apprentice training schemes in Indian Engineering firms. Such schemes are quite prevalent in England and America. These apprentices prove highly beneficial in supplying an assured number of trained personnel, thus helping to maintain the traditions of quality and quantity of production.

GOVERNMENTAL TECHNICAL TRAINING SCHEME

The Government started the technical training scheme at the end of 1940 " to provide for intensive training for a large number of skilled tradesmen required for the technical branches of the Defence Service and for ordnance and munition factories. The number of technicians trained under the Scheme and supplied to the Defence Service up to 31st December 1945, was 83,867, the number supplied to ordnance and munitions factories was 319 while 4,969 were sent to undertakings engaged in the production of war supplies. More than 100,000 trained men have passed through the Training Centres during the five years of the operation of the scheme." (*Indian Labour Gazette*, Jan. 1946 p.205). Bevin Boys Scheme proved of advantage in providing technically trained personnel to munitions factories and private undertakings.

BOARD OF EXPERTS

There was another way in which the Government aided our Engineering Concerns. It made some attempts of giving technical aid by appointing experts or a body of experts to guide and solve technical questions. But the way in which it was done makes us feel rather uneasy about the whole affair. Any person who had very little experience in the manufacturing line was appointed on the Board. Machine-tool Industry, a highly essential industry for National Defence offers a case in point. The Government of India appreciated the significance and the utility of the industry and announced that special technical aid would be rendered free to machine-tool manufacturers. The manufacturers felt that they would be much benefitted in so far as they would reap the fruit of the Board's long and ripe experience. To their surprise they found that the experts had very little technical knowledge.

A NOTE ABOUT EXPERTS

Here I feel it worth while to sound a note of warning about the word "EXPERT" There is still a hallow prevalent round the word "expert" in India. But there is a great difference in the meaning of the word as understood in England and in India. Everybody in India, especially various manufacturers have heard that England has sent so many experts to India, *i.e.* experts in automobile, in mining, in textile manufacture etc. But it must be remembered that to become an expert in any of the above industries one must have enough education in that line and long practical experience. "Engineering is a craft, for the successful exercise of which much knowledge of a technical nature is needed; it is concerned with practical design, manufacture and operation of machines of many kinds. It should be borne in mind that one ought to have enough of theoretical knowledge coupled with varied practical experience to allow one to entitle oneself as an expert." Some of the Indian manufacturers were unfortunate in taking the aid of these experts. The manufacturers themselves had very little technical knowledge with them and they solely relied on these experts. As a result some of the concerns had to wind up the whole business. Therefore great care should be taken if at all an expert's aid is to be taken.

ZEAL FOR NEW KNOWLEDGE

Another thing which strikes me most is that our technical men are not keeping themselves abreast. I feel that they should be alive to the technical progress that is achieved in other nations. They must have the catholicity of the mind to read and to practise the new trends in their trade. They must keep themselves informed of new developments. There may be difficulties in their way. It may be that they have no access to the up-to-date technical literature. It may be that their hands are not free to practise what they would think fit. It may be due to the narrow outlook of the Managing Directors or their own inaptitude for reading and following "NEW KNOWLEDGE." The greatest misfortune, I think, is that their intellect is allowed to rust. It is doubly unfortunate. It rusts the person, it kills the concern in which he is employed. Ultimately it proves a great loss to the nation. The Engineers should not enjoy dreams of self-complacency. The sooner this tendency is rooted out the better.

I think, every factory should have its own TECHNICAL LIBRARY. The library should subscribe for technical journals bearing on the trade of the factory. It should be seen that every responsible person takes the advantage of the library. The library should have a good collection of books on technical subjects pertaining to the factory.

If the nation is to launch the scheme of industrialization now, it is feared that India will fall short of technical men. Of course, suitable personnel is essential for the able handling of the various sections of an industry (whether small or big). Russia and Japan felt the same need. Both had to import technical men from foreign countries. They became self-sufficient in the latter years of the completion of their plans. India may be required to import foreign trade technicians; and in the course of years she will train her own men here and abroad. Industry would require men with initiative, ingenuity, efficiency, and with a will to work. There should not be a shortage of choice personnel in India where population figures are rising up every year. The only work that will remain is to give them proper training and opportunity.

RESEARCH

Many people think that the progress of our Engineering Industries needs a Research Department. Research is a vital necessity for the progress of any industry. Laboratories are potential

forces. In fact, the Second World War is won in the laboratories of England and America. No one can deny these facts. But so far as Engineering Industry is concerned I think that there is a greater necessity of a well organized central technical library. This industry by its innate nature is dynamic in its character. From simple things it has achieved its present complex form. All the progress it has made is mostly incidental. With daily practice and with the aid of technical literature new methods and new devices could be followed. It is enough at this stage of our industries if we faithfully and successfully practise the engineering knowledge known to us.

It is highly essential for us to know what is going on in the Engineering world in U.K., U.S.A. and other countries. For this purpose there should be a Central Engineering Library on the model of Engineering Libraries in America and reference service by post should form an important function of library service.

LABOUR

Last but not the least, is the question about labour in Engineering industries. Labour in industries has to play a very important part in the economic development of industries and therefore in the national economy. With the growth of industries the number of workers also increased. It was first in 1881 that the Government showed interest in Labour by passing the Factory Act of 1881. Labour was also awakening. The first trade Union was established in 1884. Gradually, the Labour class became more and more conscious. Trade Unions grew stronger. The Government also passed several labour laws. The schemes like Health Insurance and Industrial Housing that are in the offing show the growing and active interest of the Government in the labour welfare.

A healthy growth of trade unions is a thing to welcome. It should be remembered by all that united front and united action should be the last resort. It is through harmony that progress can be achieved. The labour is certainly interested in its welfare which is however bound up with the welfare of the industry; any set-back in industry is bound to react unfavourably on the employment, wages and conditions of work of its important compliment — Labour. Their interest is mutual. It is completely intermingled. Healthy labour unions will come forth with healthy industrial progress.

Labour that is available today is mostly illiterate. Engineering Industry, as it is not a process industry, demands more skill on the part of the worker even with all the automatisms introduced in the industry.

A higher standard of workers' efficiency is essential. In India, there is low standard of literacy and it goes very difficult to secure literate adults to work in the factories. Therefore, it should be the concern of the management to start night schools or a course of weekly lectures for their workers to increase their knowledge of the trade and in this scheme the unions should join hands with the management.

STANDARD OF LIVING

Labour legislation is emphasised to ameliorate the labour conditions. The aim is to increase the standard of living of the workers. But I am doubtful how far the aim is achieved! The present prohibitive market conditions make the condition still worse. In my opinion the standard of living does not mean only higher wages but it means a better supply of necessities of life at a cheaper rate. The problem of higher standard of living is directly co-related with the intimate relationship that exists between wages and production. We must have more output per man hour if we want to enjoy more goods and better services. I feel that legislation has so far neglected this side and it should pay more attention to this aspect if really the standard of living of the vast majority of workers and of the community is to be increased.

There is a demand for higher wages; and if there is no corresponding increase in the production, it is detrimental to the growth of the industry. Ford, in a letter to one of the unions has pointed out the rise in wages and the corresponding decrease in production and has clearly stated that the state of affairs was quite harmful to Ford Motor Co., and therefore to its employees. Higher wages and low production is an unnatural condition. It is incompatible with economic principles.

In India, the production per man is already low. If production suffers, every one suffers. If the production figures are greater their costs will be lower; if the production figures are lower the costs

go higher. The production per man must be higher, for the cost of the article includes the labour put on it from the beginning to the end. In a competitive market the cheapest and the best article would get the first customer. Therefore, it should be the duty of all the workers to guard with all care the production front. When the workers demand for higher wages without a corresponding increase in the production, it unduly increases the cost of living and does not improve their condition. Therefore it should be understood by all that unless they produce more they will not earn more of real wages. The higher the personal effort put the higher the standard goes.

MODERN TRENDS

In modern Engineering industries Engineering knowledge is almost standardised throughout the world. There is nothing so much as secret and unknown. But, of course, the skill lies in the proper utilisation of man and machine power. During my stay in England and Germany, immediately after the cessation of hostilities I had the opportunity of visiting a number of up-to-date plants. I did not find anything quite extraordinary in engineering technique; but production was due to the skill and interest shown by the workers. Human Engineering is thought to be of greater importance. Industrial psychology is becoming a key to unlock the problems of production, and to increase the efficiency. It is thought worth while to better the surroundings by air conditioning by proper display of colour in the shop and by keeping the plant condition neat, clean and cheerful. The problem of industrial health is receiving more attention.

Nutrition of workers has, of late, attracted attention and industrial canteens are run to serve the workers with hot meals. It is clear that humanistic aspect in industries is coming to the fore and it is taken as a means to increase the efficiency and the production of workers. In the march towards progress of Engineering Industries in India these trends should not be lost sight of.

CONCLUSION

Engineering Industry in India reared its head in the first decade of the 20th century. The two great wars have substantially helped the development of the Industry. So much is done but the undone vast remains. Engineering industry has many potentialities. The country is yet to industrialize and the very progress of all round industrialisation depends upon the growth of Engineering Industry. The nation today is intent upon industrialisation. The process, of course, is slow and often broken owing to foreign domination. The political power has enslaved us economically. His Majesty's Government is controlling the dollar exchange and holding us back from rapid industrialisation of our Country. A National Government at the centre will throw these evils away and will earn for the country both political and consequently economical freedom. In the meanwhile the manufacturers in India should come closer still and virgorously think about rapid advancement of our industries and actively act up to it. Economic backwardness of India is glaringly known to all. For this very reason maximum effort in the minimum number of years must be put through to elevate its economic potential and bring it on a par with other nations.

I cannot but draw the attention of the readers to the criticism levelled against the Government by Sir M. Visveswaraya, President of the A.I.M.O. while addressing the first quarterly meeting of the central committee of the organisation. His suggestions are valuable and would serve a good pointer for the Government to adopt its policy. The nation today has realised that Engineering Industries have a firm place in the nation's Defence and Economy. The people are growing more and more industrially-minded; leaders of public opinion also have reached the conclusion that Engineering Industries are the back-bone of the whole scheme of industrialisation. Political situation foretells that there will be a form of national Government at the centre. There are popular Governments in the Provinces. Therefore, with so much of industrial activity and so many schemes of industrialisation on the anvil, both at the centre and in the provinces, with a healthy co-operation between manufacturers, the good-will of the public, sympathy of the Government, careful and diligent working on the technical side and harmonious labour relations, Engineering Industries in India promise unlimited expansion and would surely enable us to attain a leading place amongst the nations of the world.