

Indian Industry

July 1962

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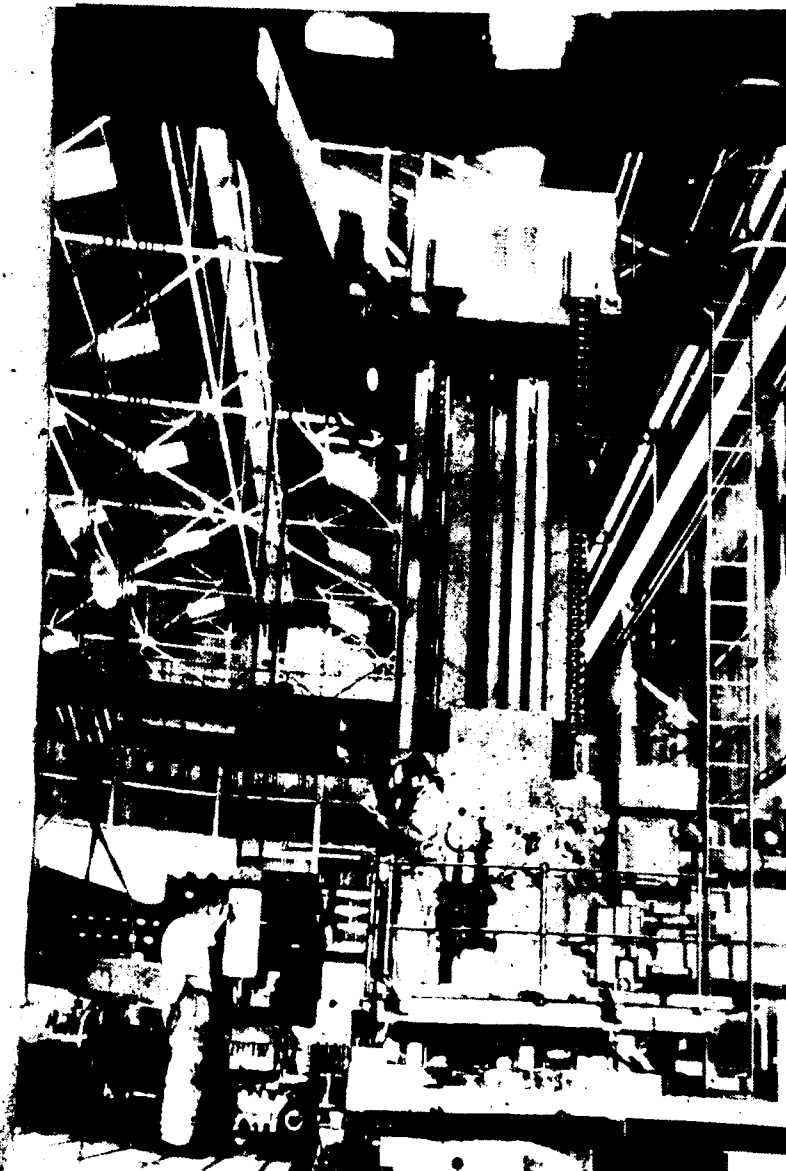
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Editor

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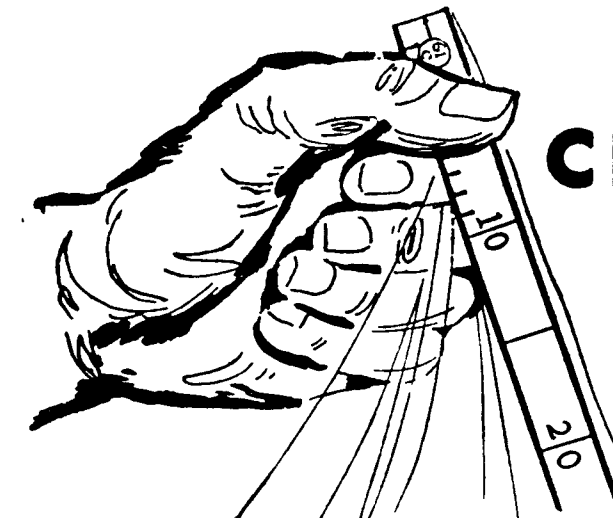
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The Editor is pleased to consider contributions of interest to the Indian Industry.

Articles should be accompanied by photographs wherever possible and a stamped addressed envelope should be enclosed for return in the event of unsuitability.

Trade notes and short news paragraphs are always welcome.

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(ISSUED BY THE SOUTHERN RAILWAY)



Private Enterprise

“ This is the last big market left in the free world for private enterprise to develop ”—

These enthusing words by a farsighted American businessman very recently will ring solace and consolation to many an Indian Entrepreneur.

“ From the bullock cart Age
Into the Jet Age ”—

India must be taken in a decade or two at any cost and as our beloved Prime Minister chants these magical words multitudinous times, we feel thrilled and energised.

Not a day passes in this vast subcontinent without an announcement for the inauguration of a new factory with foreign collaboration.

In the last two years, over 600 new companies have been launched with a capital of over Rs. 200 crores and if this tempo is maintained, the paid-up capital of the manufacturing firms in the country is sure to double up by 1971.

The recent announcement in Bonn by Mr. Walter Scheel, New Minister for Economic co-operation that the bulk of future West German aid to under-developed countries would be financed by private enterprise is being greeted with delight in Indian industrial circles. His ministry was created only two months ago to co-ordinate German aid to under-developed countries. He said that in 1962 budget 3,500 million marks are earmarked for foreign aid. Next year, the Government have planned a big campaign to attract private enterprise to this new field of investment. The Government planned in future years for private investors to take over the role of aid to the under-developed countries with the Government supplying technical assistance. To facilitate private investment in the economies of the new countries, a company specialising in development aid would be created. Mr. Scheel said his ministry would study, in addition, all the possibility of taxation reductions for investors in the new countries and also the position of countries which recognised the East German Government.

The Federal Republic of Germany has made the second largest contribution to Indian economy, amounting to over Rs. 591 crores. Several German firms have taken keen interest in improving the tempo of our production.

The magnificent part played by great firms like Burmah Shell, Caltex, Stanvac, I.C.I., Union Carbide, Indian Oxygen, Killicks, Vickers and Babcocks, Stewarts and Lloyds, Dunlop, Larsen & Toubro, Goodyear, Binnys, Harveys, Mc Leods, Siemens and a host of others helps Indian Industries to arrive at the take-off stage in a shorter time. French and Italian firms play an admirable part. They have expressed their willingness to supply machinery and advance loans for a Rs. 28 crores fertiliser plant in Gujarat. Japan is slowly widening her area of interest in India. Czech, Polish, East German technicians are already in India in hundreds and they vie with one another to start more industries with Indian collaborators. Others are coming in with greater enthusiasm and larger visions.

The first two Five Year Plans entailed an investment of over Rs. 10,000 crores for Indian Development Plans. The Third Plan needs an amount greater than the first two Plans combined.

We have during the last 10 years, reached new highs—national income up by 42%: income per capita up to 20%: living standards up by 16%: agricultural production up by 40%: industrial production up 100% PLUS.

In this mighty fine task, both Public and Private Sectors played their parts. Public Sector failed by 10% to reach Second Plan targets.

Proudly the Private Sector marched from success to success. It has exceeded its goals by 40%.

Government made a good gesture by allowing private enterprise to launch fertiliser industry. In a Press note on May 8, 1961, the Government of India made their position clear by saying: "Basically, policy regarding foreign investments would be to attract foreign capital in those fields which

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the country needs to develop in pursuance of the Plan targets."

In the coming five years we need foreign exchange close to Rs. 3000 crores. Increasing exports is an excellent attempt but it is not going to solve our immediate problems. The voracity of the huge domestic market leaves limited exportable surpluses. It is true modern machinery are bringing down costs appreciably but it is a long way to travel.

"Aid-to-India Club" (comprising Canada, France, West Germany, Japan, U.K., U.S., and World Bank) have promised us Rs. 1112 crores for first two years. These funds will go to produce basic goods—iron, steel, chemicals, machine tools etc.—; transportation (railways, highways, locomotives, trucks); and irrigation, farm equipment and fertilisers.

Our industrial development throws open new vistas which American collaborators will find interesting and profitable. Aluminium, cars, trucks, machine tools and other industries attract them. India offers American industrialists a rich choice of

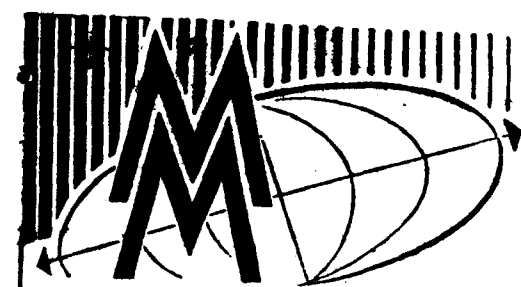
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various forms of compensation, such as lump sum payments, annual fees, royalties or free equity shares. Joint ventures are eligible to apply for loans from U.S. owned rupee funds, available under the Cooley Amendment to P.L. 480 (foreign sale of U.S. agricultural surpluses.) Such loans totalled Rs. 150 crores last August.

Government of India offers excellent incentives to joint ventures in the Third Plan. The chief tax incentives are:

1. **Tax holiday to new industrial undertakings:** Profits are exempt from income-tax up to 6% of capital employed for a period of five years. The dividends declared by such undertakings out of the exempted profits are also exempt from tax to the share-holders who receive them.

2. **Development rebate:** In addition to depreciation allowances which are liberal, a development rebate equal to 20% of the cost of plant and machinery is allowed as a deduction from the taxable income in the year of installation, thus enabling



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the enterprise ultimately to charge to revenue 120% of the cost of the asset.

3. Exemption of foreign technicians from personal income tax for up to three years of employment in approved enterprises.

A safeguard for American investors is found in the U. S. Government's "Investment Guarantee Programme," which insures capital investments against certain non-commercial risks (non-convertibility, expropriation) for a minimal fee.

As Mr. Bernard Pincus, President, U. T. S. I. powerfully pleads, India merits the scrutiny of American industries seeking their proper share of profitable world markets. Returns on American

investments in India in 1959 were about 11%, somewhat higher than the world average. And it is bound to prove rewarding, in that much-abused frame of reference, "economic statesmanship," to participate in the private enterprise development of the world's largest democracy.

Krishna Pincus

Indian Industries



Air-India in Civil Aviation

B. R. PATEL, I.C.S.

Vice-Chairman & General Manager, Air-India

The post-war history of civil aviation in India has been one of phenomenal growth. No other form of transport has made such progress in so short a time. Into its development has gone intensive endeavour, no little courage, a great deal of skill and foresight and considerable planning.

The nationalisation of air services was completed during the First Plan period (1951-56) and two Corporations—Indian Airlines Corporation and Air-India International—came into being on August 1, 1953.

The growth of I.A.C. since nationalisation has kept pace with industrial development in the country. Since its inception it has made steady progress. In 1959-60 I.A.C. passed the break-even point and showed a modest profit. During 1959-60 I.A.C. recorded 1,16,975 revenue hours flown and 1,94,01,773 revenue aircraft miles flown; they carried 7,03,013 passengers, 46,041 tons of cargo, 5,856 tons of mail and 4,79,97,904 revenue ton-miles.

The rate of development of Air-India since nationalisation has also shown a steady growth in capacity operated, revenue loads carried and financial gains on the operations. The scale of operations and the route system of Air-India have expanded continuously since 1953.

A new service to Singapore via Madras was inaugurated in July 1954. A month later, a new Far Eastern service linking Bombay and Calcutta with Bangkok and Hong Kong was introduced. This route was extended to Tokyo in May 1955. In October 1956, the Bombay-Singapore service was extended to Sydney (Australia). In August 1958, Air-India opened an entirely new route pattern for traffic between Europe and the East with the inauguration of its Delhi-Moscow service via Tashkent.

In April 1960 Air-India inaugurated a Boeing Jet Service to London and on May 14 extended its Bombay-London service to New York. Six months later was introduced a new weekly service to Bahrain and Kuwait. Air-India was the first Asian carrier to fly to New York. From a total of three stations served in June 1948, Air-India now serves 27 cities in 21 countries, covering five continents over an un-duplicated route system of 33,373 miles.

Progress can be judged best by performance and rate of development. The All statistics below show the total annual capacity operated, revenue passengers actually carried and the percentage increase between 1950 and 1960:—

Year	Capacity in Tonne-Km. (In Thousands)	% increase on the previous year	Revenue Passengers carried	% increase on the previous year
1950	16,378	+ 55.99	11,000	+ 37.50
1951	21,573	+ 31.72	16,772	+ 52.47
1952	21,012	— 2.60	15,063	— 10.19
1953	26,538	+ 26.30	26,527	+ 76.10
1954	35,129	+ 32.37	36,563	+ 37.83
1955	51,025	+ 45.25	50,710	+ 38.69
1956	64,091	+ 25.61	60,008	+ 18.33
1957	75,465	+ 17.75	73,737	+ 22.80
1958	85,407	+ 13.17	75,589	+ 2.51
1959	98,016	+ 14.76	87,601	+ 15.89
1960	1,35,443	+ 38.18	1,08,011	+ 23.30

Increase in 1960 over 1950 :

Capacity + 729.98%
Passengers + 881.92%

The increase in the capacity offered over the previous year was 72.7%, that is, from 93.486 million ATKms to 161.447 million ATKms. However, the traffic actually carried did not keep pace with the increase in capacity; the increase in the RTKms was only 41.2% from 54.241 million RTKms to 76.563 RTKms, resulting in the reduction of the overall load factor from 58.2% in 1959-60 to 47.3% in 1960-61. Incidentally, the passenger load factor in the two years was 56.8% and 50.1% respectively.

This remarkable progress has been achieved by :

- Latest equipment ;
- Technical know-how ; and
- Reputation for good service.

Air-India's policy has always been to purchase only the finest and the most suitable type of aircraft. The recent acquisition of four Boeing 707 Intercontinental Jets with two additional Boeing 707 Jets scheduled to be delivered in March—April 1962, shows that India is well ahead in the Jet Age.

The performance characteristics of the Boeing 707 Inter-continental were considered in great detail by Air-India before they were purchased. It is an aircraft with excellent high-speed handling. It possesses the ability to operate with efficiency over long inter-continental routes.

Technical Know-How

To help develop the requisite technical skills, an intensive jet training programme for Air-India pilots, flight engineers and ground personnel was drawn up with the help of technical experts from the Boeing Co. in the U. S. and from Rolls-Royce Co. in the U.K. Teams of flight crews and engineering personnel were sent to the U. S. and the U. K. for intensive training and certification for jet operations.

Simultaneously a long-term programme was drawn up for housing the giant jets centralising the various overhaul shops, training personnel, providing shops with test and overhaul equipment and supplying our far-flung stations with modern aircraft-handling equipment.

Air-India has also installed a Boeing 707 Simulator at Santa Cruz which cuts down training cost and the actual time required to check out a pilot by at least 40 percent and provide the best in familiarisation for the crews.

When considering the standards of service, it is important to remember that Air-India has to compete with the service offered by other airlines on international routes. Air-India therefore, must provide the very best of service to its passengers. A new Customer Service Section has been set up recently by Air-India to give better and more efficient service to passengers on ground and in flight. Foreign Chefs and catering staff have been employed to train Air-India staff.

Speed-reduction in actual travel time is not the only commodity the airlines sell. Travel time

includes convenient connection and departures coupled with high frequencies regularity and short "en route" stops.

The Tripartite Partnership Agreement which BOAC, Qantas and Air-India signed in Bombay on December 4, 1959, enables the three airlines to offer the travelling public an unrivalled airline service by co-ordinating their schedules and reservation systems. The airline network covered by the Agreement extends from Bombay eastward to Australia, Hong Kong and Japan and westward from Bombay to New York. Each airline will sell the services operated by the other.

Rs. 14.5 crores have been allocated for Air-India's projects under the Third Plan. Of this sum Rs. 13.5 crores are for additional planes and Rs. 1 crore for other projects like workshops, etc. To date, Rs. 141 lakhs have already been utilised in paying for the fourth Boeing and Rs. 8 crores are earmarked for the purchase of two additional Boeings. The balance available is thus just about Rs. 4 crores for the purchase of aircraft and Rs. 1 crore for workshops, equipment, etc.

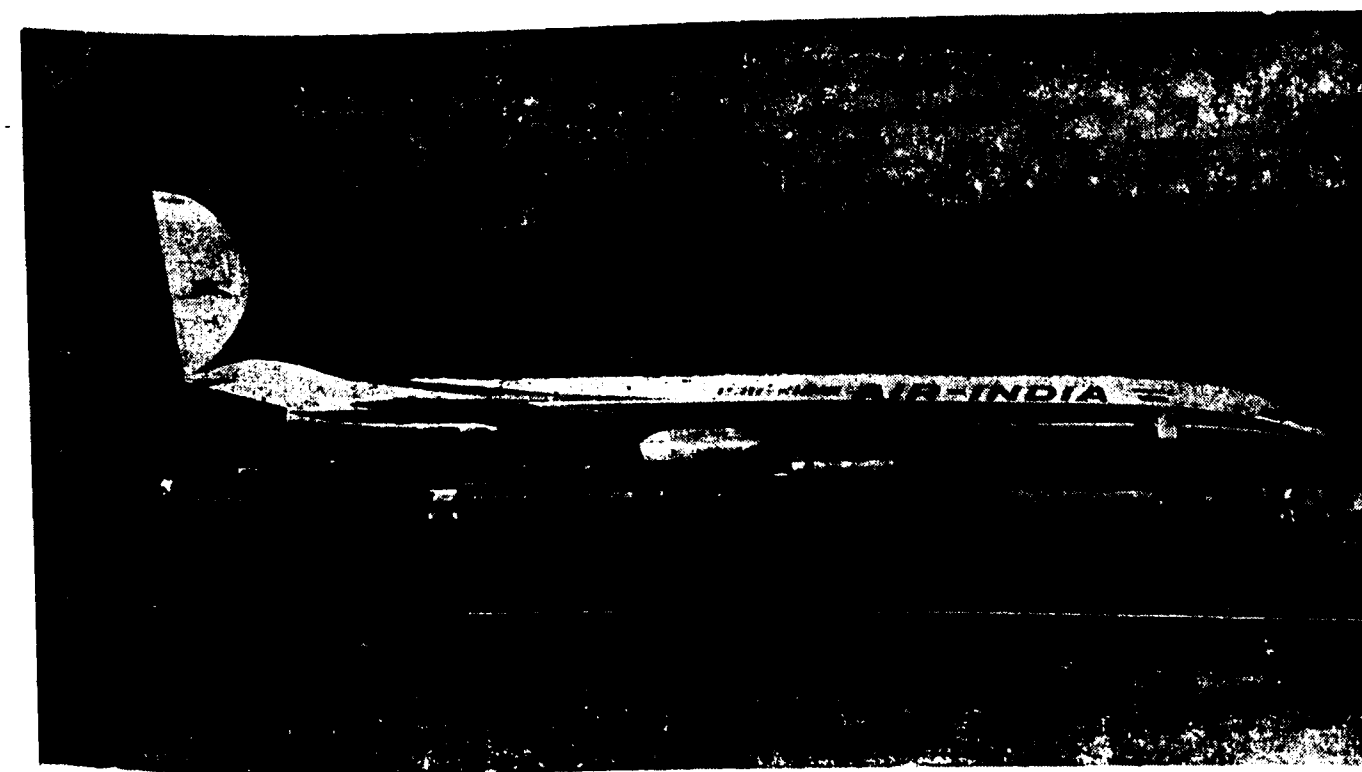
The interest paid on the Boeing loans is Rs. 39.28 lakhs. Largely in view of this liability until the Boeing loans are paid off in full, Air-India has been absolved from payment of interest on Government investment in the Corporation until October 1, 1966. This is a dispensation for which the Corporation is very grateful to the Government.

Our existing hangar accommodation will be inadequate when our two additional Boeings arrive. We have to build another Boeing hanger at a cost of Rs. 25 lakhs. We shall also have our own Jet Overhaul Shop and Test House at Santa Cruz costing approximately Rs. 50 lakhs. When completed in the latter part of 1962, the plant will be one of the finest of its kind in Asia.

We have achieved an average fleet utilisation of 9.05 hrs. per aircraft per day which compares favourably with other airlines. This step resulted in quicker life development of Rolls Royce Conway engines from 700 hours to 1,000 hours in a short span of one year. Currently, our Rolls Royce engines are going upto 1,800 hours experimentally, and we hope to increase the engine overhaul life to 2,000 hours and possibly to 2,500 hours by 1963. The reduction in expenditure on account of this improvement is obvious.

As regards fleet performance this is assessed normally by three yard-sticks, (a) average daily utilisation, (b) take-offs per day and (c) regularity expressed in terms of engine hours achieved per removal. The figures are as follows :—

	AI Boeing Fleet	Industry Average for Boeings
	1961-todate	1961-todate*
Average daily utilisation	9.53	8.51
Take offs per day	33.72	18.51



Engine hours achieved per engine removal - 1311 1115

* Industry average is an approximate index arrived at from date received from Boeing Operators' reports.

It will be noticed that the utilisation we have achieved compares favourably with the industry's average. Considering the size of our fleet and diversity of our routes, the utilisation achieved is nearing its optimum value.

What are our plans for the future? Next year we plan to operate daily flights to London and to New York (subject to Government approval), two flights a week to Nairobi and Tokyo and one flight a week to Moscow and Sydney. As Madras airport is unable to take a Boeing and the Djakarta airport can take the Boeing with very limited payloads, we are now planning to charter Comet capacity for the routes Bombay-Kuwait, Bombay-Singapore and Bombay-Djakarta.

These arrangements will cease when both Madras and Djakarta airports become fully operational for Boeing aircraft. These plans involve an increase in capacity of over 20 per cent and a fleet utilisation of nearly 3,450 hours per aircraft per annum for the six jets. This is a very substantial increase on our present operations.

The average distance travelled by an Air-India passenger increased from 2,831 st. miles in 1957-58 to 2,909 st. miles in 1960-61 showing an increase of 2.76 per cent. This increase was especially marked on the India-U.K. route, where the average distance travelled by a passenger increased from 3,135 st. miles in 1957-58 to 3,715 st. miles in 1960-61, showing an increase of 18.50 per cent.

When Air-India introduces seven Boeing fights a week on the India - U. K. route in May 1962, we shall be able to satisfy the demand for longhaul journeys. We estimate that there would be an increase of about 13 per cent in the traffic on all our routes taken together in the year 1963-64 over the previous year.

To cater to this traffic, we will have to go in for additional aircraft; certainly one more and probably two more during the Third Plan period.

Air Transport Crisis

Air transport cannot live by mileage alone. This year has been a particularly bad year for international operators. The Jets have brought in their trail capacity much in excess of what would normally be required. The expected normal rise in traffic forecast by economic pundits did not take place on account of the international situation, both political and economic. Therefore, we may emerge with no profit or even a small loss.

Some major airlines have already declared the possibility of heavy losses. While KLM and TWA have suffered losses this year, BOAC have announced that they might close the year with a loss of anything from Rs. 8 to Rs. 10 crores. In view of this, we have no reason to be unduly pessimistic about our own operations, even if we end the year with a small loss.

Coming events cast their shadows before. We cannot talk of air transport these days without resorting to supersonics. Chances where that the supersonic ship will make its debut somewhere around 1950.

The supersonics are going to be very expensive hardware, and they will arrive at a time when the world is already flooded with over-capacity. Their appearance in large numbers will make the subsonic almost obsolete. This would result in writing off of capital which the industry will not be able to bear. The indiscriminate buying of jets resulted in a situation where too many seats were chasing too few passengers.

The airlines must do some serious thinking before they decide to go in for the giant, faster-than-sound ships, because I feel that the economic health of air transport at the moment is not sound enough to bear another shock of over-capacity. A co-operative action in the matter of procurement is therefore, a "must." The IATA provides an obvious forum for this and the opportunity must not be missed.

But come what may, we in Air-India can take comfort in the thought that we shall be able to face the future with confidence and meet the challenge.

Planning in ECAFE Region

The object of this long article is to present factual data about planning organizations in the countries of the Ecafe region. It is given in the form of country notes which include brief information about the main planning organizations, their functions and, where possible, organizational charts showing the administrative structure. In view of incompleteness of the country data at the time of the writing, it has not been possible to include notes on all countries of the ECAFE region or to achieve uniform presentation in respect of the countries for which information has been given.

Afghanistan

The Ministry of Planning was founded in October 1956, shortly after the inauguration of the Five-Year Development Plan. The Ministry started functioning in March 1957 and is responsible for the formulation and revision of economic development plans, providing economic guide lines to be followed by the ministries and departments in preparing and implementing sector plans, following closely the implementation of the plans and keeping them under continuous review.

The Ministry consists of four departments: (i) The Department of Planning; (ii) The Department of Foreign Assistance; (iii) The Department of Statistics and Research; and (iv) The Department of Administration. The main functions of these departments are as follows:-

Planning

This department has the primary responsibility for the formulation and revision of development plans. For this purpose it is required to provide economic guide lines to be followed in the preparation of programmes and projects and criteria for the establishment of priorities. The department has the primary responsibility for co-ordinating the sector plans.

Foreign assistance

This department's main function is to co-ordinate all requests for foreign assistance.

Statistics and research

The chief work of this department is to develop background information on the economy of Afghanistan and other countries which is required for the formulation of development plans. Its duties include: (a) organization and co-ordination of statistical services; studies of national income, investment and balance of payments; and publication of statistical and economic material.

Administration

To carry on the administrative services required by the Ministry of Planning.

In addition to these departments, the Ministry has an Advisory Board consisting of Afghan and foreign experts appointed to serve as consultants to the Ministry. Its main function is to advise the Ministry on all matters submitted to it.

It is felt that some reorganization of the Ministry is called for in view of the Second Plan due to start in October 1961 which will require much more intensive effort than the first in its drafting and execution. Some proposals for reorganizing the Ministry with a view to streamlining its performance are under the consideration of the Government of Afghanistan.

Burma

The Constitution of the Union of Burma provides that "the economic life of the Union shall be planned" and accordingly some planning machinery has been in existence in Burma since 1946. This machinery has been changed and revised several times; the following description is based upon the reorganization carried out in 1958.

The Ministry of National Planning and the Economic and Social Board were amalgamated into a Prime Minister's Office for National Planning in February 1958. The Office was composed of a National Planning Commission and a service organization, the latter constituting a *de facto* ministry of the Prime Minister.

The Prime Minister's Office for National Planning performed the functions of a central planning authority and was the highest supervisory and co-ordinating body in the field of economic and technical development. It also tendered advice to the cabinet on broad issues of development policy.

The National Planning Commission mainly consisted of the Prime Minister (Chairman) Deputy Prime Minister and Ministers. Other members include

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the Parliamentary Secretary, Adviser to the Prime Minister, Chairman of the Union Bank of Burma and Executive Secretary to the Commission. The Commission was assisted by a Committee of Advisers whose functions were: (a) to process technical papers submitted to the Commission; (b) to make recommendations on matters appropriate to the Commission and to advise and assist the Commission generally in the discharge of its duties.

There was also a Standing Committee for supervision and co-ordination comprised of the Prime Minister's Secretaries for planning and the Council of Ministers, the Chairman of the Special Investigation Administration Board, Secretary of the Ministry of Finance and Revenue, Chairman of the State Agricultural Marketing Board and Adviser to the Prime Minister. The duties and functions of this Committee included (a) examination of administration, working and acquisition of the various Boards, Corporations and Councils in charge of implementation of the projects; (b) supervision of the implementation of the development projects and their co-ordination.

Another government committee which could be considered as part of the planning machinery was the Budget Committee whose main work was to do the budget examination work for the Minister of Finance.

Ceylon

A Seven-member Planning Committee of the Cabinet, with Prime Minister and Finance Minister as Chairman and Vice-Chairman respectively, was established early in 1953. By the end of the year, however, the Committee was dissolved and the entire Cabinet became the supreme planning body.

In 1956, the need for planning and a suitable organization for doing the planning work was keenly felt. Accordingly, the National Planning Council was constituted to prepare a plan in September 1956. The Council was composed of the Prime Minister, Finance Minister, senior government officials and representatives of the private sector. The Planning Secretariat was attached to the Council to assist it and carry on secretariat work. Since the preparation of the "Ten-Year Plan," the work of the Planning Council and its secretariat has mainly consisted of annually formulating three-year implementation programmes. This is done through appropriate implementation committees drawn from the Council, government departments and agencies concerned, as well as *ad hoc* represen-

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tation from the private sector. In addition, a "Planning Committee" has been set up in each Ministry with responsibility of formulating effective short-term programmes; these are on a rolling basis which will in effect be a substitute to Ceylon's present procedures for preparing budgets.

Towards the end of 1960, the Planning Secretariat was redesignated as the Department of National Planning. Also, in place of the National Planning Council, a sub-committee of the Cabinet has been set up to look after planning work. The Department of National Planning as such, however, is headed by the Prime Minister.

China (Mainland)

At the centre, the two main bodies concerned with planning are: The State Planning Commission and the State Economic Commission. The Planning Commission was set up in 1952 and by 1956 had developed into 23 departments with a staff of 1,500. The Economic Commission is in charge of preparing five-year plans while the annual plans are directed by the Economic Commission. There frequent exchanges of directives and constant efforts at co-ordination between the two. The data required by these two Commissions are supplied by the State Statistical Bureau which was established in October, 1952. The central government departments, bureaux and other agencies in charge of nationalized enterprises form a group which is concerned with planning at the central level and which works under the two commissions.

The planning organs at the central government level are assisted by regional and local organs in charge of planning in the 22 provinces, two too autonomous areas and several hundreds of municipalities. The planning bureau at the provincial level serves as the co-ordinating agency and presents the local plans to the central planning and economic commissions for evaluation and approval. All phases of planning in China, including preparation, consolidation and revision are carried out through this two-tier system: the central planning and economic commissions on one level, and the planning organs in the regional administration or the ministries on the other.

The procedure followed in preparing the plans may be briefly described as follows. The Chinese Communist Party and the People's Congress provide the guiding principles of planning, while the task of preparing the long-term and short-term plans in conformity with the guiding principles is performed by the State Planning Commission. For this the

Indian Industries

Commission obtains preliminary reports, estimates and data from the various agencies in charge of implementing the projects. These are considered in the light of varied data obtained from the Statistical Bureau; moreover, the Planning Commission passes "control figures" setting up the targets in various fields. These are passed on to the ministries, regional administrations and selected enterprises. The lower planning units draft their respective five-year plans taking into consideration the "control figures". Where necessary they present to the Commissioned requests, recommendations and proposals for revision. After examining these draft plans the State Planning Commission draws up formal plans for the respective units. The procedures followed in preparing the annual plans are much the same except that they are prepared in much more detail and that they are concerned with solving current specific problems.

China: Taiwan

The Economic Stabilization Board established in July 1953 and entrusted to map out economic and fiscal policies and to formulate an over-all economic development plan was dissolved in August 1958. Now the work of economic development planning is the responsibility of the Ministry of Economic Affairs and the Ministry of Communications. At present the planning work is mostly carried by the three committees described below:

Agricultural Planning and Co-ordination Committee

The membership of the committee consists of 11 to 15 persons drawn from various government departments and organizations the most significant of which is the Joint Commission on Rural Reconstruction which is primarily concerned with preparation of agricultural plans. All the members are appointed by the Ministry of Economic Affairs. The committee is mainly concerned with the formulation and supervision of agricultural plans.

Industrial Planning and Co-ordination Group

The policy-making body of the group is a council of members (13-17) drawn from various government departments including the council of US Aid and nominated by the Ministry of Economic Affairs. The main function of the Committee is to prepare industrial plans and to supervise them.

Transportation and Communication Group

The Group consists of 11-15 persons drawn from various government departments and nominated by the Ministry of Communications. This committee

is responsible for the formulation and supervision of the transport and communication plans.

These three groups are primarily responsible for the formulation of plans in their respective fields and the final co-ordination and preparation of the over-all plan is the responsibility of Ministry of Economic Affairs.

The Federation of Malaya

An "Economic Committee of the Cabinet" consisting of the Prime Minister (Chairman) Deputy Prime Minister and Ministers of finance, agriculture and co-operatives, and commerce and industry which is aided by the "Economic Secretariat" is in charge of planning in the Federation of Malaya. The Economic Secretariat is an integral part of the Prime Minister's Department.

At present the Economic Secretariat is small but, with increase in the volume of work consequent upon the adoption of the Second Five-Year Plan, the need for reorganization is keenly felt and some proposals are under the active consideration of the Cabinet. The final outcome of these deliberations is still uncertain but the current indications are that a separate organization might be established with the following functions :

- (i) To formulate and submit plans to the Economic Committee of the Cabinet.
- (ii) To co-ordinate the execution of the diverse components of the plan.
- (iii) To review and evaluate the progress of the plan.
- (iv) To advise the government on general economic problems.
- (v) To maintain all the economic intelligence necessary for the formulation and evaluation of the plan.
- (vi) To plan and co-ordinate schemes for technical assistance.

The planning organization may have four main divisions : The Planning and Investigation Division; (ii) The Economic Intelligence and Research Division; (iii) The Technical Assistance Division; and (iv) The Administrative and Common Services Division. It is expected that, as at present, the new planning organization will also be an integral part of the Prime Minister's Department.

Indian Industries

India

The Planning Commission was set up by the Government of India in March 1950. The function of the Planning Commission are to :

- (i) make an assessment of the material, capital and human resources of the country, including technical personnel, and to investigate the possibilities of augmenting such of these resources as are found to be deficient in relation to the nation's requirements ;
- (ii) formulate a Plan for the most effective and balanced utilisation of the country's resources ;
- (iii) define the stages in which the Plan should be carried out and propose the allocation of resources for the due completion of each stage ;
- (iv) indicate the factors which are tending to retard economic development, and determine the conditions which, in view of the current social and political situation, should be established for the successful execution of the Plan ;
- (v) determine the nature of the machinery which would be necessary for securing the successful implementation of each stage of the Plan in all its aspects ;
- (vi) appraise from time to time the progress achieved in the execution of each stage of the Plan and recommend the adjustments of policy and measures that such appraisal might show to be necessary and ;
- (vii) make such interim or ancillary recommendations as appear to it to be appropriate either for facilitating the discharge of the duties assigned to it ; or on a consideration of the prevailing economic conditions, current policies, measures and development programmes ; or on an examination of such specific problems as may be referred to at for advice by Central or State Governments.

Since its inception, the Prime Minister of India has been the Chairman of the Planning Commission. Members of the Commission include a Deputy Chairman who is now also the Minister for Planning and four full-time Members, and the Union Ministers of Finance and Defence. The Honorary Statistical Adviser to the Cabinet also serves *de facto* as a Member of the Planning Commission. The Minister of Planning is assisted in his work in Parliament by a Deputy Minister and a Parliamentary Secretary.

Indian Industries

The Members of the Commission work as a body; but, for convenience, each member has charge of one or more subjects and directs the study of problems in these fields.

The Planning Commission works in the closest co-operation with the Central Ministries and the Government of States. Responsibility for taking and implementing decisions rests with the Central and State Governments, the Planning Commission Serving as an advisory body to both. Co-ordination with States is secured at the highest level through the National Development Council. The functions of the Council are (1) to review the working of the National plan from time to time; (2) to consider important questions of social and economic policy affecting national development; and (3) recommend measures for the achievements of the aims and targets set out in the National Plan, including measures to secure the active participation and co-operation of the people, improve the efficiency of the administrative services, ensure the fullest development of the less advanced regions and sections of the community, and, through sacrifice borne equally by all citizens, build up resources for national development.

The National Development Council is composed of the Prime Minister of India, the Chief Ministers of all States and the Members of the Planning Commission; Ministers of the Central Government also participate in its deliberations. The Council makes its recommendations to the Central and State Governments who take such decisions as may be necessary.

Iran

In 1949 Iran created an organization to administer the operation of the First Seven-Year Plan. The organization was in charge of the execution of the Plan and was more like a huge public works department. It was reconstituted at the beginning of the Second Seven-Year Plan and now consists of: (a) The Managing Director; (b) The High Council; and (c) The Control Board.

The Managing Director is appointed for a period of three years and his duties are (i) to prepare the administrative budget and to set up the organization of the Plan Organization; (ii) to formulate plans and to disburse expenditures connected with the executive operations; (iii) to assist private institutions; (iv) to draw up laws and regulations relating to the technical and fiscal controls for the execution of programmes; (v) to compile quarterly and annual progress reports; and (vi) to represent the Plan Organization before the Council of Ministers.

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The High Council consists of seven members appointed for the full term of the plan. The duties of the High Council include the approval of plans, projects, cost estimates and the executive regulations of the programmes approved by the Joint Committee of both the Houses. The Council is also charged with the approval of regulations, by-laws and contracts and with the supervision of all the functions of the Plan Organization.

The Control Board consists of six members, its main functions are; (i) to control the expenditure of the Plan Organization in accordance with the provisions of the law; (ii) to express its views with respect to by-laws and regulations from the viewpoint of their compliance with laws and regulations; (iii) to inform the Managing Director of any violations or irregularities noticed by it and even to report on them to the Government and the Joint Plan Committee of both houses where necessary.

The set-up of the present Plan Organization is expected to undergo some changes at the time of launching the Third Seven-Year Plan. The major change may be the transfer of executive functions now assumed by the Plan Organization to the executive departments of the Government. But the Organization may retain the present functions of formulating plans, reviewing progress and disbursement of funds for the various projects.

Nepal

The planning machinery in Nepal was first created in October 1949, and has undergone several changes. The National Economic Planning Committee established in October 1949 was dissolved after a few months of its inception and no planning organization was in existence till the end of 1953 when a separate Ministry of Planning and Development was set up. The Ministry was to bring together the separate schemes undertaken by the various government departments and thus to expedite a co-ordinated execution of various development projects. In March 1957, a Planning Commission was set up but was dissolved in 1959 and in its place a high power Planning Board was formed. The Board was also abolished in February 1961 and its place has now been taken by the National Planning Council. It is vested with high powers and its decisions are equivalent to those of the Council of Ministers. The King who is the Chairman of the Council of Ministers also heads the National Planning Council. The chief functions of the Council are:

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- (a) to decide a policy of economic development on the basis of the general economic policy keeping in view the country's immediate needs;
- (b) to frame practical development plans to raise the standard of living of the people;
- (c) to give final approval to the proposed projects;
- (d) to expedite the successful execution of the plan;
- (e) to evaluate the plan and its progress; and
- (f) to finalize the annual budget and make allocations of the country's resources and foreign aid.

Pakistan

In 1953, the Government of Pakistan established a Planning Board to prepare a five-year plan of economic and social development. After the preparation and submission of the plan, a permanent Planning Board was established in 1957 and it was redesignated as the National Planning Board in July 1958. Later, in June 1959, it was redesignated as the Planning Commission. The Functions of the Planning Commission are:

- (i) In consultation with the Central and Provincial Governments and other appropriate agencies:
 - (a) to prepare a national plan at periodic intervals for the economic and social development of the country;
 - (b) to make assessments from time to time of the human and material resources of the country;
 - (c) to prepare an annual development programme within the framework of the national plan and, on a determination of priorities, to propose the allocation of resources,
- (ii) To stimulate and where necessary initiate the preparation of development programmes and projects; to examine and advise on all such programmes and projects with a view to deciding whether these conform to national objectives and, in general whether these contemplate the most efficient use of national resources.
- (iii) To recommend such adjustments in the national plan as may be necessary in view of the changing economic situation.

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- (iv) To co-ordinate the examination of development programmes projects in consultation with the appropriate authorities and to secure the approval of the Central Government to acceptable programmes and projects.
- (v) To advise on the nature of the machinery for securing the efficient execution of the national plan.
- (vi) To watch and evaluate the progress of implementation of the development programme.
- (vii) To advise on important economic policies and problems in various fields.
- (viii) To undertake and promote economic research; and to initiate surveys and investigations needed to support effective planning and development.
- (ix) To examine such specific problems as may be referred to it by the Government.

In addition to the Planning Commission, there is an Economic Council with President as Chairman which functions as the the supreme economic body of the country. Besides the Chairman, there are seven members and four co-opted members of the Council. The functions of the Council are:

- (i) to review the over-all economic position of the country and to formulate economic policies;
- (ii) to approve the Five-Year Plan and the Annual Development Programme;
- (iii) to sanction development schemes including those falling under the Five-Year Plan and the Annual Development Programme; and
- (iv) to review the progress made in the implementation of the plans and programmes mentioned above and to ensure that balanced economic development of all parts of the country is achieved.

There is also an Economic Committee of the Cabinet with the Minister of Finance as the Chairman and with the Ministers for Food and Agriculture, Fuel, Power, and Natural Resources, Industries and Commerce together with the Chairman of the Planning Commission as members. The functions of the Committee are:-

- (i) to supervise the implementation of
 - (a) the economic policies laid down by the Cabinet and the Economic Council, and

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The Philippines

- (b) All plans and programmes, including the Five-Year Plan and the Annual Development Programmes;
- (ii) to take day to day decisions on economic problems; and
- (iii) to sanction development schemes pending their submission to the Economic Council.

The Philippines is committed to a positive programme of economic and social development under its constitution which stipulates that "the promotion of social justice to insure the well-being and economic security of all the people should be the concern of the State." Accordingly, a National Economic Council was created as early as 1935. Twenty years later this Council was abolished and in its place a new National Economic Council was created, with the specific function, among others, of formulating "definite and consistent national economic policies and [to] prepare comprehensive economic and social development programmes." The Council establishes and maintains an Office of National Planning, an Office of Foreign Aid Co-ordination and an Office of Statistical Co-ordination and Standards. The Office of the National Planning provides the main technical assistance to the Council in the preparation of national plans. Its main functions are:

- (a) To assist the Council in preparing and keeping current a national plan for economic and social development.
- (b) To report to the Council on implementation of action recommendations included in the national plan.
- (c) To make continuing studies of the tariff structure and commercial relationships of the Philippines with other countries and to recommend changes if needed.
- (d) To prepare national economic policy recommendations on matters referred to the Council for advice.

The National Economic Council consists of 10 members plus a full-time chairman with cabinet rank. The Chairman and three members drawn from agricultural, industrial, financial, commercial and labour interests are appointed by the President. The rest of the members are ex-officio and are as follows: the Chairman of the National Develop-

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ment Authority as Vice-Chairman; two members designated by the Speaker of the House of Representatives from among the members of House; two members of the Senate designated by the President; the Governor of the Central Bank; and the Chairman of the Rehabilitation Finance Corporation.

Singapore

The Government of Singapore established an Economic Development Division in 1959. This division, located in the Ministry of Finance, is mainly concerned with the planning work and has all the necessary advisory, co-ordinating and executive functions. Besides this Division, the Development Planning Committee and the Development Planning Sub-committee are also concerned with the co-ordination work. The Development Planning Committee is headed by the Minister of Finance and the Sub-committee by the Director of Public Works. A Sub-committee of the Cabinet consisting of Prime Minister, Deputy Prime Minister and the Minister of Finance, is in over-all charge of the economic and planning work.

The organization of the Economic Development Division which is the chief planning agency is still in the process of evaluation now.

Thailand

The National Economic Development Board which is the principal planning agency in Thailand was established in 1959 by a special Act. The Board consists of the Prime Minister (Chairman), the Deputy Prime Minister (Deputy Chairman) and other members appointed by the Council of Ministers with the Secretary-General as ex-officio member and secretary. The Secretariat attached to the Board has been assigned the following functions:

- (1) to analyse and appraise economic conditions and recommend to the Board goals for economic development and policies conducive to economic stability and economic development;
- (2) to consider with Ministries, Departments and State enterprises their plans and programmes for economic development and to co-ordinate such plans and programmes for the purpose of formulating an integrated plan for a period of years in accordance with development goals, availability and priority use of resources; and thereafter to submit it to the Board;
- (3) to study the actual and potential availability of financial and other resources and to make recommendations to the Board on ways and means of meeting public financial requirements;
- (4) to prepare, in consultation with those of the Government's ministries and departments which have responsibilities regarding the National budget, proposals of Ministries,

Departments and State Enterprises for the annual development expenditures on new capital assets, including sums to be expended for this purpose from the National Budget, from loans, from accumulated profits, or other funds ;

- (5) to review actual and proposed expenditures for maintaining capital assets related to economic development for the purpose of recommending any necessary modification for the efficient maintenance of such assets ;
- (6) to review actual and proposed expenditures for the provision of economic services, for the purpose of recommending any modification that is deemed necessary ;
- (7) to consider all proposals for foreign technical and financial aids and loans ; to consider additional requests for, and make recommendations on programmes for the request of, foreign aid and loans and, in co-operation with Ministries, Departments and State Enterprises, to undertake necessary measures for co-ordinating foreign assistance ; moreover, in making such requests for foreign aid, the Secretariat of the National Development Board may originate such additional aid proposals as may be deemed necessary ;
- (8) to review and report of the status of economic development projects of Ministries, Departments and State Enterprises, and where considered necessary, make recommendations for the acceleration, termination, modification, or liquidation of specific programmes ;
- (9) to consider other measures for promoting economic development and recommend them to the Board ;
- (10) to consider and make proposals with respect to the economic development plans and programmes of any company or juristic partnership which not being a state enterprise but being partially owned by the Government, agrees to carry out the economic development programmes as a state enterprise ;
- (11) to undertake whatever is specified in the other laws to be the duties of the National Economic Development Board or the Secretariat.

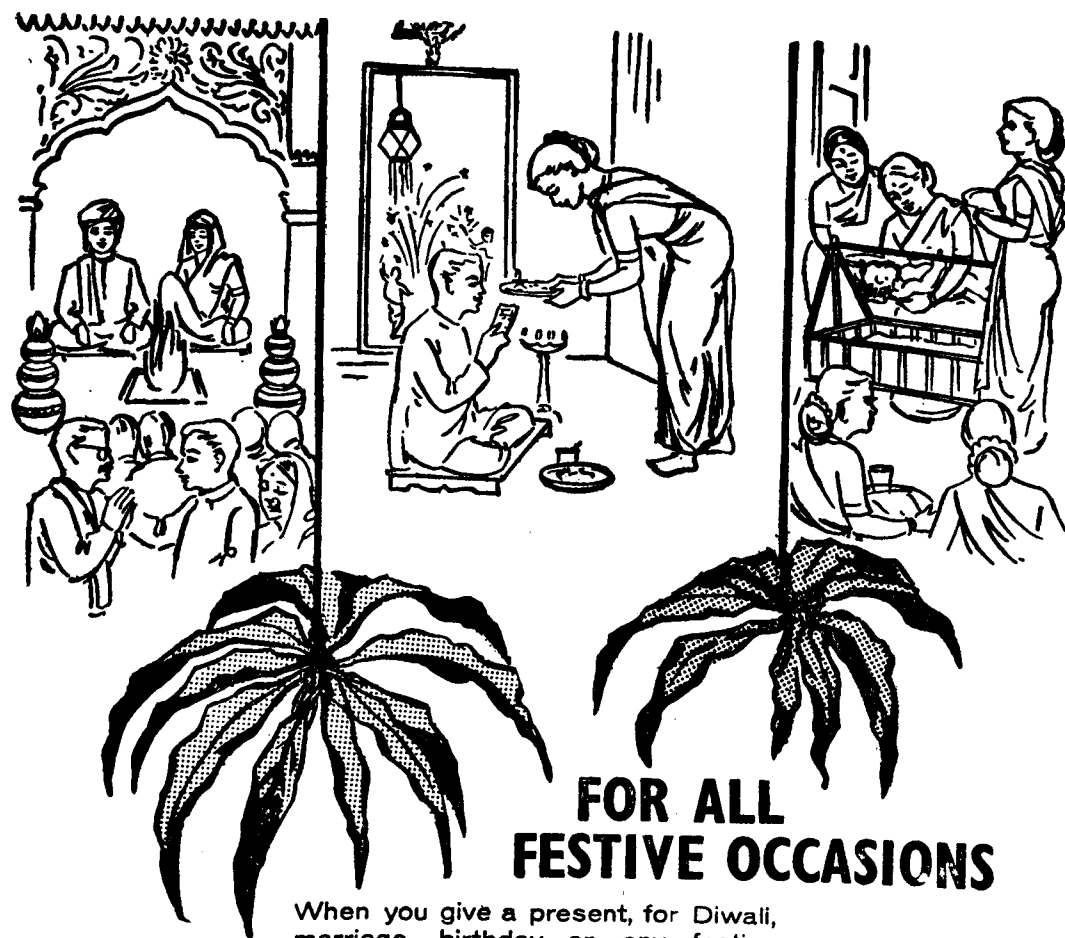
An Executive Committee comprising the Secretary-General and nine members appointed by the Council of Ministers has also been set up. The chief function of the Committee is to supervise the work of the Secretariat of the National Economic Board.

Indian Industries

DEVELOPMENT PLANS OF THE COUNTRIES OF THE ECAFE REGION

Country	Title of Plan	Period
Afghanistan	Five-Year Plan	1956/57-1960/61
Brunei	Five-Year Plan	1957-1961
Burma	Four-Year Plan	1952/53-1955/56
	Four-Year Implementation Programme	1956/57-1959/60
	Second-Four Year Plan	1961/62-1964/65
Cambodia	Premier Plan Quinquennal	1960-1964
Ceylon	Ten-Year Plan	1959-1968
China : mainland	First Five-Year Plan	1953-1957
	Second Five-Year Plan	1958-1962
Taiwan	First Four-Year Plan	1953-1956
	Second Four-Year Plan	1957-1960
	Third Four-Year Plan	1961-1964
Federation of Malaya	Five-Year Capital Plan	1956-1960
	Second Five-Year Plan	1961-1965
India	First Five-Year Plan	1951/52-1955/56
	Second Five-Year Plan	1956/57-1960/61
	Third Five-Year Plan	1961/62-1965/66
Indonesia	Five-Year Plan	1956-1960
	First National Development Plan	1961-1969
Iran	First Seven-Year Development Plan	1948/49-1954/55
	Second Seven-Year Development Plan	1955/56-1961/62
Japan	New Long-range Economic Plan	1961/62-1970/71
Laos	Plan de developement Economique et Social	1959/60-1963/64
Nepal	Five-Year Plan	1956/57-1960/61
North Borneo	Four-Year Plan	1957-1960
Pakistan	Six-Year Development Programme	1951-1956
	First Five-Year Plan	1955/56-1959/60
	Second Five-Year Plan	1960/61-1964/65
Philippines	Three-Year Programme of Economic and Social Development	1959/60-1961/62
Sarawak	Development Plan	1959-1963
Singapore	Four-Year Plan	1961-1964
Thailand	Economic Development Programme	1961-1966
Viet-Nam, Republic of	Project de Plan Quinquennal	1957-1961

Indian Industries



FOR ALL FESTIVE OCCASIONS

When you give a present, for Diwali, marriage, birthday or any festive occasion, let it be Post Office Savings Gift Coupons. It is a gift that grows, a gift that will be remembered for a long time.

These coupons can be obtained from post offices in denominations of Rs. 5/-, 10/-, 50/-, 100/- and 1,000/- and are to be exchanged later for 12-Year National Plan Savings Certificates.

Prize Bonds also can be given as gifts.



**SMALL SAVINGS
MAKE HAPPY OCCASIONS
HAPPIER**

Directorate of Small Savings, Government of Maharashtra, Sachivalaya, Bombay-32

A New chapter in industrialisation!

The inauguration of the AVB workshops by Dr. B.C. Roy on February 6 marked the opening of a chapter in industrialisation.

Construction of this modern major industrial plant and housing colony on a 700-acre site has been completed in only two years—a truly remarkable achievement and in itself an outstanding example of industry and planning. AVB, equipped with some of the most up-to-date machine tools in the world, will be one of the largest engineering units in Asia.

An outstanding example of international collaboration, AVB brings to India the varied and extensive knowledge of three leaders in industry—The Associated Cement Companies Ltd., Vickers Ltd. and Babcock & Wilcox, Ltd. These famous enterprises have joined together in establishing in the industrial part of the country a large and modern heavy engineering works to tailor-make cement-making machinery, steam-raising plant, pressure boiler plants and heavy equipment for mining and other industries.

Of tremendous importance to the country, the inauguration of AVB reflects the confidence of the industrial nations of the West in the industrial future of India.

The Associated Cement Cos., Ltd.

ACC are pioneers in India in the manufacture of cement and cement-making machinery. Today, ACC has sixteen cement works spread all over the sub-continent. In addition ACC operates collieries at Nowrozabad and Kotma in Madhya Pradesh, a Refractory Factory at Katni in Madhya Pradesh and Heavy Engineering Works at Shahabad in Mysore.

Vickers Ltd.

Vickers are internationally famous builders of ships, aircraft and heavy industrial and mining machinery. The Vickers group have built many famous ships, ocean liners, giant tankers and naval vessels of every type. Over 400 Vickers Viscounts turbine engined airliners are in service in all six continents. Vickers are acknowledged specialists in the manufacture of heavy machinery for the cement-making and mining industries.

AVB Inauguration

Babcock & Wilcox, Ltd.

The fundamental business of Babcock & Wilcox is heavy mechanical engineering. Their product range includes the largest of nuclear power plant, conventional boilers for power generation and boilers of all kinds and capacities for industrial heating and processing, marine boilers, welded and pressure vessels.

Power and potential of AVB

The real power and potential of AVB lies not only in the vast technical knowledge and experience at its disposal, but also in the up-to-date equipment and machine tools installed in its workshops.

The manufacture of AVB products will be carried out in four 700' long forge workshops, two 400' long machine shops and one 200' long forge shop, all designed on the most modern lines. Built into their structure are 13 electric overhead travelling cranes, the biggest of which have a lifting capacity of 70 tons each. The shops have been designed to allow for progressive expansion in the future, so that it will be possible to lift single pieces weighing about 200 tons in the heavy fabrication bay without necessitating any structural alterations. The works comprise a structural plating shop, a tube shop, two vessel shops, an X-ray bay, a test room, a stores building and the works offices.

Modern Machine Tools

Among the modern machine tools is a 3000-ton vertical hydraulic plate-bending machine, capable of bending 5-inch thick steel plates employed in the manufacture of high pressure boiler drums, atomic heat exchangers, and pressure vessels required for the Fertiliser, Chemical and Oil Refining Industries. This equipment will make it possible to manufacture steam-raising equipment in the high pressure range for the first time in India.

The many boring, milling and turning machines include a 22 ft. vertical borer, which is one of the largest of its kind in India. Among the pressing equipment are a 1000-ton heavy duty dishing and flanging press and an 800-ton plate edge curving press.

Fusion Welding

Considerable welding equipment, including automatic welding equipment of the latest type,

has been installed so that the most modern fusion welding technique for steel may be employed in the manufacture of AVB's products.

Cement-Making Machinery

Through the manufacture of cement-making machinery equal to the world's best, AVB will help increase the production of cement for which Government of India have set a target of 15 million tons per year by the end of Third Five Year Plan. Orders have already been received for cement-making machinery which will be manufactured by AVB according to the designs developed by ACC and Vickers, whereas specialised items will be manufactured according to the design of the Fuller Company of America.

Industrial Steam-raising Plant

The scope of AVB's contribution through the manufacture of steam-raising plant for Thermal power stations and industry is likely to be very substantial; for it must be remembered that power is the basic need of an industrial nation.

To ensure that industrial steam-raising plants give optimum performance, it is necessary to 'tailor-make' them to suit varying local conditions and the type of fuel to be employed and, in certain cases, to make supplementary use of waste product as fuel. This calls for vast experience, careful analysis and the employment of special designs to obtain the maximum economy and performance, as well as excellent manufacturing facilities.

AVB offers all these to world standards. The industrialist can rely on AVB to supply a fully integrated installation comprising the steam-raising plant itself and a wide range of equipment from the fuel handling and preparation plant to the dust handling and ash disposal plant. He can also be confident of obtaining the finest after-sales service.

Thermal Power Plant

Under the Third Five Year Plan, the installed power generation capacity in the country is proposed to be stepped up from 5.8 million KW to 12.8 million KW. A substantial portion of this additional power is proposed to be obtained by installing thermal plant for which Government have set a target of Rs. 35 crores of equipment per year by 1966.

Indian Industries



6" Spindle ram-type horizontal milling and boring machine

In this field also AVB can draw on the vast technical knowledge of the U.K. partners and the manufacturing resources available in its own shops to supply the finest equipment.

First Major Orders for Thermal Power Plants

AVB has already received its first orders—a major installation to increase the power output from the Maharashtra State Electricity Board. Four Babcock Radiant type boilers fired by automatic spreader-stokers will be installed at the Khaperkheda Power Station, 15 miles from Nagpur. These Boilers, which will cost over Rs. 2 crores, will double the power output of the Khaperkheda Station. An order for a similar type boiler has also been received

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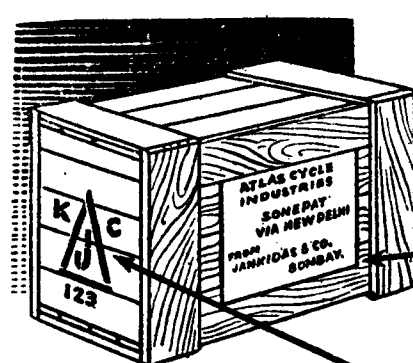
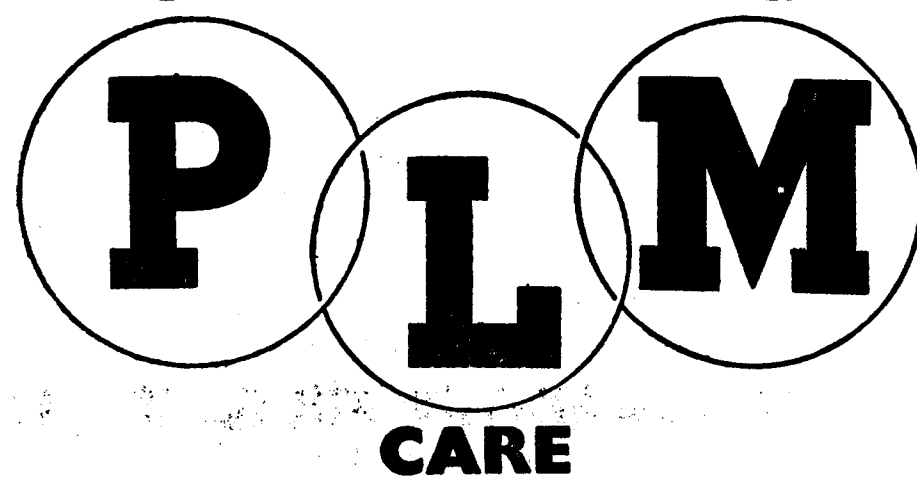
from Korba, Madhya Pradesh, for augmenting the capacity of the Korba Power Station. The value of this order is Rs. 50 lakhs.

AVB also expects to secure an order for 8 nos. 60 M.W. high pressure boilers and the value of this order will be approximately Rs. 12 crores.

Indeed, the importance of AVB to the country is tremendous and far-reaching. By providing in India the world's finest facilities for the manufacture of machinery for cement-making, mining and industrial steam raising, AVB will make possible the expansion of several Indian industries right through the years to come...starting from today!

**

GIVE YOUR WARE



PACK

your goods securely in strong cases, bags or containers, following special packing conditions when prescribed.

LABEL

your packages clearly by affixing fresh labels, containing full address of the Consignee — remove all old labels and their traces.

DON'T FORGET

A little 'PLM' care will go a long way to save you unnecessary worry and expense.



MARK

your packages correctly and clearly in bold letters with consignee's full address and destination station and with your private identification marks. Obliterate all old marks to avoid mis-despatch of your goods to a wrong destination.

WESTERN RAILWAY

India - Largest Overseas Exhibitor at 1962 Leipzig Spring Fair

The 1962 Leipzig Spring Fair, due to take place from March 4 to March 13, 1962, will again comprise the big Technical Fair and the Sample Fair of consumer goods and durables. Covering a stand space of some 300,000 sq. metres, exhibitors from some 50 countries will be showing a rich assortment of goods. Exhibits are on display not only in the 25 branches of the consumer goods industry and the 30 branches of the industries manufacturing means of production, but also in the numerous collective exhibitions put on by foreign countries, which are intended to give visitors an insight into the economy of the country concerned.

The Republic of India has been participating in the Leipzig Fairs with a collective exhibition since 1956. The coming Spring Fair will see another official Indian collective exhibition on a floor space of more than 1,000 sq. metres, which is sponsored by the Ministry of Trade and Industry in New Delhi. Alongside various state organisations, an appearance in the collective show will be made by private Indian firms as well. Whereas this show in the last few years was chiefly made up of typical indigenous products such as tea, spices, products of arts and crafts and diverse textiles, today considerable space within this collective display is also taken up by Technical items, such as batteries, small tools and electric motors. At the 1961 Leipzig Autumn Fair the German Democratic Republic was the first European country that concluded a contract with an Indian Exhibitor on the delivery to the G. D. R. of motor car batteries.

At the 1962 Leipzig Spring Fair the products of India, however, will not only be offered in the collective exhibition, but also within the various trade groups of the light industry. Thus, for example individual firms from India have for a number of fairs been among exhibitors in the lines of "Foodstuffs", "Textiles and Clothing" and "Arts and Crafts" accommodated in the Fair Buildings in the City centre, where the specialist buyer will find the products of the given branch of Industry in a concentrated offer. The 1962 Leipzig Spring Fair, which will be attended by some 9,000 exhibitors, offers visitors from all over the world staying in Leipzig a wide range of opportunities for concluding import deals, and will again have a considerable share in promoting East-West trade.

Institute of Indian Foundrymen: Southern Regional Branch

Prof. M. S. Thacker, Director-General of Scientific and Industrial Research, inaugurated the Southern Regional Branch of the Institute of Indian Foundrymen at Madras at Rajaji Hall on Sunday the 24th December 1961 at 11.45 a. m. Sri R. Venkataraman, Minister for Industries, Government of Madras, presided.

The Institute of Indian Foundrymen is a premier professional body of Foundrymen in India, affiliated to the International Committee of Foundry Technical Associations. Ever since its inception, the Institute has been playing a dynamic role in promoting the development of Foundry Industry in India by disseminating scientific and technological information through publications and by holding annual conventions every year, instituting merit certificates for outstanding work and contribution in different fields of foundry technology, through active collaboration with scientific institutions in India and abroad. Last year the Western Regional Branch of the Institute was inaugurated in Bombay by Hon'ble Shri Y. B. Chavan, Chief Minister for Maharashtra, and this year the Institute has come forward to open a Branch for the Foundryman in the Southern States. There are at present more than 2000 Foundries in India and with development of basic and heavy Engineering Industries under the stimulus of the five year plans, a new horizon has opened for the cast metal industry. During the last decade there has been a distinct change in the pattern of development of Foundry Industry in India as new Foundry Unit with better planned layout has been set up for the production of quality castings to meet the increasing demand of Automotive and other Engineering Industries. There is also a powerful trend towards mechanisation and modernisation. During the third plan an additional capacity to the extent of 139,000 tons in Grey Iron

castings and 76,000 tons in Steel castings is expected to be created in the Public Sector.

The Foundry Industry in the Southern Region is coming up very fast and Madras has become one of the seats of the Automobile Industry. Bangalore has become the centre of the Aircraft Industry and Machine Tool Industry. Coimbatore has the distinction of being one of the important Industrial Centres of the State, manufacturing diverse range of castings for Textile Industry, Machine Tools, Electric Motors, Pumps and recently Switches and Starters. It is understood that the production of Centrifugal Pumps in Coimbatore alone accounts for nearly 45% of the all India production and Electric Motors account for 30% of the National Production. Many small units have sprung up during recent years as ancillary Units of Bigger Units supplying rough castings. At present there are nearly 100 Foundries in and around Coimbatore. It is a happy augury that the Institute of Indian Foundrymen is opening a Southern Regional Branch at Madras to provide a technical forum for the Foundrymen in the Southern Region to exchange technical information and discuss problems of common interest.

The inauguration was attended by the Foundrymen in the Southern States as well as Scientists, Technologists and Educationists. Prof. M. S. Thacker, Director-General of Scientific and Industrial Research, Sir. J. J. Ghandy, Director-in-charge, The Tata Iron & Steel Co. Ltd. and Mr. S. Moolgaokar, Managing Director, The Tata Engineering & Locomotive Co. Ltd., Jamshedpur, are the distinguished patrons of the Institute. Dr. B. R. Nijhawan, Director, National Metallurgical Laboratory, is the President of the Institute and Sri. J. V. P. Rao, Director & General Manager, M/s. Addison & Co. Ltd., Madras, is the Chairman of the Southern Regional Centre.

Indian Industries

India's first ever Watch Project came into being at Bangalore on January 28 last year.

Situated on a 330 acres land acquired by HMT from the Mysore Government, this Watch Plant will function under the management of Hindustan Machine Tools. The main reason for associating the Watch Plant with HMT is the largest concentration of skilled man-power and management that HMT today has in comparison with other industries in the country. Tool Room facilities, and skilled workmanship with high degree of precision of HMT will enable the Watch Factory to have a quicker start than otherwise.

Brief Background

The Government of India entered into technical collaboration agreement with the leading Japanese firm, Messrs. Citizen Watch Co., Ltd., for the manufacture of wrist watches in India, and the task of implementation of this project was assigned to HMT.

In July-August 1960, an Indian delegation led by Mr. M. K. Mathulla, Managing Director of HMT visited Japan and finalised in consultation with Messrs. Citizen, details in regard to implementation of this Project.

This Rs. 2.5 crores project envisages the establishment of a Watch Plant with a capacity of 3,60,000 watches per annum in multiple shift. The watches to be produced in the first instance are of two types, (1) Gents', and (2) Ladies'-both models incorporating latest improvements and fashions in watch manufacture. The selling price of watches though not finally fixed, is below Rs. 100/-a piece.

The layout of the factory buildings has been completed, and recruitment of suitable Indian Technicians for training is currently going on. According to plans, about 100 technicians will be trained in Japan for a period of about 1½ years. The first batch of 52 Indian Technicians are already in Japan undergoing training.

Construction of the factory building with power and water supply connections etc., is already taken on hand. It is expected that the actual production would start by the end of 1962.

Phased Programme

The programme of manufacture has been phased so that the indigenous contents of the watches manufactured in HMT would rise from 54 per cent in the first year to 60 per cent in the second year, 72 in the third year and 84 in the

HMT Watch Project

Indian Industries

and administration are some of the difficulties that the industry is confronted with. The various authorities in the Government have been approached regularly and periodically by the industry and the earlier the Government takes a realistic stock of the situation, the better the industry would be prepared to fulfil the Third Plan targets.

Add to these difficulties the very high rate of development rebate and depreciation, which have to be statutorily provided for by this Company, and some idea of its handicaps can be gathered.

Expansion

To face the situation adequately, the management has taken a decision to expand the present capacity of the Mills to about 150 tons a day in the near future. Active negotiations are afoot with the

Government of India so that foreign exchange requirements of the expansion could be obtained from DLF or other American finance institutions to enable the expansion programme to be undertaken at an early date.

A feasibility survey looking closely into the technical and economic aspect of expansion was recently completed by the internationally reputed company, namely, Messrs. Sandwell International of Canada. They have recommended in no uncertain terms the expansion proposed to be undertaken and it is hoped that the programme will go through in such a manner that the increased output will be available by the end of 1964. That will put West Coast on a more sound basis, chiefly due to a lower cost of production and diversification of its products.



Pilot

The Japanese genius has a wonderful way of bringing the best things in this world within the reach of the masses. A wide range of ultra-modern precision cameras, cute looking miniature transistor radio sets, tape recorders that can slip into the coat pocket, and fine fountain pens—the Japanese technical wizardry has made them available at a price not beyond the means of a large majority of the buying public.

The Pilot Pen, Ink and other writing materials manufactured by The Pilot Pen Company, Tokyo belong to this unique group, providing all the writing comforts of a luxury brand at a moderate price.

In India where literacy and education are spreading at a swift pace PILOT is just the sort of pen ideally suited for use by the millions yearning to express in writing the surge of their intellectual awakening.

Keenly aware of the need, Mr. P. A. Sanjeevi formed The Pilot Pen Company Limited in 1952 to manufacture the world famous Pilot Pen and ink in association with The Pilot Pen Company, Tokyo, Japan. The collaborators had over fifty years experience in the pen-making field, making pens, inks, propelling pencils and other writing materials.

Modern factory

The Japanese Company have provided the necessary technical experts and equipment for the modern Pilot factory in Polal near Red Hills in Madras. It is the only pen factory in India which has been manufacturing all the component parts of the fountain pen from the very inception.

Some of the raw materials including the special iridium alloy which the Japanese use for their nib points are imported, and the parts are all made identical to the prototypes.

Quality testing

The technical processes connected with the manufacture are the same as adopted in Japan. The manufactured parts are tested for perfection at every stage of production by a Technical Expert from the Japanese Company to ensure that they conform to the standards prescribed by them.

The inks too are strictly tested before release in the market; a special chemical added to the ink prevents sedimentation and preserves the clear, liquid quality of the ink.

In the coming years

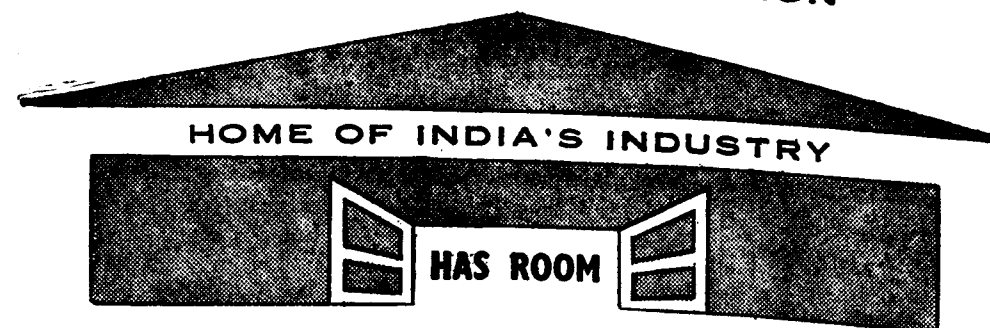
For want of certain special equipment, it has not been possible to manufacture till now all the models which the Japanese Company is making. But now that they are received, it will be the endeavour of the Company to put on the market in a short time all the models which The Pilot Pen Company of Tokyo is manufacturing.

The Pilot products manufactured in India have made such appreciable strides in the past few years that in addition to catering for the vast Indian market the Company is seriously considering plans for export. No doubt in view of the excellent quality of Pilot products, they will be received favourably in the markets abroad.

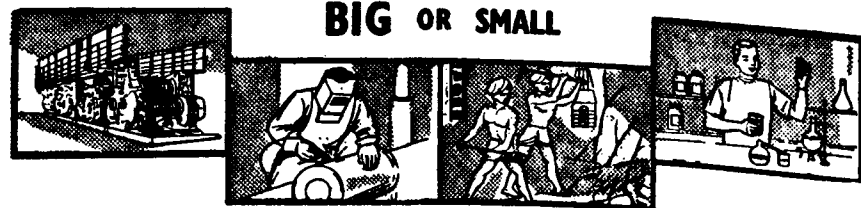
Invitation to Industry

MAHARASHTRA

HUB OF THE INDIAN UNION



FOR ALL INDUSTRIES
BIG OR SMALL



THAT WILL CONTRIBUTE TO THE NATION'S WEALTH
AND THE NATION'S STRENGTH

*Industrialise Maharashtra and India —
and make the nation strong and prosperous*

DIRECTOR OF PUBLICITY, GOVERNMENT OF MAHARASHTRA, BOMBAY

Look—No Poles

A gleaming white 35,000-cubic foot airhouse was used to house the display by British Nylon Spinners Ltd. at the Indian Industries Fair at Delhi in November.

Looking rather like a vast igloo, the airhouse consists of a waterproof skin of tough but lightweight PVC-coated nylon fabric which is held up solely by air blown in by powerful fan units. There are no poles or guy ropes.

Measuring 70 ft. by 40 ft. by 20 ft., the airhouse is easy to handle and can readily be moved from site. Bigger versions can also be produced. Uses include temporary warehousing, portable canteens and offices, emergency hospitals and so on. In Britain a house has been built beneath one and another is in use as a 500 seat theatre.

Altogether about a hundred different industrial uses for nylon were shown at the Delhi Fair by British Nylon Spinners Ltd. who are the largest producers of nylon yarns in Europe and the Commonwealth. All are made by independent firms from B. N. S. nylon yarns.

Roll-up Tank

Among the other uses for coated fabrics is an intriguing roll-up tank. Containers of this sort enable ordinary lorries to carry liquids in bulk and can be rolled up to leave the vehicle free for normal loads on the return journey. Bigger nylon tanks can be used as temporary reservoirs for fresh water in desert regions or fuel on big construction sites.

At the other extreme coated nylon jerrycans—lighter in weight than metal jerrycans and completely collapsible—are so tough that they can be dropped from an aircraft flying at 100 feet at 100 knots.

A tough but lightweight dinghy illustrates the use of coated nylon fabrics for inflatable craft. Other articles in this field include assault craft and a catamaran with inflatable hulls which folds up and fits on the roof of a car.

Flat sheets made from coated nylon often weigh less than half as much as comparable natural fibre tarpaulins. They are completely waterproof and never become stiff. One huge sectioned sheet is used to protect the entire table

at Old Trafford cricket ground. Others are used to cover harvested crops during fumigation. Smaller ones have countless other uses.

Nylon on the Move

For lorry covers there are novel "core-spun" fabrics. These are woven from yarn composed of a nylon core surrounded by cotton. They are very similar in appearance to conventional sheets but weigh less and are much stronger.

Also in the transport field are tyres reinforced with nylon cords. With their superior resistance to heat, impact, flexing and moisture, they set new standards for safety and reliability and are being used increasingly extensively for cars as well as commercial vehicles.

Car safety harness is becoming more and more popular in Britain and the majority of manufacturers use tough nylon webbing which has exactly the right energy absorption characteristics. It is already saving many lives.

Conveyor belting containing nylon is stronger, tougher and has greater impact strength. It lasts longer and often enables longer runs to be used, reducing the number of transfer points. Nylon-webbed belting is used extensively in British coal mines. New types of belting are made from all-nylon ducks.

Twice as strong

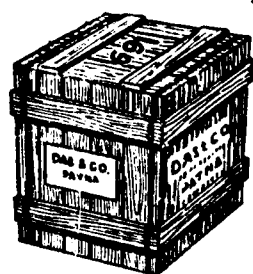
Nylon ropes, with double the tensile strength of natural fibre ropes and many times as much shock strength, are used widely for ocean towing and mooring and many other purposes.

In the fishing industry nylon gill nets have brought about a minor revolution because they catch more fish. Now other types of net are being made from nylon. A huge purse seine was on show. Trawls and drift nets are also being produced.

Among the other items in the display were drop stamp belting, transmission belting, spindle tapes, parachutes, mosquito netting, protective clothing, industrial gloves, mine ventilation ducting, filter clothes, fire hose, papermakers' felts, switchboard cords, airmail bags, pressure hose, sewing threads and tennis balls.

PLM

GIVE YOUR WARE PACK LABEL MARK CARE



By ensuring that your consignment is always securely packed, properly labelled and correctly marked ... to prevent losses to our Railways ... to guarantee your goods reaching the destination on time...to avoid all the unnecessary trouble involved in claim cases.

TO AVOID DELAY AND LOSS—REMEMBER

- To pack the goods in strong cases and to nail properly and securely
- To place a spare label inside
- To remove all traces of old markings
- To indicate the nature of goods consigned
- To line the case with shock-absorbing and water-proof material
- To mark correctly
- To address neatly, boldly and indelibly



ISSUED BY EASTERN RAILWAY

PLM

42

Indian Industries

B. O. A. C.

Smile, please - we're watching the biggest birdie in the world... This monster, believe it or not, really is a camera - two tons of it. And it has just flown the Atlantic in the hold of a B. O. A. C. cargoliner.

The camera, made by Robertson Photo-Mechanix, Inc., of Chicago, was flown to Britain to be installed in the office of a British newspaper, the Shrewsbury Chronicle. It will produce negatives of complete newspaper pages, for use with a new offset printing press. The three gentlemen waiting their turn for a giant economy size snapshot are Mr. L. Florsheim, President of the manufacturing company, Mr. D. J. Dodd, of B. O. A. C., and Mr. G. Winters, British Vice-Consul for Commercial Affairs, Chicago. They were probably hoping they wouldn't be asked to carry it round their necks.

B. O. A. C. Comets For A. I. I.

B. O. A. C. will operate Comet 4s on behalf of Air India International, B.O.A.C.'s Tripartite Pool partners, on their Singapore and Jakarta routes via Madras from 1st April, subject to Government approval. The Comets will be in service until March, 1963, by which time it is expected that Madras airport will be made ready for Boeing operations.

The switchover to Comet aircraft has been necessitated by the limitation of the existing runway at Madras airport which cannot accommodate Air India's 707s.

Silence Costs A Lot

Silence is an expensive commodity, reports the I. A. T. A. B. O. A. C.'s modern jet aircrafts carry several pounds of dead weight for internal sound-proofing: while noise suppressors for its engines mean a further sacrifice of payload amounting to more than £ 30,000 a year, - or almost 17 per

Indian Industries

cent of the purchase price of the aircraft over its anticipated ten-year service life.

B. O. A. C. Introduces T. V. at Idlewild Airport

Passengers at Idlewild Airport are now getting their information of service arrivals and departures on a closed-circuit television system, introduced by B. O. A. C. and the first of its kind at the airport.

One of the 27-inch television screens shows arrival information and another one deals with departure news. There are three pairs of these screens for passengers - one at the main sales counter, one on the second floor mezzanine and the other one in the Speedbird Lounge. Two smaller pairs are in the Monarch Lounge and some much smaller screens-eight-inch size - are installed for use by B. O. A. C. Traffic staff at various points in the terminal.

The system is the Nord Scan-A-Graph. It can be operated by one person at the two control consoles.

B. O. A. C. Ships Giant Camera Across The Atlantic

A graphic arts camera, weighing two tons, arrived in Britain recently aboard a B. O. A. C. Dc. 7F freighter from Chicago, destined for the Shrewsbury Chronicle.

It was rushed to Britain to meet a critical deadline for the Shrewsbury Chronicle's changeover to offset printing.

The camera, a model "480" manufactured by Robertson Photo-Machanix, Inc. Chicago, will function as an integral part of the paper's Goss "Subarban" webb offset installation, the first offset equipment of its kind to be used in England. The Robertson camera will produce negative of entire newspaper pages for use on the offset press. **

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The day
breaks brighter
tomorrow



WHERE a child laughs with eyes like
the clear rays of sunlight, and the strength of thunder
in his limbs...there is a home.

In a home dawns the man of tomorrow. A tomorrow
that will bring a little less of care, a little more of joy.

Today and tomorrow...Hindustan Lever serves the home
with soaps, foods, toilet preparations.

PR. 21-XS2

Automatic Inspection

N. PETROV

The shining surface of a steel bead has a microscopic speck, a result of corrosion, the disease of metal. If the quality inspector overlooks it, a ball-bearing will break down in a few months' time. The surface of the ball may have other defects—hollows, fissures, blisters, etc. How to detect them?

The "photoelectric eye" is of help here. The Tractor and Farm Machinery Research Institute has produced an automatic photo electric device which checks the quality of the surface of ball-bearings 4 to 13 mm in diameter. If the ball has a flaw greater than 40 microns, the device will detect it.

The machine is fairly simple. A special mechanism rotates the ball, at which a light beam is directed. The beam is reflected from the polished surface to a light sensitive element. If the surface has a flaw, the beam "goes out" and triggers a sorting device which directs the ball to a special bunker.

The machine checks 4,700 balls in seven hours, and ten such machines can be operated by one person. The first six machines of this type are already operating at the First State Ball-Bearing Plant in Moscow.

This is only one of the vast number of modern automatic inspection machines employed in Soviet industry. At ball-bearing plants automatic inspection machines are being used to grade balls and rings and check the strength of the metal. Automatic machines check the quality of coatings and heat treatment, of radio and electronic circuits.

It would be hard to name a branch of industry where automatic inspectors are not used. Soviet scientists and engineers have produced dozens of automatic control devices and sensory transducers for them. A veritable miracle of technology is an electronic micrometer, with a tiny electronic tube as a sensor. The instrument checks tolerances of fractions of a micron.

Rapid Advance

It should be noted that in the last few years the elaboration of automatic control devices is proceeding especially rapidly in the Soviet Union. The reason for this is that, during the last ten or fifteen years, Soviet engineering has progressed tremendously in the sphere of automation of so-called basic production processes, such as metal cutting and stamping.

But with regard to control operations the erroneous view prevailed that they were subsidiary

Indian Industries

Indian Industries

operations and there was no need to hurry with their automation. A result of this conception is that pieces machined with the direct participation of automatic instruments then have to pass through the hands of a virtual army of quality inspectors. Naturally, such automation could not be regarded as complete or, as engineers call it, integrated. Today the designs of automatic transfer lines and shops are considered incomplete until they incorporate all the necessary automatic machines for quality inspection.

We have spoken here of automatic devices which replace man and make his work easier. But there are defects which man with his five senses is simply unable to detect. Even the sharpest eye cannot spot an air hole or treacherous hair-like fissures on the surface of metal parts. Some twenty years ago one could often see a trackwalker tapping rails to detect faults in them. But even the most trained ear cannot hope to detect every hidden fault, and this may lead to terrible consequences. How reliable aids have come to the help of the railwaymen, metallurgists and builders.

First among such devices are X-rays and gamma rays. They penetrate through different substances in different ways. Thus, if there are cavities inside a metal object, they can be projected as spots on a special. An intricate installation called a betatron is capable of investigating metal 20-30 cm. thick.

Raising Labour Productivity

Magnetic and electromagnetic control methods, on which railway defectoscopes are based, have found wide application. There are also other methods of so-called "non-damaging" inspection, specifically the luminescent method and the method of eddy currents. The latter, in particular, is used to control the strength and quality of heat treatment and to measure very thin metal and paint coatings.

There also exists the so-called "active control" method. In active control the inspection is carried out not after a piece is manufactured, when it is often too late to do anything but reject it, but in the course of manufacturing. Continuous checking almost completely excluded waste.

The method of active automatic inspection has a great future. At the Chelyabinsk Tractor Plant more than 150 machine tools have been equipped with active control devices. As a result their productivity has increased by 30-40 per cent, and spoilage has dropped sharply.

But so far only two per cent of our machine tools are equipped with active control instruments. It has been estimated that the introduction of 1,00,000 automatic active control devices would free 10,000 machine tools, 1,50,000 square metres of production premises, more than 25,000 quality inspectors, and would save more than 200 million roubles.

Automatic inspection today is in the front line of engineering, where the most advanced and perfect technological means and the latest discoveries of atomic physics, electronics, and other branches are employed. Scientists and engineers are continually in quest of new, more perfect means of automatic control.

A relative newcomer in the realm of automatic inspection is television. A miniature television camera makes it possible to inspect the inner quality of pipes, in particular, of welded joints. The remote-control camera is less than 5 cm in diameter and 15 cm long. The image is enlarged 20-fold on a screen, which makes it possible to detect even very small flaws.

This camera has served as the basis for a television-sounding device to inspect drilling wells. Lowered into a well, the instrument makes it possible to inspect well walls, determine the nature of rock faults and obtain other important geological data.

Today great attention is paid in our country to the introduction of automatic control and inspection. Automatic inspection contributes to high labour productivity, low production costs and high quality. Soviet engineers and workers have set themselves the task of making Soviet goods the best in the world. Broad application of automatic inspection is one of the ways to achieve this goal. *

The reason for Western financial development aid, given to countries in Central and South-East Asia, is perfectly simple: To make these not yet fully developed lands into full-fledged trading partners. This is embarked upon with the certainty that the raising of living standards will be achieved through, not least of all, multi-lateral trade relations, such as have existed between W-European countries for the last decade.

Modern development theories aim at supporting young countries in their industrialisation to the extent that they themselves may be able to enter the world market as exporters of products and, through higher earnings from exports of finished articles, have at their disposal a better means of increasing imports.

There is, however, no fixed formula for development aid to countries of Central and South-East Asia. The situation with regard to mineral resources, power supply, available labour and the infra-structure is very much varied. Therefore, help given by Western industrial countries so far was reserved for four main categories:

(1) Investigation of the possibilities and the creation of energy; (2) building-up of the infra-structure (road network, waterways, dams, airports, towns); (3) the finding and the exploitation of raw materials; (4) expansion of nutrition basis by increasing and intensifying land cultivation.

It is generally acknowledged today that no one of these four main spheres merits priority over the others. The carrying out of individual tasks must be accomplished in the greatest possible harmony. In spite of this, however, special attention must be devoted to the locating and working of the raw material resources because the utilising of local resources of crude iron and its smelting into iron and steel enable money to be saved for the execution of other projects.

Steel is without doubt the life-giving blood of technology. It is also an essential for the building-up of the infra-structure, for the expansion of agriculture and for the improvement of technical equipment used at present. Last but not least, steel as a basic product is needed to meet the numerous consumers' demands

Steel Production

FRIEDRICH VON FRIEDBURG

Duisburg

in the respective countries. Locally produced metal and its processing into end products serve not only to satisfy consumer demands, but, at the same time, provide employment for a great number of workers in the large foundries of the iron and steel industry, and in the many medium-sized and small factories of the metal products industry.

It is not yet to be expected of development countries, especially in South-East Asia, that they themselves carry out the necessary investigations with regard to size and extent of areas where iron ore is available, to the quality of raw materials found, and to the best methods of smelting and manufacturing right up to a complete market analysis. For this, technical experience is required which the industrialized countries have acquired in 200 years of progress, including a vast experience of failures. Because of this, experienced firms from industrial countries which have already carried out similar work in many parts of the world are brought in to undertake such investigations. For foundries, these investigations generally begin with geological and mining surveys and lead up to cost calculations in relation to anticipated profits.

There is no reason why, when positive results are obtained, the execution of a foundry project should be postponed in favour of other projects such as, for instance, the establishment of medium and small factories producing consumer goods. Particularly the large foundries of the iron and steel industry are an excellent means of igniting the process of national economy and improving the standard of living. That is not the only reason to justify the higher investing costs. From past experience it is known that smaller manufactures tend to settle around such a large industrial plant, and any foundry needs itself supplier industries.

In this, Jamshedpur, in India, is a good example. When the Tata Iron & Steel Works began production

there in 1908, Jamshedpur was only a small village. Today, it is a flourishing town of 300,000 inhabitants in which the living standard of the population greatly excels that of conditions in other parts of India. A similar development can confidently be expected around the three public sector steel plants in India.

In addition, these large ventures of the steel industry are useful "training workshops". It cannot be expected that a nation which, even today, partly exists on simple farming or on a small income from crafts and other minor trades, can either from today or from tomorrow or even within a generation grow accustomed to industrial work. A process like that takes longer. Nevertheless, as the people are confronted with modern industrial establishments, the process will be speeded up. Close family connections in Asia, and the subsequent interest by family connections in one another's work will help to stir the initiative of the people, without which continuous development is impossible.

Similar expansion is possible in areas which are poor in raw materials by restricting the import of finished products and importing semi-finished goods. These goods would then be completed by local workers, producing marketable end-products.

Considering the fact that during the last ten years new foundries have been established in Burma, Pakistan, Korea, the Philippines and especially in India, it is to be concluded that the Governments and the private enterprise in these countries took the best course towards technical development.

And considering the fact also that steel consumption in industrial countries at present lies in the range of 650 kilos per capita, while in many Asian countries it amounts to only about 4 to 5 kilos annually, it is obvious that the growth requirements of the world's steel consumption are practically unlimited. **

At the turn of the century the phantom of famine haunted mankind. It was estimated that the store of carbon fuel on the earth—hard coal, oil and gas—was very limited, and, most important, it was not being replenished.

The actual size of resources of this fuel has now been ascertained, and it came out that there are more such resources than was assumed. Nevertheless, these resources will suffice at the most for another several hundred years. And that is an infinitesimally small period in the life of mankind.

What is to be done? How will our successors heat their towns, what type of energy will they turn into electric power? The heat energy of the sun is so diffused that it is hard to concentrate it, and the energy of rivers is insufficient.

In fact, we do not even have very much of the concealed heat energy latent in what is known as fissionable materials, or atomic fuel, such as uranium and artificially produced plutonium. In any case, atomic power stations, though they do have great prospects, will not be able to solve the problem completely.

Where is fuel to be obtained? In water, reply the scientists. What do we mean when we say "atomic energy from water"? We mean nuclear energy. The thing is that energy can be obtained only by means of splitting uranium nucleus, but also by means of synthesis, fusion, of light element nuclei. So far, this energy is "produced" only in the bowls of hot stars, particularly in the depths of the sun, which is the nearest star to us.

The sun may be regarded as an immense power station. It constantly sends into outer space terrific quantities of energy. This energy has a most direct bearing on our life, and we are in many ways indebted to it.

The atomic energy, which physicists and engineers are now investigating so intensively, is not connected directly with the energy of our main luminary. Yet, it has been discovered that the internal source of solar energy is nuclear. And we are now endeavouring to copy solar processes on the earth.

Emission of Energy

Right now we have a fairly good idea of what processes are taking place in the sun and in the stars similar to the sun. An atom, this tiniest particle of matter, consists, as is known, of a nucleus surrounded by electrons. The nuclei of some atoms have a greater store of energy than others. Therefore, nuclei of the first type can be turned into the nuclei of the second type, and this transformation is accompanied by emissions of vast quantities of energy. Such nuclear reactions are actually the source of solar or stellar energy.

What substance plays the part of nuclear fuel in stars? Comparing data obtained in different ways, scientists came to the conclusion that the

Turning Water Into Fire

Prof. DAVID FRANK-KAMENETSKY

Soviet Physicist

universe observable by our astronomic instruments consists mainly of hydrogen. Some are of the opinion that this superlight element in our part of the cosmos makes up for approximately 76 per cent of all matter.

What is a hydrogen nucleus like? It is a proton, which is the simplest nuclear particle. In certain conditions four protons can fuse into a nucleus of helium, a heavier element, and in the process as much as about 28 MEV of energy is produced. Is this much or little? For comparison's sake I would like to say that when an atom of ordinary fuel, carbon, is burned, only about 4 electron-volts of energy are produced. Thus, the calorific capacity of nuclear fuel is millions of times greater than of ordinary fuel.

There is a close connection between the processes taking place in the stars and those which can be used for obtaining energy from terrestrial water. The reaction by which helium is formed passes through several stages, with two particles engaged in each stage. This chain reaction begins with the fusion of two hydrogen nuclei into a nucleus of what is known as heavy hydrogen or deuterium. With the reaction continuing, one gramme of heavy hydrogen emits as much energy as is produced when 8-12 tons of hard coal and burned.

Inexhaustible Resources

Any body of water, a river, a sea or an ocean, contains quite a substantial quantity of heavy hydrogen. It has been established that approximately 5,000-6,000 molecules of ordinary water contain one molecule of heavy water which has deuterium, heavy hydrogen, combined with oxygen, instead of the usual combination of hydrogen and oxygen. Therefore, in order to produce one gramme of heavy hydrogen it is necessary to process about 25 kg of water.

Suppose that all the seas and oceans are filled with such highly calorific fuel as oil. Even in that case we would be 400 times poorer in latent energy than if we have water as a source of fuel. Thus, it means that we have found inexhaustible resources of "firewood." When scientists start burning water efficiently at power stations, the energy produced from it will be ample for mankind for hundreds of millions of years.

It is true that we do not so far know how to burn water efficiently. The problem of controlled thermo-nuclear synthesis, i.e., the possibility of setting up thermo-nuclear electric power stations, is still unsolved.

The thing is that the temperatures necessary for carrying out thermo-nuclear reactions reach millions of degrees. Yet, this is not the main problem. The first practical problem arising in this case is that of, as one physicist put it, finding "a pot in which the soup can be cooked." What we mean here is the building of such a vessel which would be able to hold

out at a temperature of millions of degrees necessary for thermo-nuclear synthesis. How can such a vessel be built? A reply to this question was supplied by Soviet scientists.

The Magnetic Bottle

When subjected to high temperatures any substance turns, as is known, into the state of plasma. Plasma is an excellent conductor of electricity. Electricity passes through plasma easier than it does through metal, and is doing so it heats plasma still more.

However—this was proved by Faraday—any electric current creates around it a magnetic field, whose lines of force are situated around the conductor in concentric circles. The magnetic field appearing in plasma, through which an electric current runs, makes the particles of ionised gas leave their straight course and wind around the lines of force.

There is a very important feature here. No matter in what direction an electric current carrier, an electron or a positively charged ion, may move, it always deviates towards the axis of the current. When the current is strong enough the plasma in a discharge tube stretches out into a narrow cord. This process is accompanied by a still greater heating of the plasma, yet the plasma remains divorced from the walls of the tube without heating them.

This is called the principle of a "magnetic bottle," which means the reaction of such a magnetic field which makes charged particles rotate along circular orbits and, compressing the plasma cord formed in the process, does not let it come in contact with its cool environment. This idea was set forth for the first time in 1960 by Academicians I. E. Tamm and A. D. Sakharov.

This conception of the Soviet physicists was verified practically in the Atomic Energy Institute of the USSR Academy of Sciences, with Academician L. A. Artsimovich in charge of the experiments and Academician M. L. Leontovich in charge of theoretical research. After a series of very thorough and extensive investigations the correctness of this principle was confirmed, and the group of physicists, who worked on this problem, were awarded a Lenin Prize.

At present, many countries are conducting research on the problem of controlled thermo-nuclear synthesis. This research has not yet entered the phase when corresponding thermo-nuclear power stations can be built. Yet, the problem will certainly be solved in the next few decades.

Scientists will turn water into fire, thus producing a small but a very effective sun on the earth. Controlling expertly its activities and adjusting the quality of energy emitted by it, men will be able to disperse forever the fear that their successors may suffer from a lack of those sources of energy which help them in their progress.

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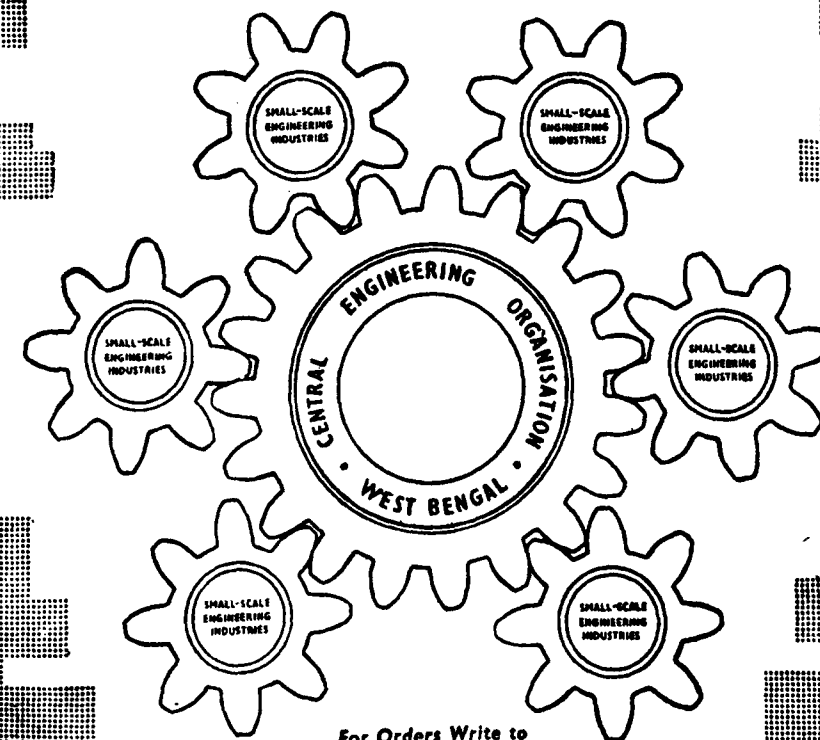
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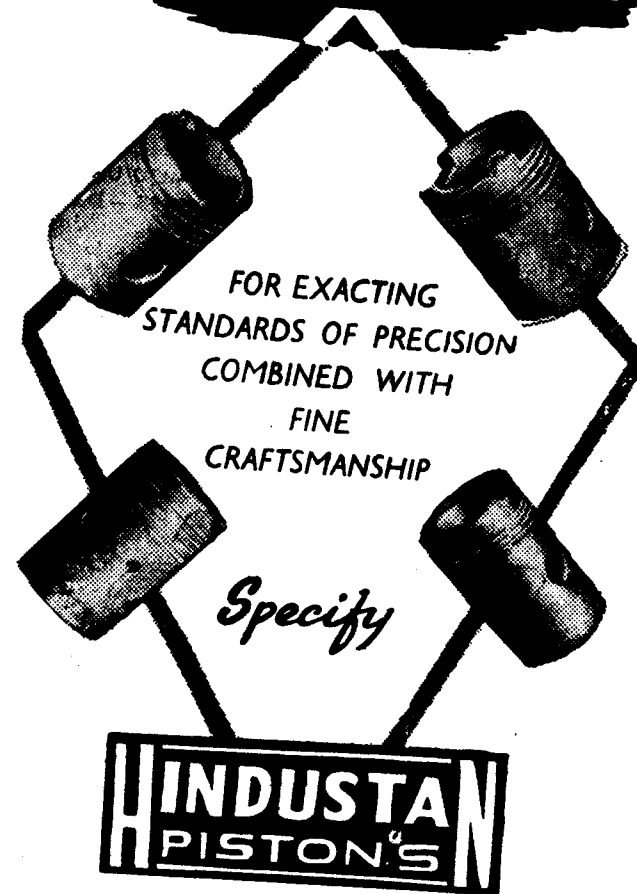
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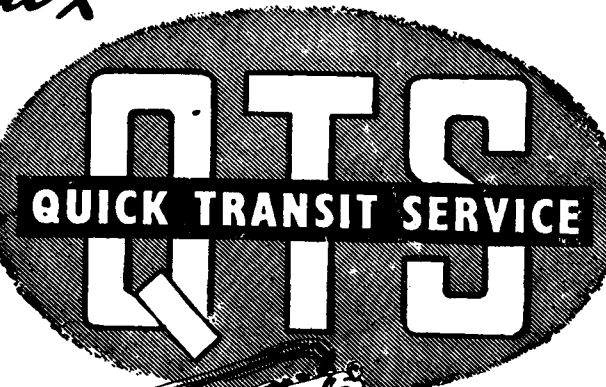
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