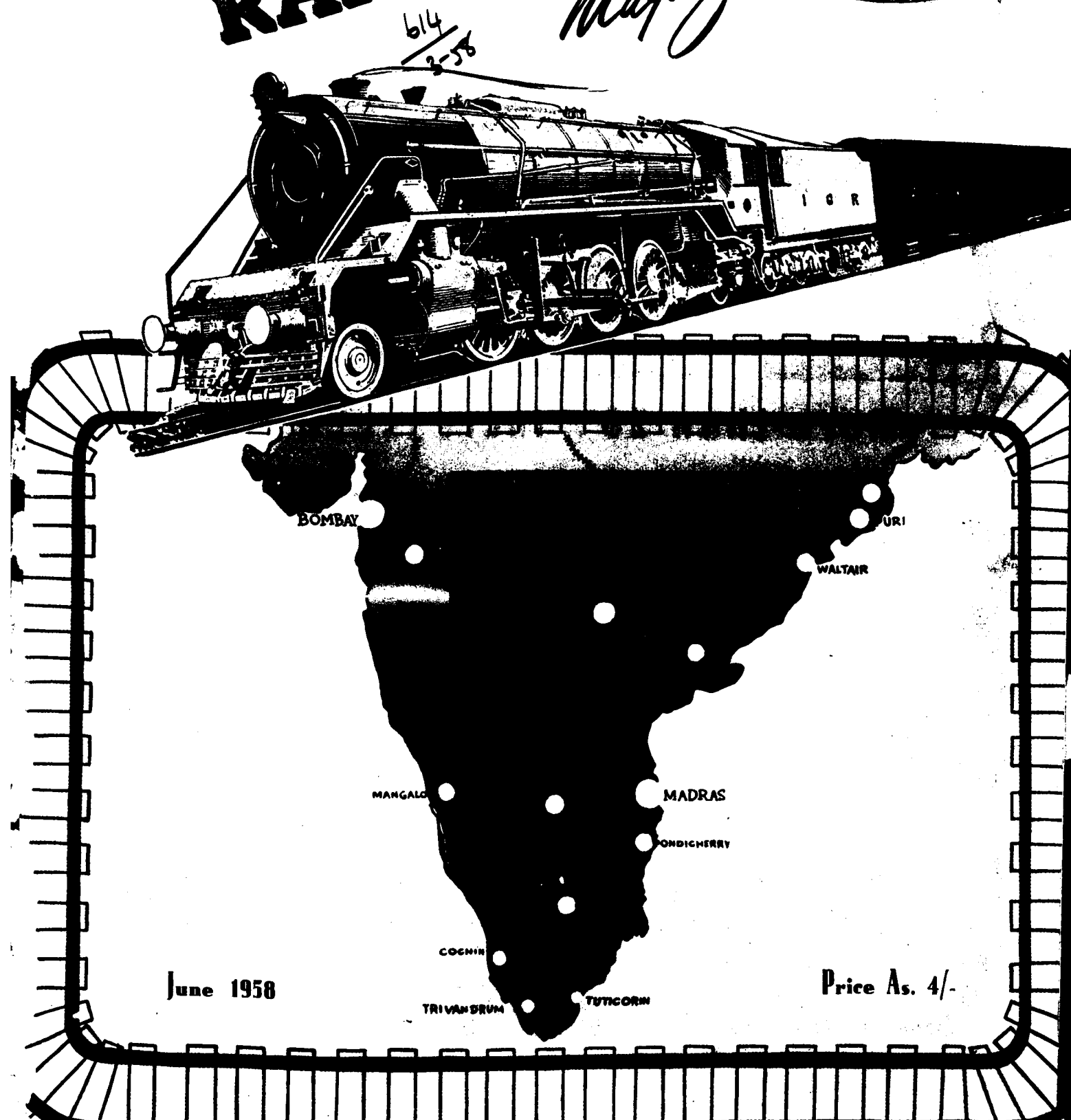
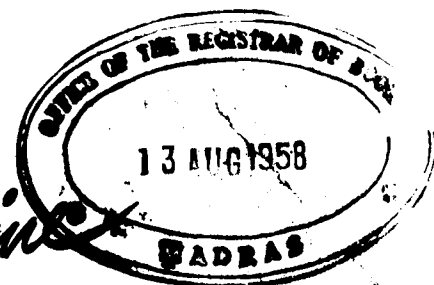


614

SOUTHERN RAILWAYS

Magazine



June 1958

Price As. 4/-

SOUTHERN RAILWAYS MAGAZINE

INDUSTRIAL MYSORE SUPPLEMENT

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Editorial Notice

The Editor invites contributions to the Magazine on a variety of topics — short stories, technical features written in simple English understandable to the laymen, Aspects of Railway Working, places of tourist interest, News from home line, activities on Railway Institutes etc. All copy should be brief and typed as far as possible.

Photographs illustrating social functions, sports events, scenic spots etc. are also invited. All contributions should reach the Editor not later than 5th of each month. Rejected Mss. will be returned provided sufficient stamps for postage are enclosed. No responsibility will be borne for copy lost in transit.

Views expressed in this Magazine should not be taken as having official authority.

All correspondence should be addressed to the Editor, "Southern Railways Magazine," Post Box No. 17, Tanjore, (South India).

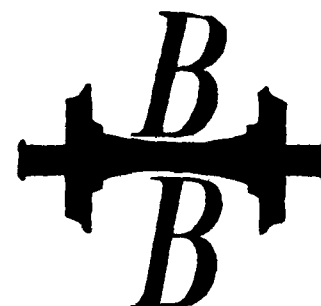


The solid wheel has an initial life 20% greater than the corresponding type of tyred wheel. This is fully illustrated by a comparison of the solid wheel, I.R.S. Drawing No. WA. 22, and the built-up wheel to I.R.S. Drawing No. WA. 23.

More than 20% increase in life



Agents for the whole of India,
Samuel Osborn (India)
Private Limited,
Third Floor, 24, Chittaranjan Avenue,
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BESSEMER LIMITED**

OVER 80 YEARS OF RAILWAY SERVICE

**KILNHURST STEEL WORKS
ROTHERHAM**

PHONE MEXBRO 2154-5-6 GRAMS 'TYRES' MEXBROUGH

A Short History of Mysore Lamps

THE Company was floated in 1936 and the manufacture started in the following year. All types of Electric Lamps in general service from 5 to 1500 Watts, Floodlight Lamps of 500 and 1000 watts, Street Series Lamps of 400 to 4000 lumens, Torch and Bicycle Lamps, Train Lighting Lamps, Decorative Lamps, Telephone Switch Board Lamps etc. are manufactured by the Company. The manufacture of Fluorescent Lamps is also under consideration.

The products are well received by the Governments and the General Public. The full requirements of the Mysore Government in Electric lamps, including the Street Series Lamps, are being met by this Factory.

We are also on the rate contract of the Government of India for supply of general service lamps to all Government Departments and for supply of Train Lighting Lamps to Railways.

It has installed highly automatic up-to-date

machinery with a capacity of 16,000 lamps per day and is managed by well-trained, skilled personnel. At present the daily production is about 10,000 lamps per day. The demand is rising and production is being stepped up. The efficiency and long life of Mysore lamps are well known and there is great demand for these lamps all over India.

The Company has been awarded Gold and Silver Medals in several Exhibitions and fairs for quality and brightness of the electric lamps.

As a member of the Indian Lamp Factories Association, the Company, strictly adheres to the price policy of the Association.

The Company is being managed by the Board of Directors with the Chief Engineer (Electricity) Government of Mysore, as Chairman.

Agents have been appointed all over India to cater to the needs of the Public and various industries.

The Mysore Chrome Tanning Company

ORIGINALLY started in 1908 as The Mysore Tannery for Chrome Tanning of Cow hides, the Company passed through vicissitudes and changed many hands and finally in the year 1940 under the patronage of Government of Mysore, it was converted into a Public Limited Company on a joint stock basis with a Share Capital of Rs. 5 Lakhs and subsequently raised to Rs. 10,00,000/- and the new company took the present name The Mysore Chrome Tanning Co., Ltd. The Government of Mysore have subscribed 26% of its share Capital. The paid up Capital is Rs. 4,94,452—8—0.

The Management is vested in a very influential Board of Directors, three of whom are Government nominees, one of whom is Additional Director of

Industries & Commerce, Government of Mysore, Ex-Officio Chairman & Managing Director.

The Company manufactures all kinds of Chrome Upper leathers, B. T. Soles for footwear, and leather articles such as Suit Cases, Document Cases, Tappal Bags, Jewel Cases, Industrial Leathers, Washers etc., etc. Its leathers are well known in the markets of India, Ceylon, Singapore, U. K. etc. The maximum manufacturing capacity is 1,00,000 sq. ft. per month, but at present it manufactures only 30,000 to 40,000 sq. ft. per month owing to scarcity of good Chrome quality hides, and other drawbacks.

The Company has now commenced manufacturing Textile Leathers also for which there is a good future.

IRON & STEEL PERMITS FOR AFGHANISTAN

A limited quantity of controlled items of iron and steel will be allowed to be exported to Afghanistan by the approved importers of fruits and asafoetida who have effected imports of the goods from Afghanistan, according to a notice issued by the Iron and Steel Controller of the Government of India. Permits will be issued to importers on 'first come first served' basis.

INDIA'S IRON ORE EXPORT TO JAPAN

An official Indian delegation led by Mr. D. Sandilya, Joint Secretary, Ministry of Commerce and Industry and Managing Director of the State Trading Corporation, left New Delhi for Tokyo for discussions with the representatives of the Japanese steel industry on the supply of Indian Iron ore during 1958—59.

During the discussions the prices for the supplies to be made in 1958—59 as well as the schedule of deliveries and shipments will be finalised.

Under a five-year agreement entered into between the Corporation and the Japanese steel industry, the Corporation has undertaken to export 7.2 million tons of iron ore to Japan during the period April 1957 to March 1962. The contract for the first year, i. e. 1957—58, was for a total quantity of 1.3 million

tons, whereas during the present year the supplies will amount to 1.4 million tons.

Last year, out of India's total exports of about Rs. 27.2 crores to Japan, exports of iron ore accounted for slightly over Rs. 7 crores.

INDIA'S COAL TARGET

It is learnt that India's target for coal production in the Third Plan period has been tentatively fixed at 100 million tons. As far as coal production in the public sector in the Second Plan period is concerned, the Planning Commission has placed a ceiling of Rs. 40 crores for investment as against Rs. 45 crores suggested by the Ministry of Fuel. The proposal to permit the private sector to produce, during the Second Plan period, an additional 1.4 million tons of coal to serve as a cushion against any possible shortfall in that sector has, however, been dropped.

The Planning Commission has also finally reduced the original provision of Rs. 60.6 crores for the integrated lignite project at Neiveli to Rs. 46.6 crores made up of Rs. 20.3 crores for the mining scheme, Rs. 17.0 crores for the thermal power station and Rs. 9.3 crores for the fertilizer plant. The briquetting and carbonisation scheme of the Neiveli Project is dropped for the present.

MYSORE LAMPS

BEST IN THE MARKET

*Awarded Gold Medals & Cups at Several Exhibitions
Under Government of India Rate Contract.*

ALL TYPES OF LAMPS MANUFACTURED

THE MYSORE LAMP WORKS LTD.

MALLESWARAM, BANGALORE-3

Telegrams: "MYSORELAMP"

Telephone: 2026

Agents for Mysore State:

K. S. GOWDER & CO.

No. 48, Subedar Chatram Road,
BANGALORE-2

Gold Thread Industry in Mysore

THE Industry of Gold Thread can be classed as a part of Sericulture Industry as the manufacturing of Gold thread whatever may be the quality, involves use of pure silk yarn. This Industry is mostly confined to the state of Bombay-Surat being the main centre and Varanasi once a thriving manufacturing place.

The Gold thread manufacture was at first sponsored by a French Concern M/s. C. Dutel & Co. Bangalore. The Mysore Gold thread company Ltd., Bangalore was the firm so started during the year 1932. M/s. Parry & Co., Madras were their Managing Agents. The said Company had a difficult period owing to very keen competition from Surat. It had at last to hand over to Sri S. Dhondusa, Mamulpet, Bangalore, a veteran Gold thread merchant who had vast experience in the Gold thread trade and already representing a German Company—The LEONISCHE DRAHTWERKE A-G—Nurnberg as Sole Agent for South India.

The said Sri Dhondusa could not by oversight change the fortune of the Industry. He had to face the keen competition both local as well as Foreign. The World War 1939 was a turning point. Imports were banned and Indian weavers had to go in for Swadeshi goods. The quality of Gold thread was improved to suit the requirements of the weavers. The factory added on their own 'SILK TWISTING PLANT' and the 'DYEING SECTION'. These minimised the cost of production. Today the products of 'S. Dhondusa Gold Thread Factory' are popular and well known for their Superiority. Quality control is introduced and this has helped a good deal for manufacturing the standard of Gold Lace. The Government of Mysore and other State Governments and number of established weaving factories are encouraging the firm. There is still a good scope for expansion as the demand when compared for the present production is very high.

PNEUMATIC SPOT WELDING MACHINE

Aston Electrical Products Pty. Ltd. at East Sydney (Australia) have produced a new pneumatic spot welding machine to meet the needs of the light gauge metal and wire working shops, using spot welding technique for metal fabrication. It is regarded as particularly suitable for the assembly of small articles manufactured for the domestic hardware and office equipment trades.

The operation of the new machine is automatic. The operator has only to press the pneumatic foot valve for each spot weld. This eliminates fatigue associated with manually operated machines and ensures a greater output of fabricated components.

Controls for the machines are conveniently placed for easy accessibility and adjustment. Welding pressure can be applied by means of an air-pressure reducing valve, a pressure gauge indicating the air-pressure applied to the operating cylinder. This means that correct welding pressure can be easily adjusted within seconds compared with the manual machine, which usually requires spring adjustment at the rear.

"Squeeze" time, the period during which pressure is applied to the weldments, is regulated by adjusting the pressure switch, mounted adjacent to the head. "Weld" time, the period during which welding current flows, is controlled electronically by a plug-in Thyatron Timing Unit.

Welding heat-taps have been provided to give a welding range from two pieces of 28 S. W. G. clean mild steel sheet to two pieces of 16 S. W. G. clean mild steel sheet on continuous production, or two pieces of 12 S. W. G. clean mild sheet intermittently, and wire work from 18 S. W. G. to 4 S. W. G.

The four controls provided i. e. "Pressure", "Squeeze" time, "Welding" time and "Welding Current", make the machine suitable for operation by unskilled process labour, as once set up correctly, weld quality will not vary.

* * * * *

PROCESSING OF SCRAP

In an 8 hour shift, a model 3,000 Harris baling press processes over 350 tons of scrap. For feeding the press, a mill-type overhead crane is equipped with a 65-inch, 8-coil electro-magnet and an orange-peel bucket. Matching the operating cycle of the press, the crane handles unloading, feeding of the press, and reloading the finished bundles into railroad cars.

The baling unit can reduce 3 automobiles to a bundle of scrap 60 × 60 × 24 inches in 90 seconds. Since bundles of this size are too large for the charging doors of most steel mills, normal bundles contain only 1 automobile.

Mysore Machinery Manufacturers

A large scale Engineering Industry in Mysore with its Factory and Office located at Mile 5, Mysore Road, Bangalore. The Company was established in the year 1946, under the former Mysore Companies Act as a Public Company. This Company is engaged in the manufacture of Textile Machinery i. e. Looms and Dobbies, besides manufacture of Steel Structures and Water Tanks. The factory also undertakes orders for supply of Grey Iron Castings and Engineering Job works.

The Factory has a fairly well equipped Foundry and workshop and has a strength of nearly 500 employees. The Mysore Looms made in this factory are installed in large Mills as well as small power loom units and are adapted for weaving Cotton as well as silk and art silk fabric. A large number of these looms are installed in Bangalore, Doddaballapur, Salem and

other power loom centres of the South besides Big Mills in Bombay and upnorth.

The Chief raw-materials required by this Industry are Iron & Steel and are obtained from the Mysore Iron & Steel Works Bhadravati and other indigenous sources. A few components are met out of Imports. The factory is worked by electric power supplied by the Mysore Government source.

The Company is managed by the Managing Agents Messrs. The Industrial Agents (Private) Ltd., subject to the control of the Board of Directors. The Company contemplates expansion of the Ferrous castings section and has a proposal to manufacture Malleable Iron Castings largely required by Indian Railways and other heavy industries.

CHITTARANJAN LOCOMOTIVE WORKS

Chittaranjan Locomotive Works which started production in January 1950 has been progressing rapidly, and upto March this year, 663 locomotives have been manufactured and put into service on Indian Railways.

The Factory, which turned out 77 locomotives before the First Plan started was expected to go into full production by 1957 and turn out 120 BG locomotives and 50 spare boilers a year. But it achieved the target of 120 average-sized locomotives by March 1951.

During 1957-58, 164 locomotives were manufactured. Production has progressed considerably from 12 per month in April 1956 to 14 per month in August 1956. The improved performance was achieved by partial night shift working and the import of some components for balancing the production of the various units.

With the fabrication of bar frames from Tata slabs inside the works, procurement of angle and dome rings from the Tatas and certain steel castings from domestic manufacturers, and the production of certain loco fittings by the works itself, it has been possible for Chittaranjan to eliminate certain imports

much earlier than expected.

During 1956-57, the factory produced 120 locomotive boilers which have been fitted to the locomotives produced here. Since the commencement of boiler production the factory has turned out 338 WG boilers upto the end of March 1957, when the production rate reached 12 locomotive boilers a month.

It has been decided to suitably expand the works for the stabilisation of an annual production of 300 average-size locomotives a year by the end of the Second Plan. The expansion is estimated to cost about Rs. 5 crores. A scheme has also been finalised for establishing a steel foundry here with assistance from the Technical Co-operation Mission.

With three new steel plants going into production soon and with the proposed steel foundry, dependence in respect of certain imported raw materials will cease and it would then be possible for the Works to be entirely self-sufficient in regard to imported items.

Total expenditure on the project till the end of 1957-58 is estimated at Rs. 14.6 crores of which about 50 per cent has gone for the housing colony and amenities for the workers.

The Bangalore Woollen, Cotton & Silk Mills

THESE Mills, situated in Bangalore and managed by Binny & Co. (Madras) Ltd., remain almost unique in the cloth industry producing from the raw materials finished Cotton, Woollen and Silk products.

WOOL, the warmest of all raw materials, is obtained, as you know, from sheep. Unfortunately the wool of the Indian sheep is generally short in staple and coarse in texture, and though used for several of the Mills' coarser types of Woollen products, it is not suitable for spinning fine yarns. The Company's production of fine woollen goods, when the most careful attention is paid to turning out the best possible article, is therefore dependent on imported raw materials. Amongst the wide variety of the Woollen goods produced by the Company's Woollen Mill situated at Hebbal, are Rugs, Shawls, mixture cloths and Worsted materials.

One of the Mills' more recent cloths, which is quickly increasing in popularity, is *Cotswol*. This cloth is a blend of high quality cotton and wool. It is neither too warm nor too cool, having a special quality which permits it to air the skin, thereby allowing the body to maintain a constant comfortable temperature. Being much cheaper than an all wool product, this cloth is just the answer to fill the gap in a public need for a cheap woollen material.

The yellow flower of the *COTTON* plant is a familiar sight in South India, and it is from this flower that the majority of the most suitable clothing for this climate originates.

From these flowers come the fibres, which have to be separated from their black and brownish seeds. Once in the Mill these fibres are beaten, cleaned, sorted and blended. This takes place over a course of fascinating mechanical processes until after 'Carding' one is left with the 'sliver', a rope like form composed of fibres now devoid of all impurities.

The 'sliver' is then further processed, depending

on the type of cotton used, until it has been suitably drawn out, the fibres paralleled and slightly twisted before being spun into yarn in the Spinning Department.

The weft yarn is transferred from the bobbins on which it has been spun, to the pirns on which it is carried in the shuttle for weaving. Warp yarn is wound from the spinning bobbins into larger and more convenient packages, and from these packages it is again wound on to large beams. The yarn from these beams, which is now in the form of a sheet, is passed through the sizing machines where starch is applied to it to strengthen it for the considerable stresses and strains to which it will be subjected during weaving. As they leave the sizing machine, the sheets of yarn from several warpers' beams are wound on to a weaver's beam, in which state it is taken to the loom.

Binny Mills are one of the few in India mainly equipped with automatic looms, and it is the high standard of yarns which these looms require which is the buyers' guarantee of the durability of the Mill's finished cloths.

SILK, that soft, lustrous, beautiful, durable and most gracious of fabrics is yet another product of the Mill.

This fabric with its humble beginnings in cocoon form, is drawn, reeled and woven into something, a finished material of very real beauty and splendour. Mysore, the home of the Indian silk worm may well be a proud state, claiming to clothe the most elegant of this country's women.

Silk produced in Mysore is as strong as foreign silk and rather yellow, but it is not cultivated as scientifically as in the major silk-producing countries. The consequence is that Mysore filature is uneven and hairy. This fault, however, could be overcome if all concerned in the growing and reeling of silk work determinedly to improve quality and production.

Unless this is done the products of the State's silk industry will continue to be unable to compete with foreign silk in quality and price in export markets.

Started in 1877 as a small business in Bangalore

Cantonment, the Company has grown and flourished. Almost 8,000 people are now employed, and the Company's "Sheep" Trade Mark has become the guarantee of quality to both distributor and consumer.

RAIL EXPERTS LEAVE FOR JAPAN

An additional member of the Railway Board and two senior officers left for Japan on 11th May 1958 at the invitation of the President of the Japanese National Railways.

They are Shri E. V. Isaacs, Additional Member of the Railway Board in charge of Mechanical engineering, Shri S.S. Mukherjee, Deputy Chief Engineer, South Eastern Railway, and Shri G. P. Warriar, Deputy Chief Engineer, Southern Railway.

These officers have been invited to promote and develop closer relations between the Indian Railways and the Japanese National Railways and also for discussions regarding the modernisation of the railways, particularly in regard to A. C. current railway electrification.

The visit would also provide the officers with an opportunity for acquainting themselves with railway facilities and related industries in Japan.

They will also visit a special exhibition of railway equipment and machinery which is being held in Japan.

AIR-CONDITIONED EXPRESS TRAINS

The air-conditioned vestibuled trains providing chair-car accommodation in third class between New Delhi and Madras Central, New Delhi and Bombay Central and New Delhi and Howrah will in future be known as "air-conditioned express trains", according to a decision taken by the Railway Board.

In Hindi, the trains will be designated as "Vatankul Express Gadi".

NEW RAIL LINK WITH KANDLA— SERVICE INAUGURATED

A new link between the Kandla and the States of Rajasthan and Punjab was opened with the inauguration of passenger traffic on the Bhildi-Raniwara section of the Northern Railway.

The 44 mile long stretch was completed by the

Western Railway at a cost of Rs. 1.60 crores.

Shri B. L. Rawat, Commissioner for the Jodhpur Division, inaugurated the through passenger traffic.

Hundreds of people, including women greeted the train as it passed through various stations on the route.

SLEEPERS FROM KASHMIR

Kashmir State would supply 4.15 lakh sleepers to the Railway during the period January 1958, to October 1959. An agreement to that effect had been reached with a view to stepping up the off-take of timber from the State. Shri S. V. Ramaswamy, Deputy Minister for Railways, informed Shri Indulal Yajnik. He added that owing to frequent floods in the Kashmir Valley resulting in lakhs of cubic feet of timber being washed away to Pakistan, there had been a reduction in the supply of timber sleepers from Kashmir during the past two years.

Shri Ramaswamy informed Shri Heda that India was importing timber from abroad. But during the past few years there had been reduction in imports also because of the deteriorating situation in the Eastern countries.

MICA PAPERS

A new material called "mica paper" and made with industrial scrap mica, which can be used with excellent results as an insulator in high temperature capacitors for supersonic aircraft, guided missiles and satellites, has been reported to the Electronic Components Conference in London.

The material, which was developed as a replacement for virgin mica, is said to have performed as well as for better than natural mica as a capacitor dielectric in extensive tests. Mica paper is also reported to have added advantages of lower cost and easier handling characteristics in manufacturing than natural mica.

BHARAT ELECTRONICS

BHARAT Electronics (Private) Limited was established by the Government of India as a Private Limited Company in April, 1954 with an authorised capital of 10 crores including the working capital of 2.5 crores. The company was started with the object of making India self-sufficient in electronic communication equipment and radar. The company is under an agreement with Messrs. Compagnie Generale de Telegraphie Sans Fil of Paris for Technical assistance for a period of ten years.

The factory is situated in Jalahalli near Bangalore, well served by water and electricity.

Construction of the factory building was taken up in May, 1954 and completed by the middle of 1956. The buildings have a floor area of over 500,000 sq. ft.

One of the departments to start functioning early was the Technical Training Centre where several batches of tradesman have been trained.

The factory went into production with the manufacture of tools for the first communication receiver in 1956. The present production programme includes General Purpose Communication Receiver, a Medium wave 400 Watt Transmitter, various types of VHF Trans-receivers a small Rawin Transmitter for the Indian Meteorological Department and different types of Consoles for All India Radio.

BOARD OF DIRECTORS

1. Shri O. Pulla Reddy, ICS, Chairman.
Secretary, Ministry of Defence.
2. Shri S. Jayasankar
3. Dr. M. B. Sarwate
4. Shri Vithal M. Chandavarkar
5. Shri S. M. Ramakrishna Rao
6. Maj. Gen. S. D. Verma
7. Dr. K. S. Krishnan
8. Shri A. K. Ghosh, ICS (Managing Director)

COPPER CONDUCTORS FOR OVERHEAD POWER TRANSMISSION

Copper conductors are being increasingly used in the country for general and rural electrification and indigenous production of these has steadily been increasing. To ensure that the indigenous production of these conductors conforms to all the requirements laid down in the relevant Indian Standard, the Indian Standards Institution has granted, under the ISI Certification Marks Act, 1952 one more licence to the National Screw and Wire Products Ltd., 51 Stephen House, 4 Dalhousie Square, East, Calcutta-1 for the use of ISI Standard Mark in respect of hard-drawn copper solid and standard circular conductors for overhead power transmission purposes, conforming to Indian Standard No. IS: 282—1951. Four licences in respect of hard drawn copper conductors are already in force and this is the fifth licence.

The Standard Mark consists of a monogram of the ISI with the number of the Indian Standard (282) superscribed on the top side.

With the grant of this licence the Institution has covered a major portion of the indigenous production of conductors. Any complaint regarding the quality

of the certified products may be brought to the notice of the licensee, as well as the Institution.

* * * * *

MANUFACTURE OF SPECIAL STEELS

Sardar Swaran Singh, Central Minister for Steel, Mines and Fuel, has announced that plans are in a "fairly advanced stage" for the manufacture of tool, alloy and special steels, and that "we shall be ready to proceed within a few months on the project."

The Minister, who was presiding over the annual general meeting of the Steel Rolling Mills Association of India, has added that "unless we go ahead with this fairly quickly, we shall be depending, even at the end of the Plan, on imports for these steels. It would be wrong to import something that we can make ourselves. The progress of the plants has been so far satisfactory. There have been some delays here and there, but these delays have been inevitable and are insignificant in relation to the size of the problems we have encountered."



MANUFACTURERS
OF

PROFESSIONAL ELECTRONIC EQUIPMENT

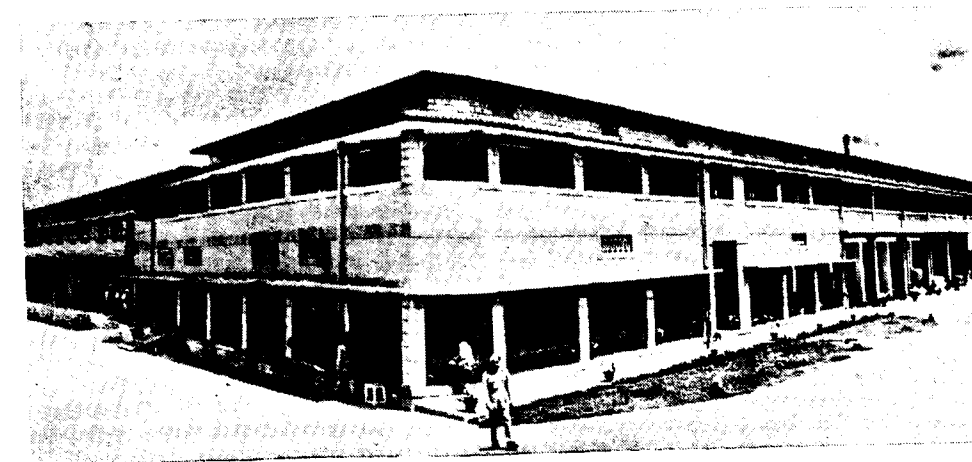
- GENERAL PURPOSE COMMUNICATION RECEIVER -
RU - 536 -

- HF TRANSMITTER -
ET - 402 -

- MANPACK VHF TRANSRECEIVER -
MF - 713 -

- MOBILE VHF TRANSRECEIVER -
MF - 833 -

- RADIO WIND INDICATOR -
ETC.



BHARAT ELECTRONICS (PRIVATE) LTD.

JALAHALLI P. O.

BANGALORE

Government Electric Factory

THE Government Electric Factory was started in the year 1934 for the manufacture of Bakelite articles with a labour strength of 200. Shortly thereafter, manufacture of Transformers which was being carried out earlier in the Electricity Department of the Government of Mysore was shifted to this factory and a regular section for the same was formed. Gradually, other lines of manufacture like the manufacture of Surveying Instruments, Transmission Towers, Line Materials etc., were also added on. At present the factory is employing about 1,000 workers.

The progress of the factory has been phenomenal during the last 4 to 5 years during the course of which the turnover has considerably increased. The production of Transformers which was of the order of 33,000 KVA during the year 1943—44 rose to about 60,000 KVA during 1955—56 and 90,000 KVA during 1956—57 and it reached 110,000 KVA during 1957—58. Likewise, the average turnover which was of the order of about Rs. 15,00,000/- upto 1948—49 rose to Rs. 42,00,000/- in the year 1955—56 and touched the figure of Rs. 67,00,000/- during 1956—57 and the same is likely to be achieved during 1957—58.

Rail Concessions to Blind, T.B. and Cancer Patients—Procedure for Availing of Concession

Some misunderstanding still appears to exist about the procedure for availing of the rail concessions announced by Government some time ago for blind persons and persons suffering from T.B. and Cancer.

Government wish to re-emphasize that in the case of blind persons the concession is admissible for all their journeys. For availing of the concession, blind persons need only produce a certificate from a registered medical practitioner or the head of a recognised institution for the blind or attested copy of the same together with the originals for inspection at the station booking office. The concession will be granted on the authority of this certificate.

In the case of patients suffering from tuberculosis and cancer, rail concessions are available only for journeys undertaken for admission to, or on discharge from, a recognised hospital, sanatorium, or institute. The concession is not admissible to them for journeys in connection with their periodical check up. For

Further expansion of Transformers, Motors and Switchgear manufacture in collaboration with AEG of West Germany is under active consideration of Government. The Scheme contemplates stepping up of production of Transformers to an aggregate of 200,000 KVA per year per shift taking the largest size to 10,000 KVA on 66,000 vs. voltage rating. Besides the manufacture of Motors is also contemplated to produce Motors to an aggregate of 60,000 H. P. per annum per shift, the largest size of the Motor to be produced being 250 H. P. The Scheme also provides for the manufacture of Switchgear and Switch Boards of various capacities and voltage ratings, the highest of all being capable of handling 600 Amps. current on the 11,000 vs. line voltage.

The present strength of the factory which is about 1,000 is expected to be increased by another 500 to 750 employees when the Scheme is implemented.

The factory is meeting the demands of Transformers required by the Electricity Department, Government of Mysore and also of various other States and Private Electricity Undertakings in the Country.

availing of the concession, the patients should first obtain the requisite certificate from the officer in charge of the hospital, sanatorium or institute. Cancer patients seeking admission in a hospital or institute may obtain a certificate from a district medical officer also. The medical certificate should be produced before the authorised railway officers who will then issue necessary letters of authorisation (concession orders) on the stations from where the journey is to commence. Only presentation of these concession orders will the tickets at concessional rates be issued.

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STUDENT CONCESSION SEASON TICKETS— AGE LIMIT NOT TO APPLY TO FEMALES

The Railway Board has decided that the age limit of 25 years imposed for the grant of concessional season tickets to students on the Indian railways will not apply in the case of female students.

CANARA BANK'S PROGRESS

HIGHER EARNINGS

THE 52nd Annual Report of the Directors of the Canara Bank Ltd., for the year ended December 31, 1957 shows a sum of Rs. 11,67,267 as available for distribution against Rs. 8,41,002 during the previous year. Out of this sum Rs. 7,30,000 has been provided for income tax, Rs. 52,500 for payment of preference dividend, Rs. 1,50,000 for dividend to equity-share holders at 10 per cent and Rs. 1,90,000 for payment of bonus to staff. The balance of Rs. 44,767 is carried forward to the next year.

That the bank's financial position is comfortable can be seen from the fact that advances constituted 49 per cent of the deposits against 52.3 per cent, during the previous year. This, it is interesting to note, has not greatly affected the earnings of the Bank, which are higher than the previous year. The Profit & Loss Account shows, on the income side, an increase in earnings from interest and

discount from Rs. 49,54,430 to Rs. 62,06,233. On the expenditure side, interest paid on deposits and borrowing also has increased from Rs. 26,72,825 to Rs. 37,34,219.

The Bank is steadily expanding its activities and in the new State of Mysore, is playing a major role in the provision of credit in rural centres. The year under review witnessed the opening of nine new branches, at Mazagaon & Dadar in Bombay city, at Ulhasnagar in Thana District, at Warangal in Andhra, at Mercara, Tumkur, Gulbarga and Hampankatta (Mangalore) in Mysore State. The Bank proposes to open many more branches during the year. The Bank has always been a source of strength to Government of Mysore in the successful execution of its borrowing programme as can be seen from the fact that last year, a substantial portion of the Rs. 3-Crore Mysore Loan was subscribed by the Canara Bank. Canara Bank can be expected to play a greater role in Mysore's economic development in the years ahead.

METAL TUBE PLANT IN INDIA

It is understood that a Bombay firm proposes to establish a factory for the production of non-ferrous metal tubes. The necessary licence has already been obtained, and negotiations are under way for the purchase of the main press and auxiliary machines for the extrusion plant.

Although the cost of the plant is estimated to be Rs. 12.50 lakhs, the company has been granted an import licence for only Rs. 4.5 lakhs. The promoters, Devidayal (Sales) Private Ltd., have, therefore, approached American and Indian financial institutions for loans to purchase machinery. The demand for non-ferrous tubes in the country is estimated at about 1,800 tons per annum and is expected to go up to 2,700 tons by 1961—62. Cables, for instance, used 8,644 tons in May against 7,899 in April, while off-take for sheet and pipe manufacture rose to 5,648 tons from 5,194 tons. Among declines were batteries, which fell to 2,466 tons from 2,561 tons in April. U. K. exports and re-exports of pig lead in May fell to 1,190 tons from 1,666 tons in April. Those to the U. S. were sharply lower at 150 tons compared with 726 tons in April, while the Union of South-Africa

also took considerably less in May at 76 tons against 250 in April. Stocks of refined lead in the U. K. continued to decline in May to stand at 34,608 tons compared with 37,509 tons a month earlier.

Consumption of zinc (in all forms) in the U. K. during May fell slightly to 24,579 tons from 24,984 tons in April. Exports and re-exports of slab zinc in May amounted to only 111 tons compared with 192 tons in April while U. K. stocks of slab zinc at the end of May totalled 50,539 tons against 47,251 tons a month earlier.

Refined tin usage in May 1,533 tons compared with 1,725 tons in April with off-take by the tinplaters lower at 778 tons against 915 tons in April. Exports and re-exports in May amounted to 924 tons compared with 821. Consumption of cadmium in May was 79.40 tons compared with 80.00 tons in April. There were no exports and re-exports during May whereas one ton was sent overseas the previous month. Stocks of cadmium at the end of May amounted to 231.82 tons against 227.88 tons at the end of April.

GOLDEN RULES OF CONDUCT FOR RAILWAYMEN

1. Do you plan your work daily? Get the more essential things done first and do not neglect the important ones sidetracting them to the fag end of the day.
2. Do not express casually careless opinion. Never venture forth an opinion unless asked for it.
3. Remember that most of our mental worries come either from trying to fight life hard or from trying to run away from life. Do neither.
4. Learn to accept people as they are, Love them, respect them, praise them, encourage them, differ with them, but above all, learn the priceless art of give and take.
5. Cry neither for the moon, nor over spilt milk.
6. Accept the things that you cannot change; have the courage to change the things that you can, and possess the wisdom to know the difference.
7. Do not drive too hard a bargain with yourself.
8. Accept life as it is — its wonders, changes, disappointments, frustrations etc., etc.

INDIA'S AVIATION INDUSTRY or the story of HINDUSTAN AIRCRAFT (PRIVATE) LTD., BANGALORE

INTRODUCTION

THE Second World War gave a great impetus to the advance of technology. And it may be stated, with some authority, that a large share of man's technical effort since, has been devoted more to aviation than to any other single branch of human endeavour. This has been generally true of the industrially advanced west, and in a lesser degree, of an underdeveloped country like India. In common with the rest of world, India seized the opportunity provided by the war. To sustain the war effort and to meet the demands of internal economy, India was compelled to make the maximum use of her internal resources, indigenous skill and enterprise. It was at once an opportunity and a challenge to our industrialists, and they were not slow to respond to the call. Among them was that great industrialist, Seth Walchand Hirachand, who had the foresight and acumen to visualise India as a centre of aviation industry and to lay its foundation. To Bangalore was given the distinction of being the home of the first Aircraft Industry in the East and Hindustan Aircraft Ltd., was established by him on the 24th December 1940 in collaboration with the Government of Mysore. Mr. W. D. Pawley of the Inter Continent Corporation, the well-known American leader in Aircraft Industry, was entrusted with the construction of the plant in Bangalore, and thereby an era of Indo-American co-operation was inaugurated.

HISTORY

Part 1—1940—46.

Shortly after the establishment of the factory, the Government of India became a member of the Company, and a year later the factory was taken over by them completely, so far as the private holdings were concerned. The only two present members are the Government of India and the Government of Mysore. The authorised capital of the Company is Rs. 18 crores. Of the paid up capital

of about Rs. 6 crores, the major portion is held by the Government of India.

The original programme of the factory was the manufacture of Curtiss Hawk Fighters, Vultee Bombers, Harlow Trainers and Allied equipment.

Barely eight months after the inception of the factory, the first aircraft was assembled and flown. And an year later, the first Curtiss Hawk P—36, a single seater fighter monoplane was completed and test flown. Almost at the same time, the first ten-seater Glider, locally designed, was built and test flown, marking a land-mark in Indian aviation. Meanwhile more planes, Hawk P—36 and Harlow PC—5, started coming off the production line. Orders continued to pour in. The U. S. Army Air Force Placed an indent for the mass production of Belly Fuel Tanks for the combat aircraft operating with the allied Air Forces. The factory began to expand with the addition of new equipment, machinery and more men to cope with the increasing programme of work. With this expansion, the factory became the Major Maintenance Base for the Far East with the designation, 84th Air Depot of the United States Army Air Force, for the overhaul of Heavy and Light Bombers, Fighters and Catalina Flying Boats etc.

In 1943 with the war in South East Asia in full swing, the U. S. Army Air Force, faced with colossal aircraft repair and overhaul requirements took over the Management of HAL from the Government for the duration of the war. All aircraft manufacturing programmes were suspended and the factory began to work round the clock in three shifts. The man power strength of the factory reached the figure of 15,000. A separate engine and overhaul department was formed with the target, in due course, to overhaul 300 Aero Engines a month.

As the war against Japan intensified in 1944,

HAL's contribution and importance became enormous and its work elicited the appreciation of the Commander-in-Chief, Allied Air Forces, South East Asia.

With the termination of the war in 1945, the management of HAL reverted to the Government of India. Some idea of the immense contribution made by HAL to the war effort can be gained by the following overhaul figures during the Management of the Factory by the American Army :—

1.	C—47	Cargo Planes	406.
2.	B—25	Light Bombers	374.
3.	B—24	Heavy Bombers	176.
4.		Catalinas	55.
5.		Miscellaneous Aircraft	160.
6.		Aircraft Engines	3,800.

With the end of the war and the consequent curtailment of its activities there was heavy retrenchment in personnel and the future of HAL itself was uncertain.

However, this uncertainty was dissipated by the recommendations of the Aircraft Technical Mission from the U. K. which visited India at the initiative of the Government of India in 1946. In the context of the already existing equipment and facilities, the Mission had no hesitation in recommending that HAL should become the nucleus for the development of aircraft manufacture in India.

Part 2—1946—1953.

With its future decided, HAL began to forge ahead. The first step taken was the formation of a Sales Department and HAL started operations as a commercial undertaking. To start with, an order from the Indian Air Force was received for the repair and erection of 100 Tiger Moth aircraft.

The following year, the year of India's Independence, HAL was recognized at the authorised Douglas Service Centre in India. More orders were received from the I. A. F., this time, for the overhaul of

Dakotas and later for the manufacture of Percival Prentice Trainer Aircraft.

At the same time a full fledged Engineering and Design Department was formed at HAL with the appointment of Dr. Ghatage as Chief Designer, who set about organising the Department in right earnest.

The following year (1948) constituted another landmark in the development of the factory when it took in hand the designing of its own Trainer aircraft, designated H. T.—2. And the following year, the first Indian built Percival Prentice was test flown while H. T.—2 wooden mock-up was completed. In the same year HAL, in addition to installing a pressurised cabin in a Dakota for the use of the Deputy Prime Minister, the late Sardar Vallabhai Patel, converted two I. A. F. Dakotas as Flying Navigational Class Rooms. Another item of work undertaken by HAL for the I. A. F. was the modification of a Dakota as a Target Towing Aircraft for gunnery practice.

In 1950, HAL was admitted as a Member of the Society of British Aircraft Constructors. This year marked another stage in its expansion with the inauguration of the Apprentice Training Scheme to cater to the increasing requirements of technical and skilled labour to man the different sections in the factory. At the same time HAL placed its facilities at the disposal of the I. A. F. for short term training of their technicians.

1951 marked another notable step forward in the development of the industry with the building and erection of Jet Fighter Aircraft entrusted to it by the I. A. F.—A technical Liaison Staff from De Havillands was posted at HAL to co-ordinate its jet aircraft production. The first jet aircraft was assembled and test flown in March of that year by Capt. Munshi. The first HT—2 prototype made its first public demonstration in August. At the same time the mock-up of an advanced trainer aircraft was also undertaken; while the Prentice programme entered a new stage—being built from HAL manufactured jigs and tools.

On the side of training, a 'Training within Industry' scheme, under the auspices of the

International Labour Organization was introduced at the upper level of Management with the intention ultimately to extend it to all supervisory personnel. Also Engineering Designers and technicians were deputed to the U. K. to familiarise themselves with the latest production methods in use in U. K. factories.

In 1952 the second prototype of the HT—2 was test flown. More and more special conversion of Dakotas for the I. A. F. were undertaken while Aerial Survey Camera modifications were carried out in one Liberator and three Dakota aircraft.

Part 3—1953 and onwards.

1953 may rightly be described as the year of the H. T.—2. The First Type Certificate in India was presented to H. T.—2 by the Director General of Civil Aviation. Six H. T.—2s flew past before the President of India in New Delhi on 26th January 1953, India's Republic Day. An HT—2 went overseas for the first time to participate in the Ceylon Air Rally in August that year.

The year also marked the completion of the manufacture and delivery of Percival Prentice Aircraft to the I. A. F. The first amphibian aircraft was received from the Navy for repair, while ten Dakotas were overhauled and converted in record time to enable the commencement of the air lift of Haj pilgrims by Indamer Company, Bombay.

Also the first *Jet fighter manufactured by HAL* was successfully test flown and delivered to the I. A. F. HAL now was awarded the Service Station Certificate for American aircraft by the U. S. Civil Aeronautics Administration and thereby became the first organisation in Asia to achieve this distinction.

During the period 1955—57 HAL turned its attention overseas with a view to exploring market possibilities for its Trainer aircraft, the HT—2 which had entered the stage of commercial production.

In November 1955 an HT—2 from Bangalore covered the countries of Burma, Thailand, Cambodia, Singapore and Malaya on a demonstration tour,

flying 4,000 miles in 54.8 hours which included 16 hours for demonstration. Wherever it went, the HT—2 created a big impression and HAL is hoping to market in due course, the HT—2 in this far flung territory. Already Singapore is using an HT—2 for its training programme with an Indian Instructor, under the Colombo Plan. Australia too has evinced interest in this aircraft and an HT—2 is now visiting Australia and New Zealand on a demonstration tour.

Last year (1957) Licence negotiations were completed with Folland Aircraft Company for the manufacture by HAL of Britain's latest Light Jet Fighter, the 'Gnat'. Arrangements were also finalised in collaboration with the Bristol Aero Engine Company for the manufacture of Jet Engines, the first of which will be the 'Orpheus'. A team of British experts arrived in Bangalore and a few HAL engineers were deputed to England to familiarise themselves with the production aspects of the Gnat and the Orpheus. Thus on the foundation stone that was laid 17 years ago, now stands a huge edifice which is bound, as years advance, to add to itself new wings and new columns. To-day HAL has come of age and stands poised at the threshold of a new era in its history—jets and who knows missiles too!

BRANCHES OF THE FACTORY AND THEIR FUNCTIONS

Some idea of the pace of development and the growing sphere of its activities can be gained from the foregoing historical narrative of the factory. It would be seen that her manufacturing projects have tended to grow and her repair and overhaul activities have also been increasing pari passu. Apart from serving as the main overhaul base for internal, Service and Civil aircraft, HAL has all along been also the pivotal point in the East for the repair and overhaul of aircraft from our overseas customers like Ethiopia, Saudi Arabia, Afghanistan, Iran, Ceylon, Burma, Indo-China etc. This branch of her activity is tending to grow rather than diminish.

In order therefore to cope with the mounting demands upon its services, HAL, even as early as 1952, had to initiate a new organisation to lessen its work-load at Bangalore. In that year, a branch of the factory was set up at Barrackpore, near Calcutta, as the first measure of the eventual bifurcation of

the two activities—Manufacture and Overhaul. The choice of Barrackpore was influenced by its proximity to our neighbours in South East Asia. This branch has been functioning mainly as an overhaul base for civilian, internal as well as overseas, and Service Aircraft. For the convenience of overseas operators there is an arrangement whereby overhauled engines can be despatched in advance of receipt of repairable units. The work at Barrackpore has been steadily growing and the time is not far off when the entire work of overhaul will be shifted to Barrackpore.

It may be mentioned in passing that two administrative branches of HAL are functioning, one at Calcutta and the other at Madras, whose main job is customs clearance.

This apart, in view of its close connection with the IAF on the manufacturing and overhauling sides, HAL has been maintaining, since 1948, its own technicians for the servicing and maintenance of service aircraft at the following IAF bases—Poona, Jodhpur, Agra, Barrackpore, Jorhat, Begumpet and Cochin (Naval air Wing).

To forecast that as the industry continues to expand itself its functions will become so variegated as to entail the widest possible dispersal of its activities, is no idle prophesy. In fact a position has been reached in the aircraft industry elsewhere in the world where aircraft factories are fast becoming exclusive units of assembly alone. The practice is to allot to sub-contractors the manufacture of major components including even sheet-metals together with specifications. It is not uncommon in the West today to see that an aircraft manufacturer is not much more than a "technical library" holding patent rights over his designed aircraft, almost the entire work of manufacture being distributed among specialised units. Until such time as these ancillary industries are established in India which can undertake the production of the various components, specialised and proprietary, HAL has perforce to continue as a comprehensive self-contained unit that it is today. But such a diversification has, however, to come about sooner or later.

WORKSHOP SERVICES

Apart from being unique in itself as the only one of

its kind anywhere in the East, HAL is also unique in that, unlike anywhere else in the West, it is a comprehensively self-contained unit, performing within its precincts, the functions of repair, overhaul and manufacture. As it has developed, it has equipped itself with all the ancillary workshops necessary, with the most up-to-date facilities and with skilled and highly experienced technicians in charge, for the repair, overhaul, erection and manufacture of aircraft, aero engines etc. Except for a small number of proprietary parts which have either to be purchased locally or imported from abroad, every repair or overhaul or manufacturing project, be it major or minor, is completed within the factory itself by its own workers and technicians with the available tools and raw materials.

Our manufacturing processes (manufacture of aero engines excluded) cover a considerable field and a wide range. Most of our airframe parts are manufactured from imported sheets of Duralumin (U.K.) or Alclad (US) as well as from supplies locally available. We make our own light alloy castings at our foundry for airframes. From imported plastic sheets we manufacture our own canopies. Landing legs (Oleos) for our trainer aircraft are also made by us. Also we make our own tools and jigs. Jig making is a special art and by making our own tools and jigs we have obviated reliance on imports of such items.

Manufacture is carried out to meet international standards and specifications, and inspection is thorough and rigorous. The Chief Inspector responsible for the final check is an autonomous official responsible only to the General Manager.

There are different shops performing different functions. To list a few, they are, the Machine Shop, Finishing, Wood, Rubber, Plastics, Tool rooms, Radio and Radar and Accessories and Foundry. The Machine shop is in a position to manufacture practically the major portion of components for the repairs of planes, engines etc. The Finishing shop gives the final touches like chromium plating, painting, electroplating, etc. In the Wood Workshop, complicated wood work required for Vampires and other aircraft is done. The same is the case in regard to Plastics, and as mentioned earlier HAL is probably one of the few factories in the World which manufacture their own plastic items as well as batteries for their own aircraft.

Special mention of the foundry at HAL is called for. In the last few years there has been developed an up-to-date foundry which has been producing all kinds of ferrous and non-ferrous castings for aircraft like Vampire, HT-2 etc., and rail coaches. Not only the castings but also the patterns are made at the foundry. The requisite alloys both of aluminium and magnesium are entirely produced at the foundry. One of the outstanding developments in the foundry of immense potentiality and value is the introduction of the light alloy forgings for which the machinery is now being installed. Expected to be the foremost plant of its kind in this country its contribution to the aircraft industry is bound to be far-reaching. The foundry is making ferrous as well as non-ferrous castings for the production requirements of Hindustan Machine Tools, Bharat Electronics, etc., sister concerns owned by the Government of India. In fact the foundry's contribution to these two concerns is shortly to be stepped up from the present supply of 50,000 lbs. of castings to 80,000 lbs.

The Engine Overhaul section carries out the complete servicing of engines of the Propeller type while the Overhaul and Vampire sections undertake all the various tasks ending with final assembly.

MAINTENANCE SERVICES

In fact no visitor to the factory would fail to be struck by the manifold services rendered by the different workshops and the way they are run by the maintenance services in the factory. Installation, renovation and general day-to-day maintenance of a variety of machinery, mechanical, pneumatic or electrical, as well as checking up for snags and defects and rectifying them are the main functions of these services. These services are helped by the HAL Foundry, the machine, finishing and other shops in getting components made.

On the electrical side, in addition to wiring and installation of electrical services, repairs requiring skill of a very high order such as winding of motors, repairing and servicing of meters are done by the maintenance services. At the same time all the mobile equipment

such as cranes, fork lights, mobile generators etc., are completely serviced by the maintenance department.

The transportation section similarly is self-sufficient for all repairs and overhaul.

Before we close this section, it would be of interest to the reader if we state that the current prices of our services compare very favourably with, and are in fact, much cheaper than similar charges abroad. The same is also true of our Trainer aircraft the HT-2 and the Vampire which are far cheaper than the prices of their overseas counterparts.

When it is considered that the engines as well as a few specialised components have to be imported the attractiveness of the Indian prices will be immediately obvious.

FACTORY ADMINISTRATION - SOME ASPECTS

A narrative like this would be incomplete without a brief mention of what part the latest concepts in factory administration play in HAL. It may be pointed out that in the Post Independence era there has been new thinking in India on the question of a re-orientation of the methods of business administration in the context of the rapid industrialisation of what had been, up to now, a predominantly agricultural economy. A lead in this sphere has been given by HAL whose management have contributed, in a large measure, to the setting up of the Institute of Industrial Management which is a country-wide organisation in India, and is a forum for the exchange of views and information on how best to run an industrial undertaking.

Another innovation made by HAL in keeping with modern trends is the *mechanisation of its accounting procedure*. In democratic countries where the nationalisation of important industrial concerns is coming to be accepted more and more as a basic principle of policy the question of running them on sound commercial and economic lines has become imperative. It has therefore become very necessary to pre-determine the costs of such undertakings and to ensure that such

INDIAN STEEL WORKERS VISIT UKRAINIAN FACTORIES

Fifty metallurgical engineers from India are receiving training at the iron and steel works in the Ukraine. One of the groups is at the Azovstal Metallurgical Plant, another one is at the Yuzhnogorny concentration plant in Krivoi Rog, and the third at the Zaporozhstal Works in Zaporozhye.

For six months the Indian steel experts are to get first-hand information about the blast furnaces, open hearths, rolling mills, dressing plants, factory railway transport and the system of department administration.

costs are carefully checked and controlled when they go into production. HAL has in operation a sufficiently comprehensive costing and cost-controlling system aided by the latest automatic machines.

TRAINING

As referred to earlier in this article, the Apprentice Training scheme which was inaugurated eight years ago is forging ahead. Particularly in an industry like that of HAL, it has been found advantageous to train its own technicians under various apprentice schemes which are pre-planned and which also include training in various other technical institutions in the country.

The training programme is being stepped up further with the opening very shortly at HAL of a Training School and Hostel for the accommodation of the trainees. The new programme has been so designed as to ensure that there is a steady supply of well trained technicians to meet the needs of future expansion and to make available the right type of technicians who are to be recruited every year.

Also in vogue for about seven years now, the "Training within Industry" programme is also making steady progress. Introduced first under the auspices of the International Labour Organisation, it originally covered the upper level of management percolating gradually thereafter down to the supervisory personnel.

Lastly a word about *welfare amenities*. In common with other modern industrial organisations, these amenities at HAL too, cover housing (not all inclusive as yet) schools, recreation facilities, medical attention, markets etc., etc. But one distinctive feature of the welfare services at HAL which is not found anywhere else is the provision of what is described as the 'Death Relief Fund'. Any employee who dies while in service, as a result of his membership of the fund, is entitled to the benefit of a cash grant of Rs. 1,000/- to his family immediately on his death to help them perform the obsequies etc. This is a boon especially in the case of indigent workers and their destitute families.

HAL'S OUTSTANDING CONTRIBUTION— THE HT-2.

While as a result of historical circumstances, HAL's main contribution has lain in the field of Defence, its chief claim to recognition in the sphere of aircraft production is based on its HT-2, a modern, basic,

all-metal trainer aircraft which has made a name for itself among its training compeers elsewhere in the world. HAL, had of course, previously manufactured, under license, the Percival Prentice Trainer, but as already mentioned the HT-2 was the first trainer aircraft designed and developed entirely in India by HAL under the able and eminent direction of Dr. Ghatage. This aircraft is now in service not only with the Indian Air Force and the Indian Naval Air Arm but also with the Civil Aviation Establishments in India as well as Flying Clubs. The Civil Aviation Training Centre at Allahabad, has already purchased 9 HT-2s and is expected to order for more; while the Indian Navy have already acquired initially three HT-2s for their training programme. Lately the Hyderabad Flying Club has acquired an HT-2 for its training programme, the first Flying Club in India to do so. As already pointed out, an HT-2 is now in service with Singapore, under the auspices of the Colombo Plan. Sturdy in construction and aerobatic without restrictions, the HT-2 has proved, in practice, to be one of the best aircraft of its class from the point of view of easy and economical maintenance and operation.

HAL'S CONTRIBUTION TO THE DEVELOPMENT OF CIVIL AVIATION

In yet another sphere, HAL has played a notable role—the development of Civil Aviation in INDIA owes not a little to the considerable assistance given to it by HAL. In fact, it is not too much to claim that Civil Aviation in India owed its early growth largely, if not entirely, to the part played by HAL in providing it with a nucleus of aircraft, overhauled and suitably converted for internal civil air transport.

It will be recalled that with the termination of the war, army Dakotas rendered surplus were acquired by the newly formed internal Civil Airlines in India and all these aircraft which had been in different stages of repair, were completely overhauled and converted into passenger airliners. Every aspect of Dakota conversion was handled by HAL including even the manufacture of seats and fittings as well as the overhaul of engines, propellers, radio instruments etc. The rapid development of Civil aviation in India has thus been largely due to the work that HAL has been able to accomplish.

Although strictly speaking no new aircraft were manufactured by HAL in the field of Civil Aviation, (apart, of course, from the HT-2 for training purposes) the work of conversions and/or overhaul of

both planes and engines carried out by HAL, to enable such aircraft to obtain certificates of airworthiness, have been an equally vital or greater contribution to the development of Civil Aviation in India. In addition, special Deluxe conversions of aircraft formerly owned by many Maharajas were carried out by HAL and most of these are now in service with a few private operators in India.

Some idea of the general work of overhaul and conversion during the last 12 years by HAL can be gained from the statistical details given below. The types of Civilian aircraft handled by HAL have been as follows:—

- | | |
|---------------------|----------------------|
| 1. Dakota, | 9. Tiger Moth, |
| 2. HT-2, | 10. Chipmunk, |
| 3. Stinson, | 11. Aero 45, |
| 4. Aeronca, | 12. Harlow, |
| 5. Bonanza, | 13. Noordyne, |
| 6. Lockheed Hudson, | 14. Grumman Goose, |
| 7. Dove, | 15. Fairchild Argus. |
| 8. Beechcraft, | |

Of these types it may be stated that Dakotas have accounted for the largest number of overhaul/conversions, say 90% and over, followed way below by Tiger Moths. All the other types of aircraft, put together, did not account for more than an infinitely small percentage.

ENGINE OVERHAUL FOR CIVIL USE

The following types of engines have also been overhauled at HAL for Civil use in the period 1946—58:

1. Pratt & Whitney R. 1830—92
14 Cylinder Radial Engine,
2. D. H. Gipsy Major,
3. D. H. Gipsy Queen,
4. R. 985
5. Cirrus Major and
6. Continental.

Just as Dakotas have formed the largest single type of planes overhauled by HAL, so also the largest single type of engines overhauled has been the Pratt & Whitney R. 1830—92 which power the Dakotas. Out of a grand total of 2493 of all types of engines

overhauled at HAL, the R. 1830—92 alone accounted for 2519; Gipsy Queen 302 engines have accounted for 36 and Gipsy Major 30; and Gipsy Queen 70, six.

CONVERSION FOR CIVIL USE

In the last 12 years, (1946—58) the total number of conversions carried out by HAL has been quite considerable—62 for internal operators and 17 for foreign customers. As already mentioned, leaving a few other types, the largest number of conversions has been carried out on Dakotas including De-luxe conversions for VIP's.

To restate the position in a nutshell—during the years 1946—58, a total quantity of aircraft of all types overhauled etc. has been 429; conversions 79 (both internal and external) and engines of all types overhauled, 2593.

Detailed figures are as under:—

Statistical table of Major overhaul work carried out by HAL between 1946 & 58.

(1) MAJOR OVERHAUL WORK OF DAKOTA AIRCRAFT AT H. A. L.

Period	Over- hauled.	Re. C. of A.	Check Inspection	Trainer Aircraft Tiger Moth. HT-2.	
1946-47	41	—	—	—	—
47-48	38	29	—	2	—
48-49	14	38	—	13	—
49-50	3	38	—	7	—
50-51	7	37	—	8	—
51-52	1	28	—	—	—
52-53	—	12	—	—	—
53-54	10	11	—	—	—
54-55	—	17	1	—	—
55-56	—	15	5	—	—
56-57	—	13	15	—	—
57-58(9)	—	8	6	—	—
	114	246	27	30	12 **

** The 12 H. T.-2 represent the number of such aircraft built and delivered for Civil use.

(2) ENGINES (CIVIL) OVERHAULED AT HAL

Period	P & W.R. 1830-92	DH Gipsy Major	D.H. G.Q. 70	R. 985	G.Q. 302
1946-47	142	—	—	—	—
47-48	237	—	—	—	—
48-49	260	—	—	—	—
49-50	249	6	—	—	—
50-51	336	8	—	—	—
51-52	392	12	4	—	—
52-53	158	3	2	—	—
53-54	179	—	—	—	—
54-55	163	1	—	—	—
55-56	111	—	—	—	—
56-57	204	—	—	—	21
57-58(9)	88	—	—	2	15
	2519	30	6	2	36

(3) NO. OF CONVERSIONS CARRIED OUT BY HAL FOR CIVIL USE

Internal 62 (1946-1958) Foreign . 17.

RESEARCH AND DEVELOPMENT

The root of all technological growth is Research which is the very-life-blood of industry. And especially, no aircraft industry can survive which does not pay special attention to research and development. Although the aircraft of to-day is a highly variegated and inevitably complicated mechanism, the main stages of its production are fundamentally three: Design, Development and Testing. Keeping this objective very much in the forefront as has already been mentioned, HAL had, as early as 1947, set up a full fledged Engineering and Design Department with Dr. Ghatage as Chief Designer. The Design and Development wing has on its staff a seasoned hand of highly qualified engineers and experts many of whom have had the benefit of training in foreign countries and whose efforts have already contributed not a little to the rapid development in the field of designing. As one example, the HT-2 has been the product of continuous research and development over the past several years.

Recently, placing an even greater emphasis on the importance of designing, HAL has engaged a team of aeronautical experts from abroad under the leadership of an eminent German aircraft designer,

Dr. Kurt Tank, as part of its plans for the strengthening and expansion of the design and development organisation in the Factory.

On the side of research, HAL has the advantage of being able to work in close collaboration with the Aeronautical Engineering Department of the Indian Institute of Science which is also located at Bangalore. This has enabled constant interchange of ideas and data between the two organisations to their mutual advantage, particularly in regard to research and development in the field of Aerodynamics and Airplane Structure. For instance, there has been close collaboration between the two organisations in carrying out the wind tunnel tests on the design of HAL's model, HT-2. The provision of another large tunnel, spinning and high speed tunnels and a structures Laboratory at the Institute of Science are bound to be of even greater benefit to HAL.

HAL is also collaborating similarly with several other important development and research institutions all over the country.

In this context, it would be useful to make a special reference to the notable contribution made by the Foundry at HAL to aircraft production. For example mention should be made of the introduction of the DTD 300—11% Mg-Aluminium Alloy casting for the first time at HAL. The production of this Alloy and the casting technique required in order to obtain castings of class one category, have been quite a problem even for those who have been concerned in the production of such castings, over a considerable period. Even to-day a good deal of research and experimentation is being extensively carried out in the U. K. and other foreign countries in this regard. But, in spite of all its limitations, the HAL foundry has been successful in producing this alloy as well as castings in this Alloy. The Foundry also has produced not only Vampire castings but also the patterns required for the production of Vampire castings besides the patterns and castings for HT-2 and other miscellaneous aircraft.

HAL has in addition its own fully equipped Test Laboratory. It controls the entire sphere of activity—from purchase to production. Testing of raw materials to purchase specifications, control of the processes employed for the manufacture and testing of the final product to service standard—all these comprise the day to day functions of the Laboratory. The Laboratory is also useful in finding out ways and

means to anticipate and prevent operational troubles, to improve the manufacturing processes and techniques and to develop new uses for existing materials, products and services.

In this way the Laboratory analyses all processes and lays down specifications, while standards are set for all techniques. It works in co-ordination with the Manufacturing shops.

Work for the Laboratory flows in from almost all departments of the factory. The Finishing and Quality Control Departments call for process checks, while metallographic and X-ray examination of parts from the Foundry, Sheet Metal, Heat Treat and Engines are a regular feature. The testing of raw materials is another vital function undertaken by the Laboratory.

The Factory has in addition, its own experienced Test Pilots and its own airport and Sea Plane landing base.

Having described the Research, Development and testing aspects of aircraft manufacture at HAL, it would not be out of place to say a word about the production set-up. Each manufacturing project is fully preplanned from all the production aspects such as process planning, material planning, time control and so on. This, therefore, makes it possible for the factory to embark on any new project on a pre-determined basis as is the case elsewhere in industrially advanced countries for the manufacture of equipment under modern production line methods.

FUTURE PRODUCTION PLANS

From now on, the main emphasis at HAL will be on MANUFACTURE—writ large. The function of repair/overhaul is to be eventually concentrated at Barrackpore. In fact with the growing stress on manufacture, a position is visualised when in due course the work of overhaul/repair may be distributed among sub-contractors as suitable ancillary industries spring up.

The latest production picture is, that apart from the HT-2 which has been under commercial production for some time now, D. H. Vampire Jet Fighters as well as Trainers are rolling out of the Factory's production line for the IAF.

As for the future, keeping in step with the latest developments in the field of aviation production, HAL

will shortly be launching upon a new line of manufacture—more up-to-date jet fighters. As already referred to plans have been finalised for the production under licence, of Folland's modern light jet fighter, the 'Gnat' and its power plant, the Bristol Orpheus Jet Engine. The factory buildings for these two projects are fast nearing completion. Preliminary work is already under way and production plans are being co-ordinated with the team of Bristol experts now on deputation to the Factory, and according to present expectations, the first Indian built 'Gnat' and the Orpheus Engine will be available within the second five year plan period itself, that is by about 1961.

At the same time plans having already been finalised, work is progressing steadily on the development of an advanced Jet Trainer, a modern medium transport aircraft etc.

But simultaneously with its programme of manufacture there is no doubt that HAL will continue to function, in the future, as in the past, as the main repair and overhaul organisation of aircraft—Military and Civil—Indian and overseas—in this part of the world.

CONCLUSION

In the short span of seventeen years, from being a repair, overhaul and assembly depot, HAL has grown into an important unit of manufacture, unique of its kind anywhere between Cairo and Tokyo, to meet not only the Defence and Civilian requirements of India but also to market some of its products overseas and make its specialised services available to overseas customers. It has, over the past several years, acquired a reputation and set up a tradition which have assured for it a high place among the aircraft industries of the world.

For HAL, the future is full of promise and opportunity. As its manufacturing activities expand and new projects succeed another, it is to be hoped that it will be enabled to take its due place and play its part in world commerce—commercial aircraft production.

Fifteen years later, the clock is coming a full round again to-day with the man-power strength of the factory standing at nearly 12,000; and as the factory expands, the peak figure of 15,000 reached in 1943 bids fair to be eclipsed and even surpassed. The main factory today extends over hundreds of acres of

land and hundreds of new acres are being added to it. New buildings to house new projects are fast springing up and within the next few years, with a huge housing colony accommodating all its thousands of employees within its periphery, Bangalore is destined to become the biggest aviation city anywhere to be found in the East.

In no other field of human endeavour in India has there been such a phenomenal evolution as in the case of our aircraft industry, which in step with the rest of the world, has now entered the era of jet production. So bewilderingly rapid and so sudden are the changes that are overtaking this industry that it seems that even the jet age itself may soon become obsolete, as the age of missiles and rocket propulsion is not far off. So in the coming years, India's Aircraft Industry will have all its resources fully stretched and all its energies fully bent upon keeping abreast of the latest developments in the field of aviation. Consequently, it is not too much to say that HAL will be one of the most vital national organisations in India giving full scope for the free play of indigenous initiative and enterprise and destined to play a major role in the future of India.

RAILCOACH AND BUS BODY

MANUFACTURE AT HAL

In yet another important sphere of national production, namely, surface transport, HAL has been making a very sizable contribution—the manufacture of all metal Railway Coaches for the Indian Railways—a revolutionary development unknown before in India. HAL's decision to embark on this new subsidiary project was approved by the British Technical Aircraft mission in 1946 along with its recommendation that HAL should be developed into a centre for future aircraft production in India.

By and large, in the west, Railway Coach construction preceded aircraft construction whereas HAL starting from aircraft construction took up railcoach manufacture. Thus it was able to apply aircraft

design principles to railcoach building. The extent of HAL's contribution to India will be appreciated when it is realized that immediately after World War II the coaching stock of the Railways had dwindled to a parlous state leading to lack of adequate trains, overcrowding etc. By its newly designed railcoach perfected in consultation with the Railway Board, HAL has ushered in a renovation in Third Class Travel on Indian Railways and travel by these coaches is comfortable to the point, one may say, of luxury.

As many as one thousand coaches and over have so far been produced by HAL and are operating with the Railways. The present production capacity of the factory is 18 coaches per month which is to be stepped up to one each per day.

The Production of military coaches is also under way.

The next project under HAL's programme of expansion is the manufacture of broad gauge integral coaches in collaboration with M. A. N., a leading railcoach manufacturing firm in Germany. It is expected that within the next five years, HAL would be turning out 300 coaches per annum. The first integral coaches are expected to roll out of the production line at the rate of five coaches from October, 1958.

It may be mentioned that HAL has been a pioneer in this sphere of transport as well as in aircraft construction. The Integral Coach Factory at Perambur which has only recently come into the picture is producing coaches according to a Swiss design.

Linked-up with railcoach manufacture, HAL has been producing pre-fabricated all metal bus body-kits for the various major Road Transport Organisations in India. HAL was until recently producing buses, single and double deckers, out of these pre-fabricated kits but has now given over this line to other firms under Licence Agreements in order to accommodate its other future development plans.

7,000 TRAINS RUN DAILY IN INDIA

About 7,000 passenger and goods trains run daily in India, traversing distances aggregating an average of 562,000 miles per day—or equivalent to more than 400 rail journeys between Delhi and Madras. The trains worked "harder" during 1956-57 (the latest year for which figures are available) than in any previous year in their history. Passenger trains alone "did" 325,000 miles daily, goods trains putting in another 237,000 miles daily. Together, they covered the equivalent of 25 journeys round the globe at equator, every single day, all through the year.

Research Brings Many Improvements To U. S. Railroads

RESEARCH conducted by railroads of the United States has resulted in a steady flow of technical improvements. These improvements have produced railroads vastly superior to those of half a century ago, and intensified research is bringing about still further advances.

So wide in scope is railroad research that it is almost impossible to define its limits. Just as the railroads draw upon practically every section of American industry for their materials and supplies, so do they also cooperate with many industries in carrying out technological development.

A striking example of inter-industry cooperation on railroad research is the development of the diesel-electric locomotive. This relatively new type of locomotive, which is now replacing steam locomotives, is saving U. S. railroads million of dollars annually in operating costs.

The metals industry, by creating strong light-weight alloys, made it possible to build an engine of adequate power within a locomotive size limited by roadway clearances. The automobile industry, using advanced designing, developed the modern diesel engine used in the locomotive. The electrical industry perfected the electric generating the motor-drive equipment. The combination of these and other developments, through cooperation between the railroads and other American industries, eventually resulted in the production of today's efficient diesel-electric locomotives.

What is being done currently in railroad research? With hundreds of specific projects being carried on, any brief answer must of necessity cover only a few significant developments. Following are some of the high points:

Rails—Since breakage of rails had been definitely controlled through improved metallurgy, the "controlled cooling" process for eliminating shatter cracks and the development of detector cars for track inspection, research engineers are now turning their attention to one of the most troublesome parts of track structure—rail joints. New joint bar designs have recently been developed and are being tested. Lubricants to reduce corrosion between the joint bar and the rail are being investigated. Welding processes for

building up battered rail ends have been developed.

But more important, perhaps, is a study under way to cut the number of rail joints in half, with a consequent large saving in trouble and maintenance costs, by doubling the present standard length of rails from 39 to 78 feet.

Locomotives—While improvement work on diesel-electric locomotives continues steadily, four new types of locomotive power are occupying the attention of research engineers. These are the oil-fired gas turbine, the coal-fired gas turbine, the steam turbine, and the Ignitron electric locomotive.

The oil-fired gas turbine is relatively new, and ten of them are now being tested under service conditions. The coal-fired gas turbine is a long-range research project. A pilot model of such a turbine has been developed and is now being operated in a test plant, burning pulverised coal and delivering the hot gas steam directly into the turbine rotor. The primary problem in this project is that of removing the larger size particles of flying ashes and burning all the fuel particles in the combustion chamber before the gas stream enters the turbine.

The steam turbine, already in use on railroads on a trial basis, is being further developed by a number of co-operating companies. With steam turbine and electric drive, it marks an abrupt departure from the conventional steam locomotive.

Devices installed in Ignitron electric locomotives make possible the large-scale conversion of alternating current to direct current without any mechanically moving parts or heavy loss of energy. Large mercury-arc rectifier tubes make this possible. Since alternating current is best for motor-drive equipment, this type of locomotive is expected to fill the need for an efficient electric current converter.

Cars—Current research on passenger cars is directed chiefly toward developing improved control of temperature and humidity in air-conditioned cars. In connection with freight cars, many separate research projects are under way to improve those parts which are now subjected to greater stresses due to present-day higher speeds and heavier loads.

A large number of investigations are going on to develop better refrigeration for perishable goods such as fresh fruits and vegetables. More efficient mechanical refrigeration equipment is being developed and, at the same time, conventional icing methods are being greatly improved. New methods are being used to circulate air within cars. New and more effective non-inflammable insulation and heat and sun reflecting paints for car exteriors are being tested.

Signalling and Communications—In the field of signalling, such recent developments as centralised traffic control, automatic train control, cab signals and automatic block signals have contributed immensely toward increasing railroad operating efficiency, safety and economy. They are being

steadily improved.

The same is true of communications. Radio is becoming an important part of operations and the number of radios in use on trains, in yards and terminals, and at wayside stations is steadily increasing, totalling almost 10,000 at present as compared with only 4,100 two years ago.

With so many research projects under way in so many fields, it is obvious that the cumulative total of railroad improvement and development work is very extensive. And each change begets others, requiring still further study and investigation. The American railroads, in short, are engaging in research as never before, for as technology progresses, more and more research is required.

NO VICTIMISATION OF RAIL EMPLOYEES—MINISTER REFUTES CHARGES IN RAJYA SABHA

The Railway Minister, Shri Jagjivan Ram, strongly repudiated charges of victimisation by the Railway Board of its employees for political and trade union activities.

Shri Jagjivan Ram, who was replying to the debate on the Appropriation Bill in the Rajya Sabha, said, "We do not victimise employees for political activity. We punish them for political activity."

The Railway Minister said that any citizen who chose to join Government service "should know, and knows", that his citizenship right was abridged to a certain extent—that, whatever be his political belief, he should not take part in political activity.

During the debate Shri Jagjivan Ram referred to the plea for participation of labour in the management of railways, and said that he was pursuing the proposal to set up joint committees at all levels.

The Railway Minister scouted suggestions for the creation of zones on linguistic and State basis and said that such a step would create an impossible situation.

Shri Jagjivan Ram was also emphatic in rejecting a plea for Statewise representation on the Railway Service Commissions.

The Railway Minister once again pleaded that he would not be able to completely eliminate overcrowding during the Second Plan period. The position, he, however, assured would improve. The Railway were paying more attention to sections and areas where there

was chronic overcrowding.

About track renewals, he said, within the available resources, the Railways would take up such renewals as were possible so that the speed of the trains was maintained.

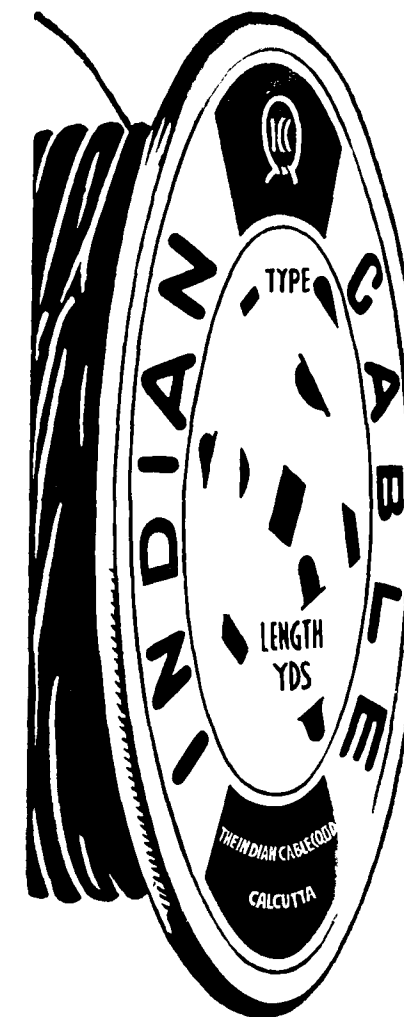
The Railway Minister assured that the Railway Board was trying its best to see that the vacancies reserved for Scheduled Castes and Scheduled Tribes were filled up by the candidates belonging to those communities.

DIESEL ENGINES FOR RAILWAYS— TENDERS CALLED

The Railways Minister, Shri Jagjivan Ram, said in the Lok Sabha that the Government had invited tenders from various countries for purchase of diesel locomotive engines and also for manufacture of diesel locomotives in India in collaboration with private firms of the Government.

Shri Jagjivan Ram, who was answering supplementaries, said that after the quotations were received the Government would decide whether the manufacture of diesel engines should be in the private or the public sector.

Earlier, Shri Shah Nawaz Khan, Deputy Minister, told Shri G. P. Sinha that the Government had placed orders for 100 locomotives. The Tata Locomotive Works were not manufacturing diesel locomotive engines at present.



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CLEANLINESS LEADS TO HEALTH AND HAPPINESS

Clean orderly habits contribute to general health and welfare and as such to happiness and prosperity; they are more important than medicines.

Cleanliness prevents disease; medicine only attempts to cure.

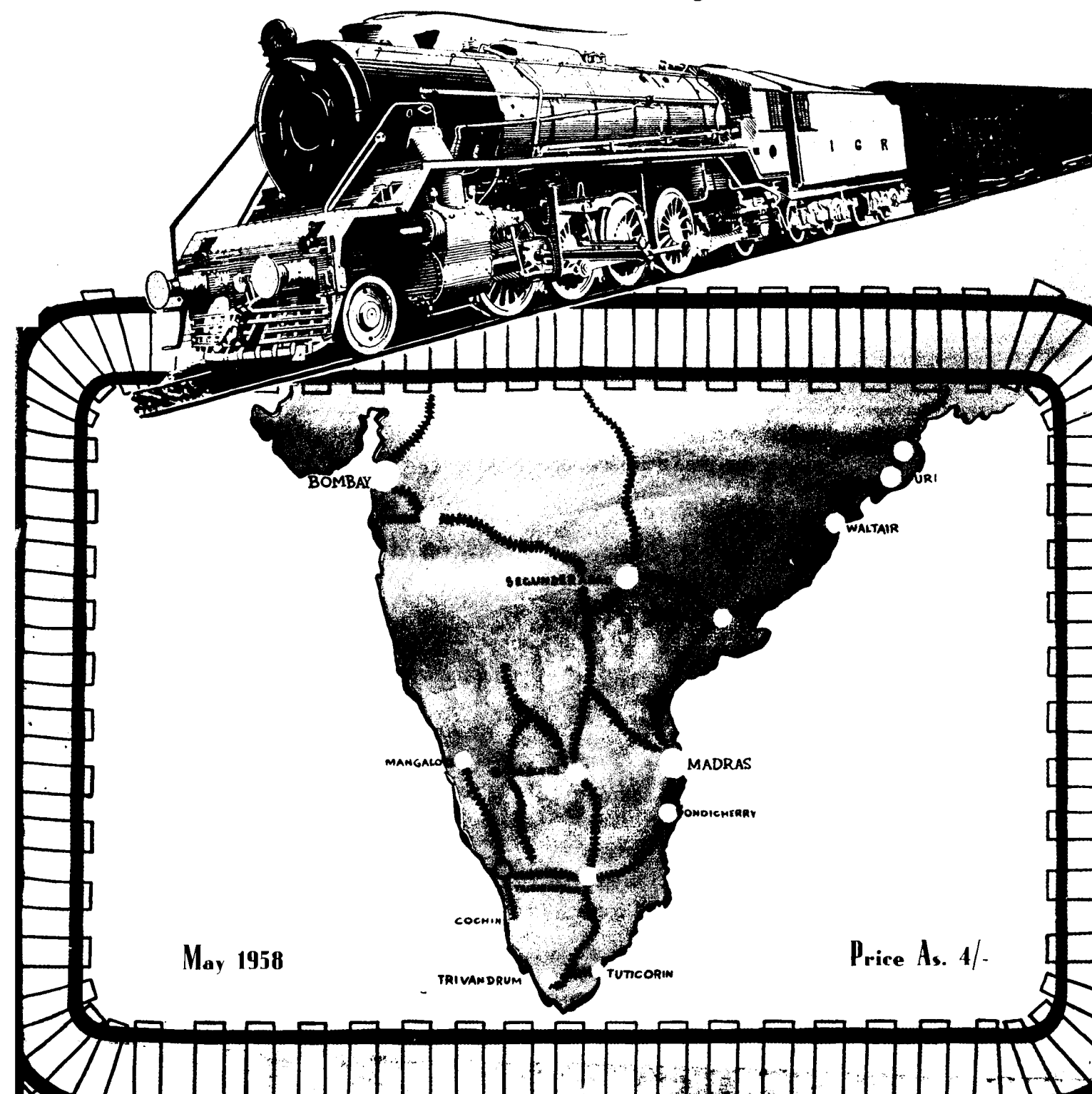
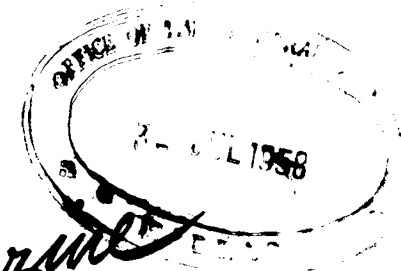
Cleanliness of the person, of the houses and colonies, reflects discipline in the individual and the community. Discipline is the foundation stone for progress of oneself and the country. Cleanliness is a good habit. It is also cheap.

All Railwaymen should set an example of cleanliness. This will help others and themselves.

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May 1958

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GOLDEN RULES OF CONDUCT FOR RAILWAYMEN

1. Do you plan your work daily? Get the more essential things done first and do not neglect the important ones sidetracting them to the fag end of the day.
2. Do not express casually careless opinion. Never venture forth an opinion unless asked for it.
3. Remember that most of our menial worries come either from trying to fight life hard or from trying to run away from life. Do neither.
4. Learn to accept people as they are, love them, respect them, praise them, encourage them, differ with them, but above all, learn the priceless art of give and take.
5. Cry neither for the moon, nor over spilt milk.
6. Accept the things that you cannot change; have the courage to change the things that you can, and possess the wisdom to know the difference.
7. Do not drive too hard a bargain with yourself.
8. Accept life as it is—its wonders, changes, disappointments, frustrations etc., etc.

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Fuel and Power Industries in the United Kingdom

THE main primary sources of energy in Britain are coal, petroleum and, to a small extent, water power; secondary sources, produced from these, are electricity and coal gas.

Coal, mined within the country, supplies 86 per cent of Britain's energy and it must continue to be the main source for many years to come. But it is unlikely that production of coal can be increased sufficiently, even by the very large investments planned, to satisfy increasing demands for energy, which may well double within the next twenty years. For supplies of crude petroleum Britain is almost entirely dependent on overseas imports; water power resources are limited. For these reasons, Britain is investing large sums in the development of nuclear power as an alternative source of energy. But the new source will not start bearing much of the burden for at least ten years, after which time its use should increase rapidly. The fuel and power industries, with the exception of the petroleum industry and coal distribution, are mainly under public ownership.

The Government's fuel and power policy has two principal objectives. The first is to ensure that power supplies are adequate to meet the rapidly growing demands of industry and of the domestic consumer in a country with an expanding national income. The second is to make the maximum possible use of indigenous resources and so lighten the load on the balance of payments.

The Government also aims to reduce air pollution. The Clean Air Act, 1956, makes it an offence to emit dark smoke or to fail to provide industrial premises with equipment to arrest grit and dirt, and empowers local authorities, subject to the approval of the Minister of Housing and Local Government, to declare 'smoke control areas', in which the emission of smoke from chimneys will constitute an offence; provision is made for the payment of grants by local authorities and the Exchequer towards the costs incurred by owners and occupiers of houses in these areas in making necessary changes to appliances. A Clean Air Council, to review progress and to advise the Minister, was set up in May 1957.

COAL

Coal has been worked in Britain for over 700 years and an organised coal-mining industry has been in existence for over 300 years, some 220 years longer than in any other European country. British coal exports dominated the world coal market until about 1910. By 1913—the peak production year—the industry was producing 287 million tons of coal, exporting 94 million tons and employing 1,107,000 workers.

The very fact that the British coal-mining industry was developed so early has meant that many of the best seams of coal are now worked out; every year coal has to be mined from deeper and thinner seams and productivity can be maintained only by increasing efficiency.

The industry declined during the first world war owing to a shortage of man-power and to the shortage of plant and materials necessary for undertaking any mechanical improvement. Moreover, alternative sources of energy and lower prices in continental countries led to a later decline in exports, which had fallen to 67 million tons in 1925.

Attempts at securing economies through amalgamation date from the Sankey Commission of 1919. In 1930, a Coal Mines Act established commissioners to bring about the formation of larger and more efficient units. The Coal Act of 1938 transferred ownership of the mineral coal to the State and made it the statutory responsibility of a Coal Commission to accelerate the integration of the industry by still further reducing the number of separate undertakings. At the outbreak of the second world war in 1939, however, this process was not far advanced.

ORGANISATION UNDER PUBLIC OWNERSHIP

In 1942, the Government assumed full control of the industry's operations, though the colliery undertakings continued to own the coal-mines. In May 1946, the Coal Industry Nationalisation Act received the Royal Assent. On 1st January, 1947, the assets of the industry were vested in the *National*

Coal Board, which was appointed by the then Minister of Fuel and Power and became responsible for the industry's management. Under the Act, the Board consisted of a chairman and eight other members, but this provision was amended by the Coal Industry Act, 1949, and the Board now consists of a chairman and not fewer than eight or more than 11 other members; the number of full-time members must not exceed eight and there must be one, and may be two, deputy chairmen.

The Board's main duties are:

- (1) to work and get the coal in Great Britain to the exclusion of any other person;
- (2) to secure the efficient development of the coal-mining industry; and
- (3) to make supplies of coal available of such qualities and sizes and in such quantities and at such prices as may seem to it best calculated to further the public interest.

The Board is also charged with securing the safety, health and welfare of its employees and the benefit of their practical knowledge and experience. The Board's policies must also be directed to ensure that its revenues shall be not less than its outgoings properly chargeable to revenue account and taking one year with another.

There are minor exceptions to the Board's exclusive monopoly to work coal in Britain: for example, it may license private enterprise to work small mines in which the number of underground workers does not greatly exceed 30. Production on opencast sites, which had been the responsibility of the Ministry of Fuel and Power (as it was then called), was transferred to the Board on 1st April, 1952.

The Board is responsible for its own regional organisation. The collieries, numbering about 900, are grouped into 50 Areas which are the basic units for commercial management. The size of the Areas varies according to geological, geographical and other technical considerations. The Areas are grouped into nine Divisions which roughly correspond to the main coal-bearing regions. A Divisional Board for each Division supervises and co-ordinates the work of the Areas within the Division (except in the small South Eastern Division, which is administered by a General Manager), formulates divisional policy, and is answerable to the National Coal Board, which is

responsible for questions of national policy, finance and the co-ordinating of major schemes of development. The day-to-day work of running the collieries is under the direction of colliery managers.

Two Coal Consumers' Councils were set up under the 1946 Act: the *Industrial Coal Consumers' Council*, members of which represent consumers, merchants and suppliers of coal, coke and manufactured fuel for industrial and other purposes, involving supply in bulk; and the *Domestic Coal Consumers' Council*, members of which represent similar groups concerned with coal for domestic use. The most important function of the Councils, which are responsible to the Minister of Power, is the general consideration of the commercial arrangements and activities of the National Coal Board, to ensure that the monopoly in the industry set up by the 1946 Act shall have the maximum practical regard for consumers' interests.

The Coal Industry Nationalisation Act requires the National Coal Board to publish an annual report and statement of accounts which are laid before Parliament.

At the end of 1947 (its first year), the National Coal Board showed a deficit of £ 23.3 million, after paying compensation to the former mine-owners and interest on borrowed capital. In the years 1948, 1949 and 1950 there were surpluses of £ 1.7 million, £ 9.5 million and £ 8.3 million respectively. There were deficits of £ 1.8 million and £ 8.2 million in 1951 and 1952, a surplus of £ 0.4 million in 1953, deficits of £ 3.6 million in 1954 and £ 19.6 million in 1955, and a surplus of £ 12.8 million in 1956.

The National Coal Board raises capital by long-term borrowing direct from the Exchequer, instead of through the issue of stock. There is a statutory limit of £ 650 million at present on such borrowing and special authorisations is needed for borrowing, in any one year, more than £ 75 million in excess of the highest level of aggregate advances in the preceding year.

PRODUCTION

It has been estimated that Britain has workable reserves of coal of 43,000 million tons, more than enough at current rates of consumption to last for 200 years. But certain types such as high quality coking coal will be exhausted long before then unless they are eked out by blending with other types of coal.

The main coal-bearing areas are: (1) the Yorkshire, Derbyshire and Nottinghamshire field which produces about 40 per cent of the total output, (2) the Durham and Northumberland field, (3) the South Wales field, and (4) the Scottish field. Other important coal-bearing areas are those of Lancashire and the West Midlands (Staffordshire and Warwickshire). There are no coalbearing areas in Northern Ireland.

In the years since nationalisation the National Coal Board has been able to secure quick increases in production and productivity by reorganisation, by a wider application of improved working methods and by increased mechanisation of cutting and conveying. As a result, deepmined production increased from 187.2 million tons in 1947 to 214 million tons in 1954 despite a fall of 4,000 in average manpower. In 1956, 210 million tons was produced from deep mines, which, with 12 million tons from opencast workings, gave a total of 222 million tons. Productivity of all workers increased between 1947 and 1956 from 1.074 to 1.232 tons per manshift.

Future progress depends on bringing new mines into production, the development of machines for power-loading the coal at the face on to the face conveyor belt and on the reorganisation of the haulage systems by carrying out major reconstructions. The National Coal Board has launched a large programme of major reconstruction and new sinkings.

Since the war the coal industry has suffered from a shortage of manpower. In 1956 manpower averaged 703,400 about 9,000 fewer than the industry needs.

MARKETING

The principal marketing officials of the Board are also officers of the Minister of Power's Coal Supplies Organisation, whose function is to apportion the coal to consumers according to the Minister's determination of the national interest.

The Board, as sole producer, is bound to make the first sale of coal. It has, however, no monopoly of distribution, though it does act as a wholesaler and, in the colliery areas, makes direct sales to consumers. Retail distribution is for the most part carried on by private firms, but the price structure is controlled by the Ministry of Power.

CONSUMPTION AND EXPORTS

Although the level of coal production has risen

appreciably since 1946, inland consumption has risen even faster—mainly because of the expansion of industrial output. In consequence, the proportion of output which is exported has greatly declined, compared with pre-war, in spite of a virtually unlimited demand for exports of British coal. Exports (excluding bunkers) rose from 4.5 million tons in 1946 to 13.9 million tons in 1949. In 1955 and 1956, exports were deliberately cut to 12.0 million tons and 8.4 million tons respectively.

The greater part of exports of British coal is sent to Europe, and especially to Denmark, Sweden, Germany, the Irish Republic and Italy. Nearly all Britain's coal exports since the war have been covered by trade agreements, and the National Coal Board has sought to honour its old customers even when that has meant importing coal at great expense from Europe and the United States and selling at a loss at the prevailing internal prices. Imports in 1955 amounted to 11.4 million tons, in spite of the reduction in exports, but in 1956 were reduced to 5.2 million tons.

LABOUR RELATIONS

Negotiations on wages and conditions of service are conducted through a Joint National Negotiating Committee, consisting of 16 members appointed by the National Coal Board and not more than 16 members of the National Union of Mine-workers. Disputed issues are referred to a National Reference Tribunal consisting of three permanent independent members and four assessors without voting rights, two representing labour and two management. There are also District Joint Negotiating Committees, which deal with the application of national agreements, settle any difficulties and differences that may arise at district level and refer unresolved differences to the national committee.

The Coal Industry Nationalisation Act requires the Board to enter into joint consultation with its employees to discuss such matters as production, safety, health and welfare. At almost every colliery there is a Consultative Committee in which the workmen's representatives are elected by secret ballot. The colliery manager is chairman, and he nominates three colliery officials to be members of the committee. There are also Consultative Councils at the area, divisional and national levels on which the Board and the four staff organisations in the industry—the National Association of Colliery Managers, the British Association of Colliery Management, the

National Association of Colliery Overmen, Deputies and Short-firers, and the National Union of Mine-workers—are represented.

SAFETY, HEALTH AND WELFARE

The safety, health and welfare of miners are safeguarded by comprehensive legislation, which was consolidated and brought up to date by the Mines and Quarries Act, 1954. Responsibility for the enforcement of safety regulations lies with the Mines and Quarries Inspectorate of the Ministry of Power.

The National Coal Board has its own safety organisation and, in accordance with the Nationalisation Act, follows a policy directed towards securing the safety, health and welfare of its employees, examples of voluntary action by the Board to reduce risks are the installation of fire-resistant conveyor belts, the replacement of light alloy supports (which has been found to be liable to produce dangerous sparks) and the wide-spread introduction of courses for training for various classes of officials and workmen. The Board has also continued to strengthen the medical services which existed before nationalisation. Chief Divisional and Area Medical Officers have been appointed and Assistant Medical Officers are being appointed in areas with a labour force of more than 15,000 men. Medical centres are being set up at the pit head.

The Board is responsible for its employees' welfare at their work-places, for example, by the provision of pithead baths and canteens, which the social welfare of coal-miners and their families has, since 1952, been the responsibility of the Coal Industry Social Welfare Organisation, which is controlled by the Board and the miners' trade unions.

Research into problems of safety and health is carried out also at the Ministry of Power's Safety in Mines Research Establishment, which maintains a close liaison with the Mines Inspectorate and the National Coal Board's research organisation.

DEVELOPMENT AND RESEARCH

Contraction and curtailment of development in the industry since the peak year, 1913, had led to a position in which less than one-third of current output was coming from pits started in the twentieth century. Large-scale development was therefore essential.

In 1950, the National Coal Board announced its long-term plan of development for the industry, involving the reorganisation and increased mechanisation of existing mines and the sinking of new ones. The plan envisaged a capital investment of £ 635 million at 1949 prices between 1950 and 1965, when it was estimated that the annual output of coal would have risen to about 240 million tons. The plan was not a rigid blueprint, room being left for modifications in the light of changing circumstances and new knowledge. Actual capital expenditure in the years 1950—54 was £ 258 million at current prices. Under a revised plan issued in May 1956, the Board provides for an output of 228 million tons in 1960 and 240 million tons in 1965. An annual output of 250 million tons is not thought possible before 1970. Opencast production is expected to continue at a rate of about 10 million tons a year. The capital cost of achieving these output figures, and of providing the money for major schemes to be completed after 1965, is estimated at £ 860 million for collieries and their associated activities. In addition, the Board proposes to spend £ 140 million on ancillary activities. A total of £ 590 million will be spent between 1956 and 1960 and £ 410 million in 1951—65. Manpower requirements are estimated at 682,000 with an output-per-man-year of 319 tons in 1960, and 672,000 with an output-per-man-year of 342 tons in 1965. When the programme is completed, four-fifths of Britain's coal will be coming from virtually new mines.

The mechanical cutting and conveying of coal are now the general practice: in 1956, 87 per cent of total deepmined output was mechanically cut and 93 per cent was mechanically conveyed. The loading of coal at the working face offers, at present, the next most important possibility for increased coalface mechanisation. In 1956, 36.4 million tons were power loaded, compared with 13 million tons in 1953 and 5 million tons in 1947.

In 1947, the National Coal Board took over, with other assets, the Coal Survey, a national organisation for surveying coal resources within Britain, and 70 laboratories in the various coalfields, which it has since extended and modernised.

In 1948, the Board established a central research organisation at Stoke Orchard, near Cheltenham, Gloucestershire, to provide facilities for fundamental research in the coalmining industry, as distinct from the day-to-day scientific control exercised by the divisional and area scientific organisation. This is now known as the Coal Research Establishment. A second

central research organisation for the investigation of underground problems, known as the Mining Research Establishment, was formed in 1952 by the Board at Isleworth, Middlesex, and a Central Engineering Establishment is now operating near Bretby in Derbyshire for developing new machines and testing equipment.

The Board also subscribes to a number of autonomous research associations in receipt of grants from the Department of Scientific and Industrial Research (DSIR), including the British Coal Utilisation Research Association, the British Coke Research Association and the Coal Tar Research Association. In addition much of the work of other bodies, such as the Safety in Mines Research Establishment of the Ministry of Power and the Fuel Research Station of DSIR, is closely related to the Board's problems.

From 1st July 1956, the National Coal Board and the Central Electricity Authority have accepted responsibility for the planning and construction of a pilot plant for the underground gasification of coal. This is a process for converting coal in the ground into gas for use in generating electricity and it has reached the stage of being demonstrated on a small scale after 6 years of work by the Ministry of Power in co-operation with the National Coal Board. Exploitation of the process on a commercial scale is being undertaken. The National Coal Board has set up an Underground Gasification Executive to carry out its part in the project.

PETROLEUM

The petroleum industry in Britain dates back to 1850, when Dr. James Young, a Glasgow chemist, succeeded in obtaining lamp oil and lubricants from natural mineral oil occurring in the Derbyshire coal measures. The Scottish shale deposits, yielding similar products, were first worked in 1858.

INDIGENOUS PRODUCTION

Sources of crude oil within Britain (including shale oil) supply altogether less than one per cent of total United Kingdom requirements, the remainder being imported from overseas.

Current output of shale oil is drawn from 7 shale mines and one opencast quarry, retorted in four crude oil works, and the crude products are refined in a central refinery at Pumphreston, near Edinburgh.

Output of shale reached a peak of 3.4 million tons in 1913, but the cost of the processes and other economic difficulties led to a reduction of output. This amounted to over 1 million tons in 1956, yielding some 79,000 tons of crude shale oil. From the latter, some 63,000 tons of refined products were obtained. In 1956, some 84,000 tons of motor and aviation spirit were obtained from coal by hydrogenation, and 314,500 tons of refined benzole from coke ovens and gas works. Prospecting for crude petroleum has so far led to the establishment of oilfields in Nottinghamshire (small amounts of oil were found in further borings at Plungar in Leicestershire in 1953), and one in Lancashire. Production of crude oil in 1956 was 66,000 tons.

INTERNATIONAL TRADE

British and British-Dutch oil companies have been responsible for developing the oil resources of many countries to mutual advantage, especially in the Middle East, Far East and Caribbean areas.

Today they produce one-third of all oil entering into international trade, with a tanker fleet (part owned by them and part on charter) amounting to nearly one-third of the world's tanker tonnage. (United Kingdom registered tanker tonnage is nearly one-fifth of the world's total.)

CONSUMPTION

Consumption of petroleum products in the United Kingdom has risen from almost one million tons in 1900 (mostly kerosene for lamps, and lubricants) to over 25 million tons in 1956 (predominantly gas, diesel and fuel oils and motor spirit).

REFINERIES

Up to 1939, three-quarters of the United Kingdom's supply of petroleum products was refined overseas, in accordance with the view, commonly held in the world oil industry at that time, that it was more economical to refine at the source of production. Since the second world war, however, the industry has come to favour the siting of refineries in the consuming areas. In this it has had Government support, both because of the need to save foreign exchange and because of the extra employment and other advantages to the economy resulting from the new development. The expansion programme in the United Kingdom carried out by the major oil companies was a substantial one, costing over the years 1947 to 1954 very nearly £ 200 million.

At the end of May 1957, refinery capacity in the United Kingdom amounted to almost 31 million tons a year. Plans for a second major phase of expansion to bring this up to at least 39 million tons by 1958 have been announced by some of the leading companies. Actual production of refined products rose from about 5 million tons in 1948-49 to 28.7 million tons in 1956. Exports of refined products became possible, and their value reached £ 84 million in 1954 and £ 99 million in 1956. Imports of refined products were valued at £ 87 million in 1954 and £ 126 million in 1956, compared with £ 141 million in 1951.

RESEARCH

Research into problems of petroleum technology is carried out mainly by the leading oil companies, which have also endowed research at the universities on a substantial scale. Some work on the production of oil products from coal is done at the Fuel Research Station of the Department of Scientific and Industrial Research.

ELECTRICITY SUPPLY

Public supply of electricity was first provided at Godalming, Surrey, in 1881, though there were earlier demonstrations of its use to consumers, such as the former Metropolitan Board of Works, in the lighting of the Thames Embankment. From the earliest days a measure of public control has been a feature of the industry, and the Electric Lighting Act of 1882 authorised the Board of Trade to grant licences for the establishment of electricity undertakings by local authorities or by companies (which the local authorities might compulsorily purchase after a given period of time) to supply consumers in given areas. By the turn of the century, technical developments, including the introduction of the electric motor as a source of motive power, had led to a large increase in the scale of distribution of electricity, and a variety of independent supply systems had grown up all over the country.

It was not until after the first world war that steps were taken to reorganise the industry on a national scale in order to realise the benefits of concentration, integration and standardisation in electricity supply. In 1919, the Electricity Commissioners were set up as a supervisory body and to promote reorganisation through voluntary agreement. Then, in 1926, the Central Electricity Board was established to co-ordinate more efficiently the generation of electricity.

Its main duties were to concentrate the output of electricity in certain stations, selected for their efficiency and low operating costs, and to connect these selected stations with one another and with local distribution undertakings by means of a national system of main transmission lines, known as the Grid. Thenceforward, steady progress was made in putting this plan into effect and, by March 1948, 143 selected stations, out of some 300, were supplying 95 per cent of the electricity generated for public supply.

ORGANISATION UNDER PUBLIC OWNERSHIP

With the exception of a few small non-statutory undertakings accounting for less than one per cent of the electricity consumption, the public supply of electricity in Great Britain is now exclusively in the hands of public corporations: in England and Wales, the Central Electricity Authority is responsible for generation, and 12 Area Boards for distribution; and in Scotland, the North of Scotland Hydro-Electric Board and the South of Scotland Electricity Board are each responsible for generation and distribution in their respective areas. In Northern Ireland, electricity is supplied by two municipal undertakings and one public board.

Under the Electricity Act of 1947, a central authority, then known as the British Electricity Authority, and 14 Area Electricity Boards, took over in April 1948 the assets of former municipal and private electricity supply undertakings throughout Great Britain, except in the area already served by the North of Scotland Hydro-Electric Board (see below). Under the Electricity Reorganisation (Scotland) Act of 1954, the Authority's functions in Scotland were taken over in April 1955 by the South of Scotland Electricity Board (see below) and the name of the Authority was changed from British Electricity Authority to Central Electricity Authority.

Over 200,000 people are employed in the electricity supply industry.

ENGLAND AND WALES

The *Central Electricity Authority* is appointed by the Minister of Power and is responsible to him for the general policy of the whole electricity supply industry in England and Wales. Its main function is to develop and maintain an efficient co-ordinated and economical system of electricity supply, and it is responsible for the generation and bulk supply of electricity to the Area Boards.

The *Area Boards* (of which there are at present 12) are responsible for the distribution of electricity in England and Wales. Each consists of a full-time chairman and deputy chairman and four to six part-time members, appointed, as are the members of the Central Authority, by the Minister of Power.

Area Consultative Councils have been set up in the area of each Area Board to represent the interests of consumers. They each consist of between 20 and 30 members, of whom between 50 and 60 per cent are nominated by local authority associations. The chairman of each Area Consultative Council is an *ex officio* member of the corresponding Area Board. There are also Consultative Councils for each of the districts of the two Scottish Electricity Boards and the chairman of each is a member of the respective Board.

Finance. The Central Authority and Area Boards, taken together, have made a consolidated net surplus on their operations in each of the years since they were established. Up to and including the financial year 1955-56, these surpluses amounted in the aggregate to over £ 70 million.

Labour Relations. Under the Electricity Act, 1947, the Central Authority is required to devise a satisfactory procedure for collective bargaining and joint consultation with its employees. In each of the three main groups of workers (administrative, technical and manual), there is a separate National Joint Industrial Council or Board, which negotiates terms and conditions of employment. A National Joint Advisory Council, drawn from management and employees, has been set up to discuss the health, welfare and safety of all groups of employees. There are also separate district councils and local works and advisory committees forming part of the negotiating and conciliatory machinery.

Proposals for Reorganisation. In November 1956, the Government published a White Paper (Cmd. 27), putting forward proposals, based on the report of the Committee of Inquiry into the Electricity Supply Industry (Cmd. 9672), for the reorganisation of the electricity supply industry in England and Wales. These proposals have been embodied in the Electricity Act, 1957, and will take effect on 1st April, 1958. The Central Electricity Authority will then be replaced by an Electricity Council, which will advise the Minister of Power on questions affecting the electricity supply industry and promote and assist the maintenance and development, by a new

Central Electricity Generating Board and by Area Boards, of 'an efficient co-ordinated and economical system of electricity supply'. The responsibility for generating and supplying electricity in bulk will be placed on the Generating Board. Appointments to the Council and Board were announced in August, 1957.

Greater autonomy for Area Boards is proposed. The Generating Board and each Area Board will be required by law to balance their accounts individually, in order to encourage financial responsibility and a critical attitude towards costs. The industry's central reserve fund will be wound up and distributed to the Area Boards, each of which will maintain its own reserve fund.

The most important functions of the Minister, under the new arrangements, will be to appoint the chairman and deputy chairman of the Electricity Council and the members of the Generating Board (the other members of the Council will be the chairman of the Area Boards and one other member representing the Generating Board); to approve each Area Board's capital development plans and the industry's research programme; and to approve, in consultation with the Treasury, the Board's borrowing requirements, having regard to the development programmes submitted by the industry. The Minister also has power to issue general directions to the Council and the Boards if he considers this necessary in the national interest. It is also proposed to strengthen the Consultative Councils.

SCOTLAND

The *North of Scotland Hydro-Electric Board* was set up in 1943 as a non-profit-making body to develop the water power resources of the Highlands and Islands and to distribute electricity in the more sparsely populated parts of Scotland not covered by existing undertakings. It is a non-functional board, consisting of a chairman, deputy chairman and not fewer than three nor more than seven other members who are all part-time members without departmental responsibilities, appointed by the Secretary of State for Scotland.

The Act of 1947 made the North of Scotland Hydro-Electric Board solely responsible to the Secretary of State for Scotland for all generation and distribution in its area. This area was extended under the Act to include that part of Scotland north and west of a line running roughly from Dumbarton on

the Firth of Clyde to Newburgh on the Firth of Tay. In the rest of Scotland, the Central Authority, then known as the British Electricity Authority, together with the South-East and South-west Scotland Electricity Boards, was responsible to the then Minister of Fuel and Power in all electricity matters.

On 1st April, 1955, the *South of Scotland Electricity Board*, answerable to the Secretary of State for Scotland, took over the Central Authority's functions in Scotland, and also the functions of the two Scottish Area Boards, which were dissolved. The Board consists of a chairman, deputy chairman, two full-time and five part-time members. Under the Electricity Reorganisation (Scotland) Act, 1954, the then Minister of Fuel and Power retained only three functions in regard to electricity in Scotland, namely, to act jointly with the Secretary of State in regard to staff pensions and safety measures, and to remain solely responsible for the certification of meters.

NORTHERN IRELAND

In Northern Ireland, the bulk of electricity is

acquired by the *Northern Ireland Joint Electricity Committee* set up by statute in 1948, for sale to statutory distribution undertakings. Of these the *Electricity Board for Northern Ireland* distributes electricity throughout the country with the exception of the cities of Belfast and Londonderry, where it is carried out by municipal undertakings.

GENERATION

Almost the whole of Britain's electricity is produced in coal-fired steam generating stations. Abundant supplies of coal, together with good rail and water transport for moving it, in contrast with the remote and scattered location of relatively small water power resources, led to this preponderant development of electricity supplies from thermal generating stations. The development of hydro-electricity on any scale is comparatively recent.

The setting up of the North of Scotland Hydro-Electric Board in 1943 marked the beginning of a new era of intensive water power development in the Highlands of Scotland. A development scheme

NEW TYPE AIRCRAFT REFUELLER GOES INTO OPERATION AT SANTA CRUZ AIRPORT

An aircraft refueller of a type and size to be built in India for the first time, was put into operation by Stanvac at the Santa Cruz airport.

In constructing this new refueller unit known as the step-down semi-trailer type, Stanvac engineers have disproved the long-held belief that such units could not be manufactured in India.

The unit which incorporates the very latest features developed and tested thoroughly in the United States, has a tank capacity of 2400 I. G.

While the trailer fuel tank is usually tilted in the common type of refuellers, the "step down" design of this new refueller enables the placing of the tank parallel to the ground.

Another departure from convention has been in the designing of the tank. Usually tanks are built on a frame or a "skeleton". The tank trailer of this new refueller is frameless. This not only reduces the weight of the unit, but enables it to carry more product relative to the amount of steel used. Because its design lowers the centre of gravity in the trailer, it makes for easier and safer driving and gives added manoeuvrability to the whole unit.

(Continued on page 13)

In order to give added strength to the tank, one piece dished baffles and special fabricating technique involving "lap welding" were used. This involved the fabrication, also for the first time in India, of a one piece dished baffle of perfect bend and obtaining a perfect lap for lap welding.

The refueller is fitted with the latest aviation servicing equipment which gives the unit the maximum pressure and flow control so that it meets the exacting refuelling requirements of such modern types of aircraft as the Viscount. Quality-control devices fitted to the unit are as modern as those used anywhere in the world.

The total cost of the unit was about Rs. 85,000 roughly twenty-five per cent less than the imported units, and about half the total cost involved represented a saving of foreign exchange.

The fabrication of this new type of refueller is part of Standard-Vacuum's programme of modernising their aviation service equipment, commenced three years ago. In implementing this programme, seven flat top refueller units were imported in 1956 and five additional units were scheduled to be

drawn up by the Board in 1944, showing the water power resources which it proposed to examine, listed 102 hydro-electric projects with an estimated annual output of 6,274 million units of electricity. The ultimate output of Highland hydro-electric power is expected to be substantially higher and eventually may exceed 10,000 million units. In 1956, 1,282 million units were generated from water power compared with 322 million in 1949.

In 1956, 85,326 million units (one unit = one kilowatt-hour), or nearly 98 per cent of the public supply in Great Britain, was generated at steam stations, 1,667 million units, or 1.8 per cent, from water power, and 168 million units by other means, e. g., diesel and waste heat and refuse destruction. The high rate of expansion of output, which has been a feature of the industry since its earliest years, has been continued since the war. Total production in 1956 was eight times what it was in 1930 and has increased in nearly every year and especially since 1953.

The installed generating capacity of the electricity authorities (including the North of Scotland Hydro-Electric Board) in Great Britain at the end of 1956 totalled 24,615 megawatts (maximum continuous rating) compared with 12,546 megawatts at the end of 1948. The Central Electricity Authority is planning a large-scale programme of capital investment for the regions it controls, which makes provision for an increase, between the years 1957 and 1961, of 9,400 megawatts (sent out).

Sales of electricity in Northern Ireland (where the total generating capacity of 391 megawatts is in coal-fired thermal stations) amounted to 956 million kilowatt-hours in 1956, when the maximum load sustained was 335 megawatts. Further plant installations, with a generating capacity of 60 megawatts, are due to be completed in 1957—58.

The Central Electricity Authority is the largest consumer of primary fuel in Britain and in the year ended 31st March, 1957, it used just over 42.7 million tons, consisting mainly of coal. Average thermal efficiency of steam stations (i. e. the ratio of power output to the coal consumed) rose from 20.91 per cent in 1947—48 to 24.93 per cent in 1955—56 as new plant was brought into use. Twenty stations containing much of the newest plant had an average efficiency of 29.14 per cent in that year.

To meet increasing demands for electricity and to

save coal, generation from alternative fuels is being actively promoted. The chief alternatives are expected to be oil, to a small extent peat, and nuclear energy. As regards oil, dual firing apparatus able to use either coal or oil has been fitted to a new power station at Marchwood, on Southampton Water, and similar apparatus is to be installed in other power stations similarly situated on river estuaries and thus able to be fed conveniently from nearby oil refineries. The use of peat has been advocated in Scotland, as in Northern Ireland, as a source of power and as a means of making land available for agriculture. In July 1953, the Government announced that it had accepted a recommendation of the Scottish Peat Committee, appointed in 1949 to advise on the development of Scottish peat deposits, that an experimental peat-burning station for generating electricity should be established in Caithness. A pilot project covering some 300 acres at Altnabreac, Caithness, has been started. A peat-burning gas turbine, developed by a Scottish firm with assistance from the Development Fund is coming into operation in 1957. As the peat is cleared from the bog, the land is made available for farming.

NUCLEAR POWER STATIONS

Nuclear power stations are being built for both the United Kingdom Atomic Energy Authority (UKAEA) and for the Electricity Authorities.

As an extension of its experimental work and to produce plutonium, the UKAEA has built and is building a number of reactors which also produce electricity on a reasonably large scale. Most notable of these is the Calder Hall nuclear energy establishment in Cumberland which, since 17th October, 1956, when it was officially opened by the Queen, has been the first large-scale nuclear power station in the world to supply electricity to a national electrical network. Calder Hall A, consisting of two reactors, has an installed capacity of 92 megawatts (MW); Calder Hall B, due for completion in 1958, will double the installed capacity. Four more similar reactors are being built at Chapel Cross, near Annan in Dumfriesshire, Scotland. A further establishment at Dounreay, Caithness, Scotland, started in 1954 and now on the way to completion, houses breeder reactors which will produce electricity.

A provisional programme of commercial nuclear power stations for the Electricity Authorities was published in a White Paper (Cmd. 9389) by the Government in February 1955. This envisaged

spending £ 300 million on building 12 nuclear power stations, together with the necessary ancillary services, uranium and prototype development in the ten years 1955—65. Between 1,500 and 2,000 megawatts of electricity would be produced by this means by 1965, saving 5—6 million tons of coal a year.

Since the publication of the 1955 programme, two factors have led to a reassessment of the targets provisionally set: rapid technological advance, which has already made possible stations of more than four times the installed capacity of Calder Hall; and increased imports of fuel, chiefly oil, to meet increasing energy requirements accentuating the burden on the balance of payments.

Accordingly, on 5th March, 1957, the Government announced a revised programme of nuclear power, under which nuclear energy would be providing 5,000—6,000 megawatts of electricity by 1965, instead of 1,500—2,000 megawatts as originally planned, the equivalent of 18 million tons of coal (or ten million tons of oil) a year used in conventional stations for a similar output. During the decade ending in the year 1965—6 the total capital investment by the Electricity Authorities of fulfil the combined nuclear and conventional power station programme (including ancillary transmission facilities) might be of the order of £ 3,350 million. This would compare with an estimate of £ 2,600 million during the decade for purely conventional stations; of the difference of £ 750 million, some £ 200 million might be accounted for by the procurement of the initial charges of uranium.

By the end of August 1957, work on two stations—at Bradwell in Essex (300 MW installed capacity) and at Berkeley in Gloucestershire (275 MW)—was well advanced. At Hunterston in Ayrshire, Scotland, work had begun on a site for a third station. The building, at Hinkley Point, Somerset, of a fourth station (500 MW) was under negotiation, and sites in North Wales for two further stations were being considered. The Northern Ireland Electricity Board had decided to build a station of 150 MW, for which sites were then being examined.

TRANSMISSION AND DISTRIBUTION

Main electricity transmission lines—the Grid—cover most of the country. Those of the Central Authority totalled at 31st March, 1957, 5,500 route miles (8,602 circuit miles) of which 415 miles were operated

at 275,000 volts, 4,635 miles were operated at 132,000 volts and the remainder at 66,000 volts and below. The reduction over the previous year was due to the transfer of a section to the South of Scotland Electricity Board. In the North of Scotland district there were 1,480 circuit miles of main transmission lines at the end of 1956, all operated at 132,000 volts. Control of energy movements on the Grid in England and Wales is managed through the eight operational areas, set up by the Authority for that purpose and distinct from the divisions in which the generating side of the industry is organised; each area has a central control station and the operations are co-ordinated by a control station in London. The Grid in Scotland is operated from the North of Scotland control centre at Tummel Bridge and the South of Scotland control centre at Glasgow.

The new Supergrid of main transmission lines at 275,000 volts will assist in meeting the growing demand for electricity during the next 20 years with the greatest economy and will make the British electricity supply the most closely integrated power network in the world. The first stage was completed in 1954.

In September 1956, a joint committee of the Central Electricity Authority and Electricite de France recommended the adoption of a scheme for interchange of energy by direct current by means of a single cable capable of transmitting between 120,000 and 150,000 kilowatts at 200,000 volts, and the scheme is being undertaken. It was hoped to begin work on the project in 1957 and to complete it by 1960 at a cost of about £ 5 million. The object of the scheme is to take advantage of the differences in the incidence of peak periods in the two countries.

The Area Electricity Boards distribute to consumers electricity acquired mainly from the Authority, but in part from other sources, e. g. collieries. There were 14.5 million consumers in December 1956, and increase of about 5 million on those supplied in December 1939. Industrial users are the group of consumers with the highest consumption, and demand from this sector is increasing rapidly. The principal domestic uses of electricity are for lighting, cooking, and for space and water heating, but the demand for numerous other domestic purposes is increasing.

The development of electricity supplies for rural areas has been facilitated by the change in the structure of the industry under the 1947 Act. During the year ended 31st March, 1957, supplies were

provided for a further 13,135 farms which raised the number of farms provided with electricity to over 188,059 out of a total of 272,000 farms.

The North of Scotland Hydro-Electric Board has also pressed ahead with the distribution of electricity to consumers in the North of Scotland. At the end of 1956, there were 351,524 consumers of electricity in the Board's district and 55.5 per cent of the farms and 55.4 of crofts in the district had a supply of electricity.

DEVELOPMENT AND RESEARCH

The comprehensive capital development plan to bridge the gap between ever increasing demand and supply is limited by shortages of equipment and finance. The borrowing powers of the Central Electricity Authority and Area Electricity Boards were originally limited to a maximum of £ 700 million, but in 1954 were extended to £ 1,400 million. Capital expenditure during 1956 by the Authority and Area Boards was about £ 209 million and approved expenditure for 1957 amounted to £ 233 million. The original investment plans of the Authority have been considerably modified by the programme of nuclear power development, outlined on pp. 10—11 inasmuch as it is conceivable that, from the middle of the 1960s, most new plant will consist of nuclear-powered stations.

Borrowing by the North of Scotland Hydro-Electric Board is limited by the Electricity Act, 1947, as amended by the Hydro-Electric Development (Scotland) Act, 1952, to a maximum of £ 200 million. Borrowing by the South of Scotland Electricity Board is limited by the Electricity Reorganisation (Scotland) Act, 1954, to a maximum of £ 75 million.

The Central Electricity Authority undertakes research on its own account and helps to finance research through its membership of the British Electrical and Allied Industries Research Association, an organisation to which manufacturing firms and large consumers of electricity also belong and which was established before the supply industry passed into public ownership. This Association is one of the 44 autonomous research associations in receipt of grants from the Department of Scientific and Industrial Research. The Central Electricity Authority also has an Electrical Supply Research Council including independent experts to advise it and the Area Boards, and can consult the Minister of Power's Scientific Advisory Council on problems affecting the

supply and use of electricity. Direct research on a laboratory scale takes place at the Central Electricity Laboratories at Leatherhead, Surrey, extensions to which were opened by the Authority in July 1950. Examples of research include gas turbine generation and experiments in the use of wind power for generation.

As part of its programme of power station construction for 1962, the Central Electricity Authority plans to install a turbo-generator of 550,000 kilowatt capacity—much larger than any now in operation, or, as far as is known, than any at present projected anywhere in the world. The decision to build a machine of this large capacity is the latest step in a programme aimed at reducing cost of generation by increasing the size of generating sets and boilers. Work is in progress on even more advanced machines for subsequent programmes.

GAS SUPPLY

Public supply of gas in Britain dates from 1807, when Pall Mall, London, was first lighted with gas. In 1812 the London and Westminster Gas Light and Coke Company received a Royal Charter to supply gaslight in London. In the early years of the industry, gas was used almost exclusively for lighting and was provided by a growing number of company and municipal undertakings. Then, after the middle of the century and the invention of the Bunsen burner in 1855, gas was used increasingly as a source of heat for many purposes, such as domestic cooking and space and water heating, in addition to a number of industrial uses. After 1880, however, gas for lighting purposes was subjected to increasing competition from the new electricity supply industry; but the invention of the Welsbach incandescent mantle in 1887, which raised the efficiency of gas lighting very considerably, enabled the industry to hold its own while the supply of gas for purposes other than lighting increased.

The gas industry in its present form developed in the main during the period between the wars when increasing competition from electricity had to be met and when changes in social habits and outlook were taking place. The industry undertook a large-scale programme of modernisation of production and distribution and launched wide-spread sales promotion campaigns especially for the numerous uses of gas in the home. By 1939 the industry had become mainly a supplier of heating instead of a supplier of lighting.

ORGANISATION UNDER PUBLIC OWNERSHIP

Under the Gas Act, 1948, the gas industry was brought under public ownership and control on 1st May, 1949. The assets of 991 undertakings, of which 269 belonged to local authorities, were vested in 12 Area Gas Boards. Together they cover the whole of Great Britain and are charged with a statutory duty to develop and maintain an efficient, co-ordinated and economical system of gas supply to domestic, industrial and other consumers. The national body is the *Gas Council*, which is appointed by the Minister of Power and is responsible *inter alia* for advising him on questions affecting the gas industry. It is a co-ordinating council, not a trading body. It consists of a full-time chairman and deputy chairman and the twelve chairmen of the Area Boards.

The *Area Gas Boards*, which have a large measure of financial and operational responsibility and are similar in most respects to the central bodies of the other publicly owned corporations, are charged *inter alia* with the responsibility of manufacturing and distributing gas to consumers. Thus, their powers differ from those of the Electricity Area Boards, which are limited to the distribution and sale of current, while the central executive body—the Central

Electricity Authority—is charged with the duties of generation and transmission. Each of the Area Gas Boards which, like the Gas Council are appointed by the Minister of Power, consists of a full-time chairman and deputy chairman, in some cases one, and in one case two, full-time members, and always five or six part-time members including the chairman of the Area Consultative Council. There is no common pattern of organisation; each Board is fully independent and has devised its own subordinate structure.

A link between the industry and the consuming public was established under the nationalisation scheme by the creation of a *Consultative Council* in each board area. These councils consist of not fewer than 20 and not more than 30 members, of whom between 50 and 75 per cent are chosen from panels of persons nominated by the local authority associations.

In Northern Ireland, the gas supply industry remains in the hands of a number of municipal undertakings and statutory and non-statutory companies.

As has been said, the Gas Council is not a trading body, but the operations of the Area Boards have

(Continued from page 9)

imported the following year. In view of the difficult foreign exchange positions, Stanvac initiated a plan to fabricate the refuellers locally, strictly limiting imports only to those parts or equipment which were impossible to obtain or manufactured in India. In addition to the unit that has just been commissioned, Stanvac is building another eight new units to complete the five that were to be imported under the 1957 programme, and the rest to cover the current year's requirements.

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ELECTRIC LOCO FOR INDIA SHIPPED FROM U. K.

The first of 12 electric locomotives designed for use on the Eastern Railway in India has just been shipped from Liverpool. This powerful locomotive—of 3,120 h. p.—has been built by the Vulcan Foundry Ltd., a pioneer in the field of locomotive

construction and now one of the companies of the English Electric group.

At the present time its electric traction equipment is operating over the railway systems of 29 countries, and the English Electric group has also carried out complete electrification contracts in India, Japan, Brazil, Morocco, and many other countries in various parts of the world.

Motor-coach trains built by English Electric are in operation on the electrified Madras suburban services and also in Bombay, while locomotives of 3,600 h. p. are being delivered for the operation of passenger and freight services on the electrified main lines from Bombay to Poona and Igatpuri.

Besides handling the Indian Government contract, the English Electric group is at present producing rail traction equipment for the railway systems in Britain, South Africa, Nigeria, Rhodesia, Australia, New Zealand, and the Netherlands.

resulted in the seven years up to 31st March, 1956, in an aggregate disposable surplus of over £ 13.5 million.

LABOUR RELATIONS

Under the Gas Act, 1948, the Gas Council is responsible for arranging satisfactory procedures of collective bargaining and a system of joint consultation with its employees. There are separate Joint Industrial Councils at the national level for manual workers and salaried staffs, and subordinated regional councils and local committees. At national and regional levels the councils combine negotiating and consultative functions, but there are in some cases separate Consultative Committees at the local level.

PRODUCTION

In 1956, in Great Britain 27.7 million tons of coal were carbonised by gas undertakings and 29.5 million tons by coke ovens operated outside the gas industry. About one-quarter of the output of gas from coke ovens is sold to gas undertakings for general distribution; the remainder is mainly consumed at the ovens or at collieries or steelworks.

In 1921, 250,300 million cubic feet of gas was manufactured by authorised gas undertakings or acquired from coke ovens, and the number of consumers was 7.6 million. By 1955, gas manufactured and acquired from coke ovens for distribution had risen to 2,912 million therms and the number of consumers had risen to about 12.8 million, an increase of 140 per cent in the volume of gas available and of about 67 per cent in the number of consumers.

In 1956, the quantity of gas produced in Northern Ireland was 7,625 million cubic feet, most of it for household use.

The total number of persons employed in the gas industry in March 1957 was 140,300.

CONSUMPTION

Half of all gas produced is sold for household use and the remainder for industry, commerce and public services.

Domestic Use While an accurate statistical analysis of the domestic load is not possible, evidence

given before the Ridley Committee (on Fuel and Power Policy), appointed by the then Minister of Fuel and Power in 1951, suggested that about 70 per cent of the domestic load was used for cooking, the remaining 30 per cent being spread over space heating, water heating and other installations. Most homes in Britain are now supplied with gas, except in some rural areas where, owing to difficulties in storage and transmission, gas is not economic. These difficulties have been overcome to some extent by the use of local high-pressure storage tanks but this development is unlikely to grow, owing to the steady extension of rural electricity supplies. Bottled gas, derived from petroleum, is widely used in rural areas.

Industrial and Commercial Use Gas is used extensively in industries which require a simple control of temperature to a fine degree of accuracy. Among such industries are pottery and certain processes in the manufacture of iron and steel products. Industrial use of gas increased greatly during the second world war and reached 103,000 million cubic feet in 1943. By 1956 industrial consumption is estimated to have reached 759 million therms.

BY-PRODUCTS

With the rapid increase in the volume of gas produced, the problems of the disposal of substances which were regarded originally as the 'waste' products of the carbonisation of coal (notably tar, benzole, sulphur and ammonia) became increasingly important.

Production of coke at gas works in 1956 was 12.7 million tons, and at coke ovens 19.5 million tons. The gas industry and coke ovens jointly produce over 2.9 million tons of crude coal tar and about 110 million gallons of crude benzole a year. These products, together with those of the sulphur and ammonia type, provide a source for the manufacture of a long and ever-growing list of essential derivatives which include dyestuffs (of which Britain now produces most of its own requirements), fertilisers, plastics, germicides (the sulphonamides and sulphanilamides), insecticides, refrigerants, perfumes, and synthetic yarns.

With further research and development, more especially in the field of organic chemistry, the production of coal carbonisation derivatives is becoming of increasing importance to the economy of the industry.

DEVELOPMENTS AND RESEARCH

The chief objects of capital expenditure in the years immediately after the war were to overtake arrears of plant renewal. Plans for further expansion were approved by the then Minister of Fuel and Power in 1954 and are outlined in the Gas Council's publication *Fuel for the Nation*.

Under the Gas Act, 1948, borrowing by the Gas Council and the Area Gas Boards was limited to £ 250 million. Borrowings to a total of £ 235 million had been authorised up to 30th June, 1954. The Gas and Electricity (Borrowing Powers) Act, 1954, extended these borrowing powers to £ 450 million.

Capital expenditure in the year ended 31st March, 1956, was £ 61 million, compared with £ 46 million in 1952-53 and £ 36 million in 1950-51.

The post-war structure of the industry has already permitted considerable integration by the linking of undertakings for the transmission of gas (through gas grids and long-distance mains), enabling production to be concentrated in the most efficient units. Progress is also being made in interconnection for the reception of gas from coke ovens, notably in Wales, Durham and Yorkshire.

Supplies of suitable coal to meet a steadily increasing gas consumption are becoming more difficult to obtain. Investigations into alternative sources of gas are being actively undertaken by the Gas Council. Gases from oil refineries (butane or propane) are used in several installations in smaller towns remote from large gas works or the grid systems. Progress has also been made with the possible use of methane, drained from coal mines. In agreement with the National Coal Board, Area Gas Boards have agreed to schemes for using methane from Point of Ayr Colliery in North Wales and from Haig Pit at Whitehaven, in Cumberland.

Eight oil gasification plants are at present in operation and 20 additional plants are on order. These plants will be capable of producing 82 million cubic feet of gas per day and of saving 850,000 tons of carbonising coal a year. The South Eastern Gas Board and the British Petroleum Company are jointly building a plant to convert petroleum products from the company's Kent oil refinery to gas of acceptable quality. It is expected that the initial installation, which will convert some 50,000 tons of petroleum products a year to gas and will have a daily output of

18 million cubic feet of gas, should be completed by the summer of 1958.

The Gas Council is investing £ 1 million in a five-year survey for natural gas within Britain.

The research organisation established by the Gas Council consists of a research committee, which advises the Council on policy and sees that it is carried out; and two research stations, one in London and one at Solihull, near Birmingham. Research is also carried out on behalf of the Gas Council at Leeds University and by the British Ceramic Research Association (an autonomous research association grant-aided by the Department of Scientific and Industrial Research). Further, the Council and Area Boards support a number of research associations, the work of which has a bearing on the gas industry. These include the Coal Tar Research Association, the British Coal Utilisation Research Association and the National Benzole Association. The underlying aim of the Council's research programme is to 'make the most economic use of the natural resources available to the nation, whether by improvements in existing processes of gas manufacture, by seeking new processes or new sources of supply of gas and by the extraction and use of other products of gasmaking'.

FUEL EFFICIENCY

The Government has for a number of years sought to promote efficiency in the use of fuel, among both industrial and domestic users, and has been assisted by various bodies representative of producers and consumers.

The *Coal Utilisation Council* consists of representatives of the National Coal Board, coal distributors and coal appliance manufacturers. It was formed in 1932 to give information and advice on the best use of solid fuel, including the choice of installation and operation of solid fuel appliances, to domestic consumers and to retailers of appliances. During the second world war, the reduction in coal production and the demands of war industry made economy imperative. When the Ministry of Fuel and Power was formed in 1942, an industrial fuel advisory service with regional branches was incorporated within it. In 1943 the *Women's Advisory Council on Solid Fuel*, consisting mainly of representatives of appliance manufacturers, women's organisations and others interested in the housewife's point of view on domestic fuel arrangements, was formed to advise women on the use of solid fuel for heating and cooking.

Further measures have been taken during the last few years. Under a scheme introduced in 1952, loans on favourable terms are available from the Exchequer to industrialists for financing approved fuel-saving schemes. At present these loans are interest-free for the first two years, repayment may be spread over a maximum period of twenty years and no security is required. In October 1953, a non-profit-making company, known as the *National Industrial Fuel Efficiency Service*, and sponsored by the British Productivity Council, was formed to promote fuel-saving in industry. This company, which largely replaced the industrial fuel advisory service of the then Ministry of Fuel and Power, came into operation on 1st May, 1954. It provides advice and services to all non-domestic fuel users in a variety of forms, from 'spot' inspection to full-scale heat and power surveys and regular visits on a contract basis. A survey of the generation and use of steam carried out by the Ministry has been employed to show the possibilities in the increased uses of back-pressure steam in the generation of electricity. The electricity and gas industries, the largest consumers of primary fuel, are succeeding each year in obtaining more energy from each ton of coal they use, by increasing the thermal efficiency of their plants. The campaign for fuel efficiency is closely linked with the campaign for the reduction of smoke.

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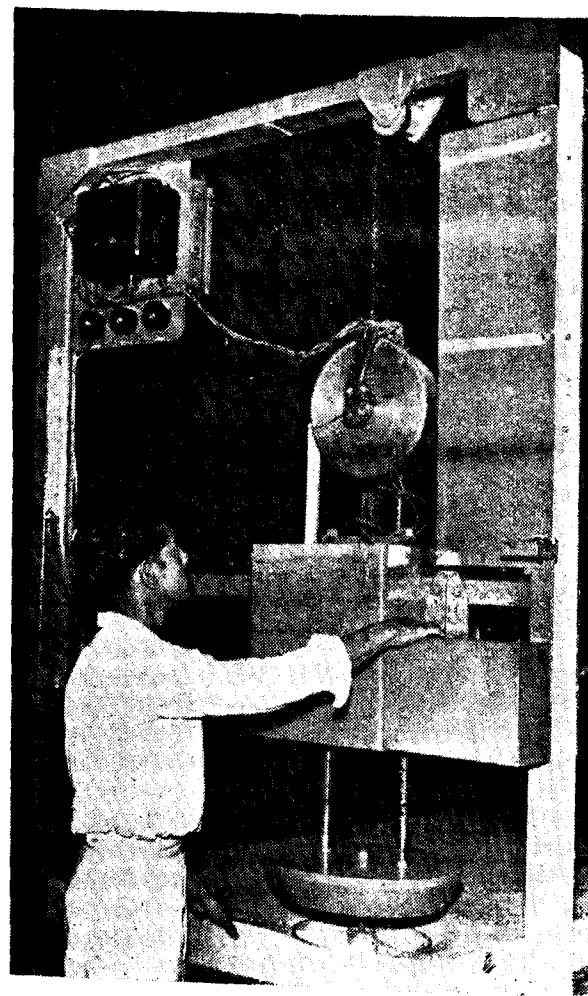
Asia's Largest Rubber Factory Comes of Age

INDIA'S rubber manufacturing industry is destined to play a key part in fulfilling the country's Five Year Plans. Not only in motor transport, but in industry generally and for the supply of consumer goods, the rubber manufacturing industry is today called on to play a responsible part as one of India's basic industries. It is a matter for satisfaction, therefore, that the range of rubber products manufactured in India is continually widening and thus helping the industry to meet the vital requirements of numerous branches of the country's economy.

The growth of this infant industry has been truly remarkable. Barely 20 years ago, India imported the bulk of her requirements of manufactured rubber goods. In 1935-36, these imports were to the value of Rs. 2 crores; by 1950-51, they had dropped to a mere Rs. 33 lakhs and in the same year, goods to the value of Rs. 1.66 crores were exported. The Government of India has permitted the import of tyres and tubes to meet the recent shortages arising out of the greatly increased demand for these products. It is expected, however, that the expansion programmes now under way will help to correct this position in the not too distant a future.

The tempo of economic activity in the country is rising at a rate not known before. This development is very largely due to the growth of heavy industries, power transmission and agriculture, all of which are making increasing demands for rubber products such as rubber covered cables, transmission and vee-belts, conveyor bolting and hoses. But the tyre manufacturing section of the industry will have to face the heaviest demand. It is estimated that a fleet of 1,60,000 trucks will be necessary by the end of the Second Plan period to handle the growing goods traffic by road. The production of motor vehicles and bicycles will also increase. By 1960, 57,000 cars and trucks, 12,000 motorcycles and scooters and 12,50,000 bicycles will be manufactured in India per annum. The tyre industry will be required to meet the original equipment and replacement requirements, and it is estimated that by 1960, the demand for automobile tyres will be 16,00,000 and for bicycle tyres 110,00,000 as against the actual production in 1956 of 9,38,400 and 63,20,400 respectively. Besides tyres and tubes, the industry supplies a large number of vital components required for the modern automobile such as fan belts, radiator hoses, adhesives for body building, latex foam cushioning, etc.

The first rubber factory in India was established almost 32 years after that venerable figure John Boyd Dunlop, invented the first practicable pneumatic tyre. India is the only country in the world where the rubber manufacturing industry is largely fed with indigenous natural rubber. As a result, the industry has firmly taken root within a short period of two decades. The tyre manufacturing section is the mainstay of the industry and large scale tyre manufacture in the country was pioneered by Dunlop in 1936 when they set up a factory in Sahaganj near Calcutta which comes of age this year. The factory was officially opened by Sir John Anderson, then Governor of Bengal, on the 28th November, 1936. Since then, new plant and machinery have been added from time to time to expand the volume and range of products. This factory is now the largest rubber manufacturing enterprise in Asia.



The resiliency of a Dunlopillo mattress being tested mechanically.

During the Second World War, the Dunlop Sahaganj factory gave a creditable account of itself and apart from the rapid expansion in the production of tyres and tubes for cars and trucks, aero tyres and tubes were added to the range. The first major post-War development at Sahaganj was the production of quality cycle rims which was of particular significance in view of the setting up of the many new bicycle factories soon after.

Production of Dunlopillo Latex Foam cushioning commenced in 1951 and in course of the last five years output has gone up four-fold. The increasing use of this material in transport, Assembly Houses, cinemas, hotels, hospitals as well as in the home, promises a great future for this product.

The recent extensions to the Sahaganj factory are of particular interest in relation to the Five Year Plans. The belting and hose plants were officially opened by Dr. B. C. Roy, Chief Minister of West Bengal, in December 1952, and it is now turning out conveyor and elevator belting, transmission and industrial vee belts of the best quality which were mostly imported until

recently. Long length braided hose by the lead press moulded process, and a number of special types of hoses, hitherto imported, have been added to the range. Recently, Dunlop initiated an anti-corrosion and abrasion resistant rubber lining service which has already enabled the Railways and other enterprises to save valuable foreign exchange.

In the first Five Year Plan period Sahaganj undertook the manufacture, for the first time in India, of tyres for jet aircraft. Another important project now under way is the installation of plant for the production of large earthmover tyres. Numerous expansion schemes are being implemented at Sahaganj to meet the growing demand and a considerable increase in the output of truck and bus tyres, cycle tyres, cycle rims, industrial rubber products and Dunlopillo is planned.

Twenty-one years after the founding of India's first tyre factory, Dunlop are putting up another at Ambattur near Madras which is expected to go into production by the end of 1958. Truck, bus and cycle tyres will be produced here primarily for the needs of the South Indian market.

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SHRI KARNAIL SINGH VISITS INTEGRAL COACH FACTORY

Shri Karnail Singh, Member, Engineering, Railway Board, New Delhi, recently inspected the Integral Coach Factory, Perambur. His visit also coincided with the ceremony of the inauguration of the sixth and last assembly line scheduled to go into production in the Main Assembly Shop on January 9th.

Regretting at the outset that he could not address the gathering in Tamil, Shri Karnail Singh said that the making of Integral Coaches in India was a fine achievement. But, he added, even greater than this achievement was the acquisition of confidence of the workers of I. C. F. that they can "fashion metal sheets into anything that is required." He congratulated all the workers and the officers from whom they had received direction for their fine work at Perambur.

After seeing the fine workshop at Perambur, Shri Karnail Singh said, it was a great pleasure to see the "inner happiness and the brightness so far as the human part of it is concerned." And in so far as the work part is concerned, I can see in the hands and the eyes of the workmen at the machines, the confidence, with which you all are either handling the

electrodes or pressing sheets through straightening machines or doing any other type of work.

Earlier Shri K. Sadagopan, Chief Administrative Officer, in his introductory speech said it was a great honour to welcome Shri Karnail Singh whose "dynamic ability, leadership and personality" was reflected in the attainment of the most impressive production record of locomotives at the Chittaranjan Locomotive Works—when Shri Karnail Singh took charge of it.

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JAPANESE RAIL ENGINES—INDIA PLACES ORDER

The Railway Board have placed an order for 10 broad-gauge electric A. C. type locomotives with a firm of rolling stock manufacturers in Japan.

A feature of the contract is that deferred payment terms have been agreed upon by the firm concerned.

The total value of the order is in the neighbourhood of Rs. 98 lakhs.

The Railway Board have also placed an order with another Japanese firm for the supply of spare parts for metre-gauge rail cars, which are already in service.

191498

IN YOUR OWN INTERESTS HOW TO PURCHASE TICKETS

Buy your tickets only at the proper place. The authorised offices are (i) the Booking offices at the railway stations, (ii) the Town or City Booking Offices, (iii) the out-Agencies, (iv) Travel Agent. Never buy tickets from any other source as that may lead you to trouble. Please note that tickets are not transferable.

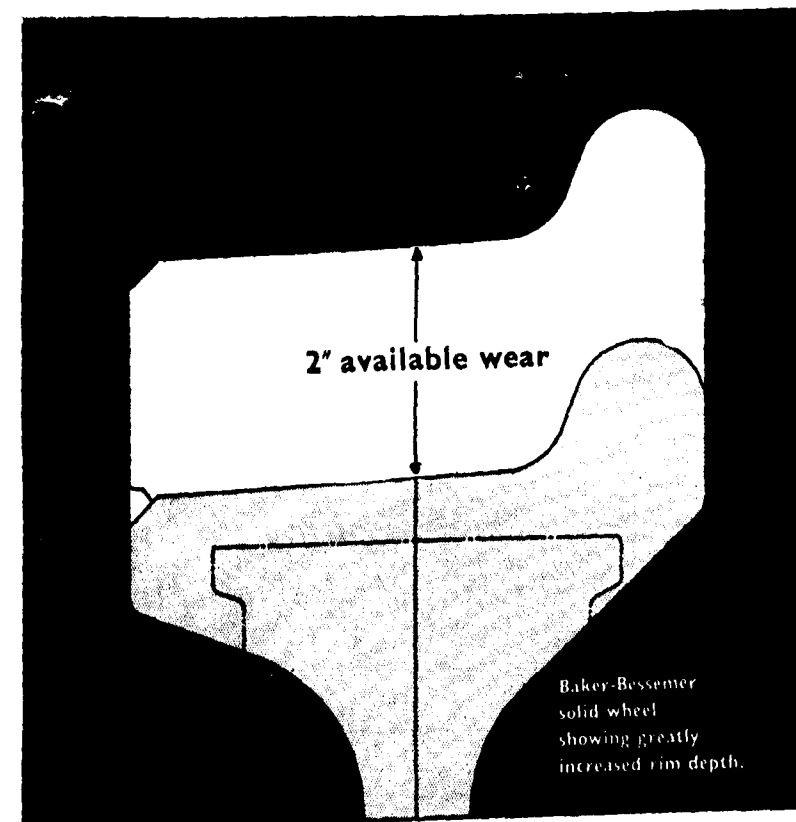
Buy your tickets in the proper time. You can avoid unnecessary excitement and trouble if you come to the station in good time, that is at least half an hour before the scheduled departure of your train. The Time Tables of the Railway are on sale at Booking Offices and Bookstalls.

Buy your tickets in the proper manner. Queue up at the Booking Window and you can get your ticket easier and quicker than by crowding at the counter.

By handing in the *exact fare in good coins or currency* you get the ticket easier and quicker, and save for yourself and the Booking Clerk time and trouble.

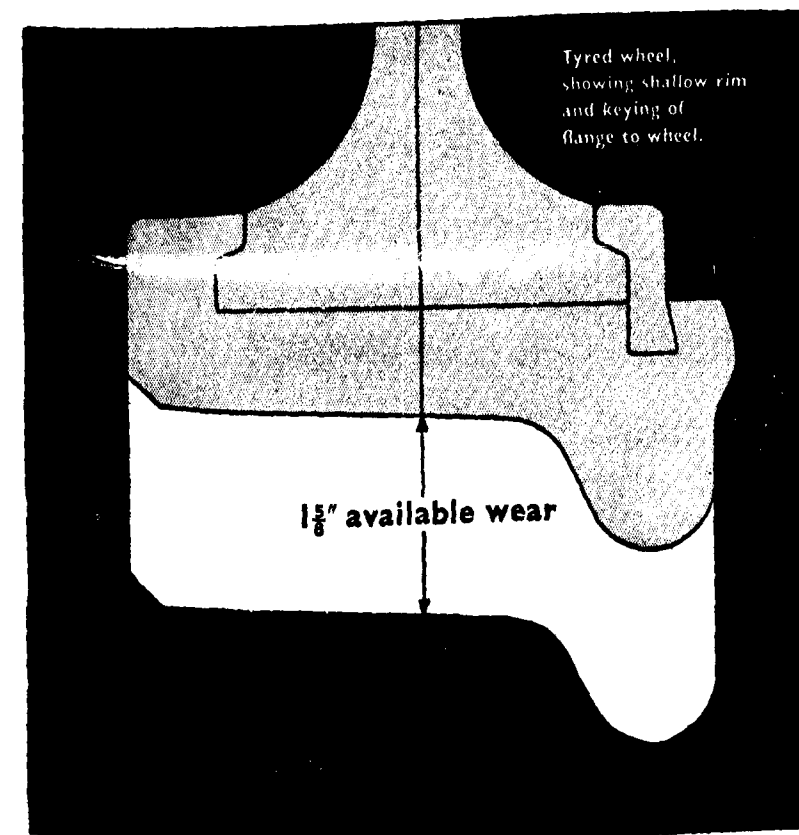
Check up your ticket and money before leaving the counter and draw the attention of the Booking Clerk to any discrepancy you may notice.

(Inserted in the interests of Travelling Public)

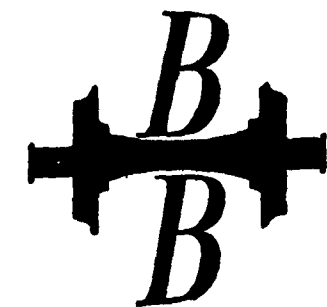


The solid wheel has an initial life 20% greater than the corresponding type of tyred wheel. This is fully illustrated by a comparison of the solid wheel, I.R.S. Drawing No. WA. 22, and the built-up wheel to I.R.S. Drawing No. WA. 23.

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CLEANLINESS LEADS TO HEALTH AND HAPPINESS

Clean orderly habits contribute to general health and welfare and as such to happiness and prosperity; they are more important than medicines.

Cleanliness prevents disease; medicine only attempts to cure.

Cleanliness of the person, of the houses and colonies, reflects discipline in the individual and the community. Discipline is the foundation stone for progress of oneself and the country. Cleanliness is a good habit. It is also cheap.

III Railwaymen should set an example of cleanliness. This will help others and themselves.