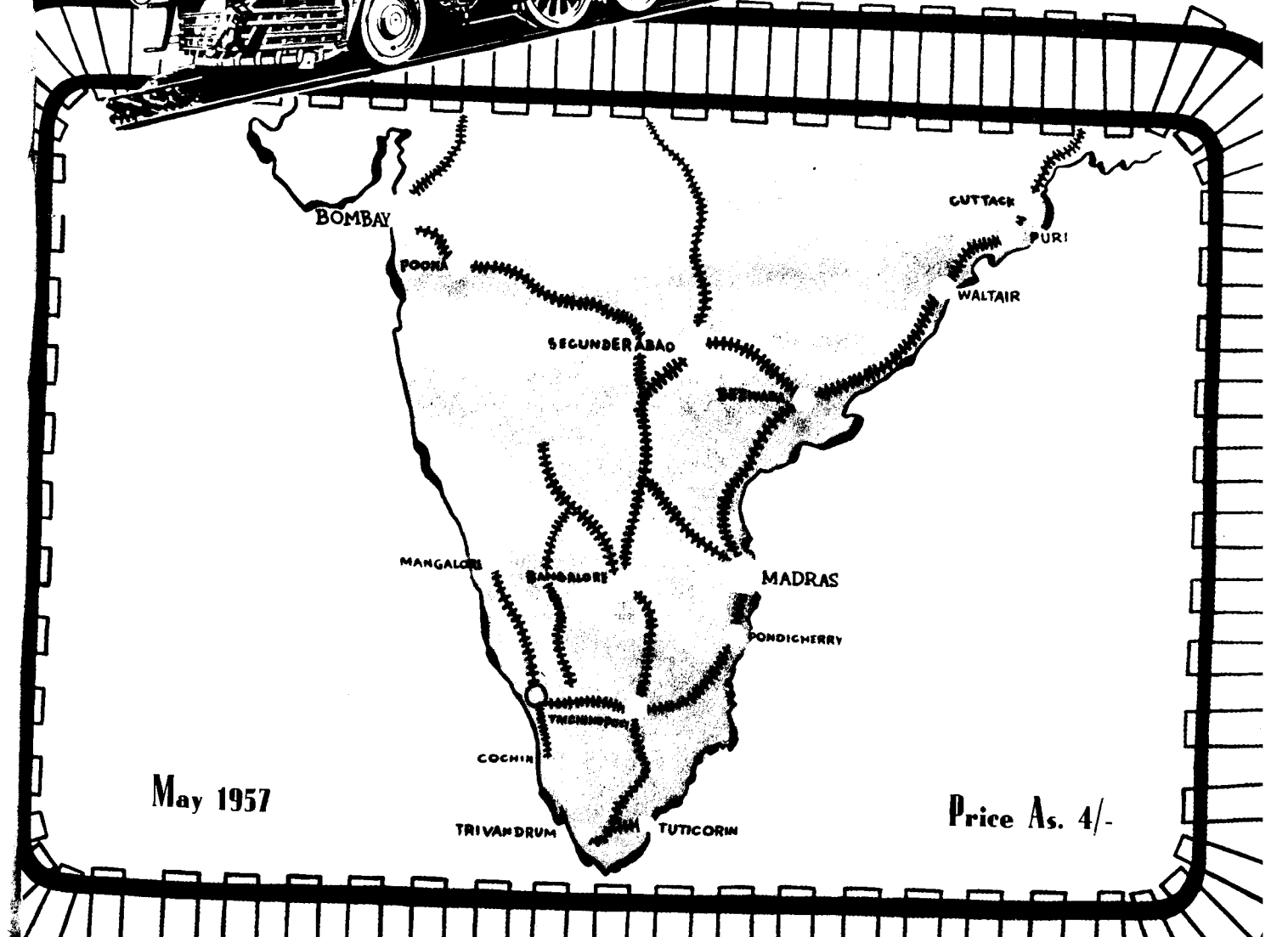
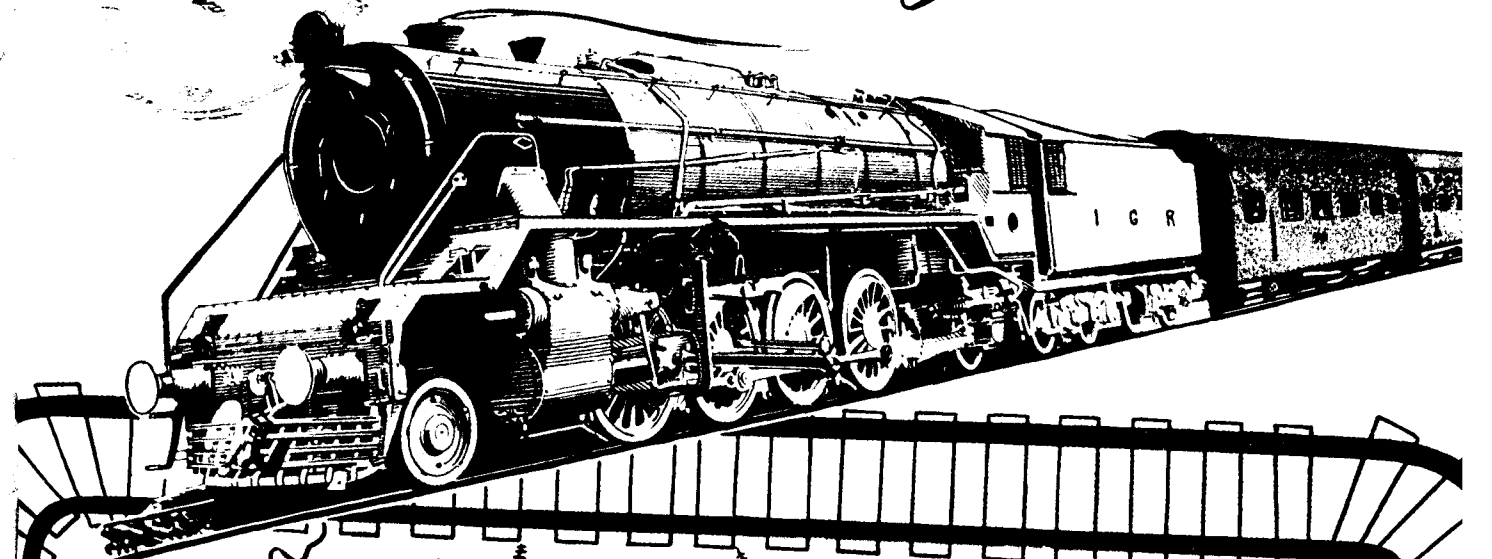


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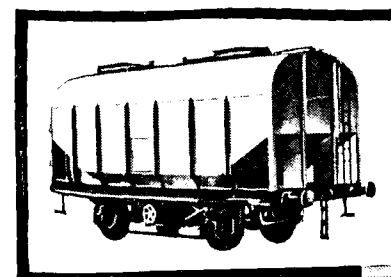
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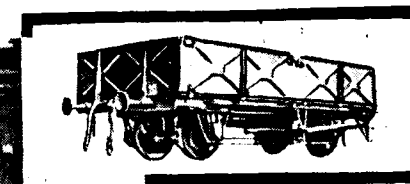
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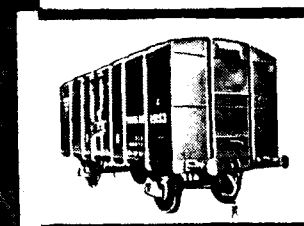
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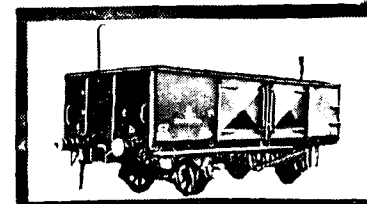
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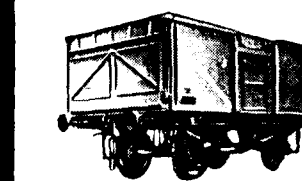
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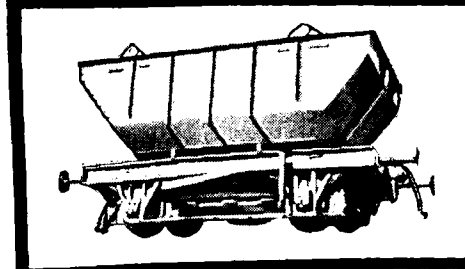
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## RAILWAY BUDGET

**S**HRI JAGJIVAN RAM, Union Minister for Railways and Transport presented the interim Railway Budget covering the first five months of 1957-58 in Lok Sabha on March 19, 1957. It was estimated that there would be a net surplus for this year of Rs. 21.43 crores at the prevailing levels of fares and freights. In the year 1956-57 that has just concluded, the estimated net surplus was Rs. 26.95 crores against a surplus of Rs. 14.22 crores for the previous year ending 31st March 1956. The current year's estimates were subject to revision on the basis of the recommendations of the Freights Structure Inquiry Committee accepted and implemented during the course of the financial year.

For the year that has just commenced budget estimates placed gross traffic receipts at Rs. 368.5 crores. Working expenses are expected to be Rs. 244.16 crores out of a total expenditure of 303.28 crores. Of the net railway revenues of Rs. 65.22 crores, the net anticipated surplus is expected to be Rs. 21.43 crores. In the year 1956-57 that has just concluded the gross traffic receipts are estimated to be Rs. 350 crores which is some 34 crores of rupees higher than for the previous year and Rs. 103 crores higher than in the year 1950-51 whilst total expenses including appropriation to depreciation revenue are estimated to be Rs. 285 crores against Rs. 267 crores in the previous year.

Shri Jagjivan Ram, reviewing railway operations in the last year stated that the tonnage handled over the whole system had risen by 10 per cent to 126 million tons in 1956-57. The net ton miles per wagon day, an index of efficiency in wagon utilisation, had risen to an average of 541 which was a record. On the passenger side, in the drive to reduce overcrowding 120 new trains had been introduced during the year and the run of 91 others had been extended. Besides this several trains were strengthened by attaching additional bogies.

The appointment of an expert committee under the chairmanship of Shri A. N. Khosla, Vice-Chancellor of the Roorkee University to prescribe appropriate designs for waterways and instructions for the upkeep of railway bridges and other structures was announced by the Minister. The railways' own organisations concerned with designing, research and standardisation would be strengthened so as to step up operational efficiency and to attain self-sufficiency.

The first year of the Second Five-Year Plan had been one of anxiety due to shortages of steel, cement and permanent way materials. Steps were being taken to economise in the use of steel and cement wherever possible. Besides, steps had been taken to procure the requisite supplies in co-operation with the concerned Ministries.

In the first year of the Plan under the rolling stock programme orders for 557 locomotives, 1,931 passenger carriages and 27,184 four wheeled goods wagons had been placed whilst orders were proposed to be placed against the current year's programme for further 411 locomotives, 2,346 passenger coaches including 68 Electrical Multiple Unit coaches and 17,729 goods wagons. Among the locomotives ordered were 100 of the powerful (2,000 h. p.) diesel class for mainline goods haulage which would help on sections where steam traction was at or near saturation density.

In the proposals for the Second Five-Year Plan a sum of Rs. 80 crores had been set apart. In addition to the lines originally proposed for conversion from steam to electric traction, it was now contemplated to add the sections between Gomoh and Moghal Sarai and Asansol Raj Kharswan and Bara Jamda where the coal and steel traffic would be very dense. The team of railway experts now in India conducting a detailed survey under the Technical Co-operation Agreement between India and the U. S. A., besides undertaking a study of the use of more powerful locomotives, etc., would also study and report on ways and means of increasing the railways movement capacity in the colliery areas to cater to the large increase in production of coal under the Second Plan.

The Railway Minister expressed his satisfaction at the relations of staff with the management which he characterised as being happy. The rules for promotion of Class IV staff to Class III service were in some ways restrictive and he promised to examine this matter further. He also gave an account of the recent upward redistribution of a large number of posts in the non-gazetted cadres of all Government Railways in India. The scheme which represents a new deal to workers will benefit 170,000 railwaymen in the lower pay grades whose responsibilities and work load have increased with the greater complexity of problems facing the railways to-day.

## The United Kingdom Coal Industry

**T**HE mining industry occupies a key position in the UK national economy. It provides over nine-tenths of the power supplied to British industry, employs over 700,000 workers and contributes directly about £ 500 million to the net national income. Since 1946 the industry has been under public ownership and control under the National Coal Board, which has put into operation a long term plan for reorganization and development. When this programme is completed four-fifths of Britain's coal will be coming from virtually new mines. The object of this paper is to outline the history of the industry, describe its current problems and show how those problems are being tackled.

### HISTORY

Coal extracted from surface seams was used in Britain as a domestic fuel as far back as the Bronze Age — some 4,000 to 5,000 years ago. Later on, its value for this purpose was well known in Roman Britain. The first written mention of coal dates, however, from the Anglo-Saxon Chronicle of A. D. 852 which refers to the despatch of '12 loads of coal' to Peterborough Abbey. The early thirteenth century saw the beginnings of an organized coal industry when Henry III granted a licence to dig for coal at Newcastle-on-Tyne. In 1306 there are records of shipments of coal from Newcastle to London for domestic purposes and for forges and, a few years later, of exports to continental Europe. During the next few hundred years the mining of coal by very primitive methods extended to most of the present-day coalmining areas, but by 1700 the annual output was less than three million tons.

### THE PERIOD OF EARLY EXPANSION

The great expansion of the industry after this time, and particularly after 1800, can be attributed to three main causes — a vast increase in demand stemming from the Industrial Revolution and the increase in population which accompanied it, radical changes in methods of transport and progressive improvements in mining techniques.

Perhaps the most important of the early events of the Industrial Revolution was the discovery by Abraham Darby, about the year 1709, of a method of smelting iron with the use of coal (in the form of coke) instead of charcoal which was rapidly becoming scarce. The striking development of Britain's iron and steel industry,

on which the progress of so many other industries largely depended, owed much to this early discovery. Meanwhile coal was being used more and more extensively for boiling and evaporating purposes in the growing glass, chemical, soap and sugar industries. Moreover, the introduction of steam-driven machinery in a widening range of industries created an ever-growing demand for coal as a source of power. The domestic use of coal for heating purposes also had an important industrial aspect for it made habitable for large populations many areas which were previously habitable only in summer months. In the nineteenth century coal found important new uses — in the generation of gas, as a source of valuable chemical by-products and, later, in the generation of electricity.

As regards transport developments, the replacement of pack horses and sailing ships by railways and steam ships not only created new demands for coal as a means of propulsion but made it much easier to transport coal over long distances.

Within the coal mining industry itself the principal technical developments in the eighteenth century were the introduction of pumping engines and winding engines. Pumping engines became an urgent need because the mines were reaching ever deeper into the earth and were increasingly subject to subterranean flooding. This need prompted many new inventions. One of the first was Thomas Savery's steam pumping engine which appeared about 1698 and was capable of drawing water out of the pits at the rate of 60 gallons a minute. Savery followed this by a better machine termed the 'Miners Friend'. A few years later Thomas Newcomen devised a beam engine which employed steam at atmospheric pressure, and 60 of these engines were subsequently installed in the collieries around Newcastle. In 1769 James Watt patented a pumping engine with a separate condenser, which greatly improved its efficiency. The problem of hoisting coal to the pithead found a satisfactory solution in Watt's rotary engine, introduced about 1787.

Of the other early improvements in technique one of the most important was the introduction of the miner's safety lamp by Sir Humphrey Davy in 1813. This greatly reduced the danger of underground explosions from 'fire damp' (methane gas). A further development was the substitution of rope haulage in the pits for hand and pony haulage.

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On the other hand, progress in one major direction, the substitution of machinery for manual labour at the coal face, made slow progress. The first coal cutting machines did not appear until the end of the nineteenth century. By 1909 some 1700 coal cutting machines were in operation.

During the early period of coal mining employment conditions had been extremely bad and women and children were engaged on hard and dangerous tasks for lengthy periods. In 1842 Lord Shaftesbury initiated legislation which forbade the underground employment of women and girls and of boys aged less than 10 years. The Coal Mines Regulation Act of 1850 laid down rules for the safe running of mines and made provision for the appointment of inspectors to see that the law was carried out. Further legislation included an Act passed in 1908 restricting the working day to 8 hours.

Between 1750 and 1850 Britain's coal output expanded ten-fold, and by the end of the nineteenth century there were 3,000 mines in operation producing 170 to 180 million tons a year. In export trade Britain achieved a predominant position, due largely to the proximity of the coal fields to the shipping ports, unrivalled shipping facilities and the quality of coal supplies. Exports rose from an annual average of 7.5 million tons in 1855-64 to an average of 73.3 million tons in 1901-10.

In the peak year, 1913, the industry produced 287 million tons of which 94 million tons were exported. The industry then employed 1,107,000 men.

#### RECESSION AFTER 1913

After 1913 output tended to decline. The immediate cause was the outbreak of the first world war, which led to the shortages of manpower, plant and materials. The industry was confronted, however, with much more persistent problems. A major problem was the rapidly rising cost of production, due in part to the increasing difficulties of mining: the very fact that the British coal mining industry had developed so early meant that many of the best seams of coal were now exhausted and fresh coal had to be mined from deeper and thinner seams. The industry was also faced with increased competition from newly exploited continental mines. This occurred at a time when the general demand for coal was checked by a heavy depression in heavy industries using coal (e.g. iron and steel), by the introduction of more economical methods of combustion and by the exploitation of rival forms of energy—fuel oil and hydro-electric generation.

Owing to the difficulties in finding markets, the coal producers attempted to cut prices by reducing wages, which form by far the largest element in the cost of production. This was the main factor behind the numerous labour disputes which burdened the industry during the inter-war years. The aggregate duration in working days of such disputes rose from 46.4 million in 1907-13 to 105.1 million in 1919-25 and in 1926 there was a stoppage of unprecedented magnitude, amounting for the loss of 145.2 million working days.

The upshot of all these adverse circumstances was that coal production during the inter-war period was not only at a lower average level than between 1900 and 1913, but was subject to much greater fluctuations. In particular, shipments to other countries showed a marked downward trend. Before 1914, 33 per cent of production was normally exported. In the early 'twenties this figure was down to 30 per cent and in the early 'thirties to 20 per cent.

During the first world war the Government had assumed full control of the industry. In consequence of the unrest in the industry after the war a Commission was set up, under the chairmanship of Mr Justice Sankey, to investigate the future of coal-mining. Members of the Commission reached divergent conclusions but the chairman and other independent members recommended state ownership of the mines on payment of compensation or unification by some other means.

Meanwhile, attempts to bring about economies by amalgamation of collieries, which had been considered by the Sankey Commission in 1919, were advanced by the Mining Industry Act 1926 which enabled colliery owners to prepare and submit to the Board of Trade schemes of amalgamation designed to secure greater economy and efficiency in working. To strengthen the move towards amalgamation a Coal Mines Act was passed in 1930, establishing a Reorganization Commission with the duty of bringing about the formation of larger and more efficient units. The Reorganization Commission was abolished by the Coal Act, 1938 which transferred ownership of 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. However, at the outbreak of the second world war in 1939 this process was not far advanced.

The second world war brought exports to a standstill and accelerated a downward trend in output, productivity and labour force. At the same time there was a

steady upward movement in demand. No longer were there problems of finding markets for the coal produced: the main task was to produce enough coal to meet urgent needs. The need for greater output per man employed and for more labour in the industry was stressed in a White Paper on Coal presented to Parliament in 1942. To achieve these aims the Government took over full control of the operation of all coal mines and of the allocation of coal raised. A Ministry of Fuel and Power was established with the general duty of ensuring the effective and co-ordinated development of fuel and power supplies, and of promoting economy and efficiency in their distribution and consumption. At its head was a Minister assisted by a Controller-General. To advise the Controller a national board and regional boards were set up.

#### THE REID REPORT

In 1944 the Government appointed a committee of seven mining engineers under the chairmanship of Sir Charles Reid to investigate the current technique of coal production and advise what technical changes were necessary in order to bring the industry to a full state of technical efficiency. In its report, published in 1945, the Committee stressed the urgent need for reconstruction in the industry to eliminate uneconomic units and make possible a wide range of technical reforms, which were outlined in the report. It emphasized the inability of the then existing system of ownership to carry out this reconstruction and recommended the setting up of an authority to carry out the changes on a national scale.

#### THE NATIONAL COAL BOARD

In 1946 the Coal Industry Nationalization Act was passed. This brought the coal-mining industry into public ownership and control under a public corporation—the National Coal Board. It transferred to the Board all coal-mines, all mineral rights in coal and any other mineral rights which were held by the Coal Commission or by colliery concerns and could not be developed except as a by-product of coal-mining; and most of the ancillary undertakings run by colliery concerns. On 1st January 1947, therefore, the Board took over 1,500 collieries and many ancillary undertakings such as brickworks, coke-ovens and by-product plants. The Board now operates about 900 collieries which produce nearly all the mineral coal, while the remainder are 'small mines' (of 30 or less men underground) run by private operators under licence from the Board. Opencast mining, for which the Ministry of

Fuel was previously responsible, was transferred to the Board on 1st April 1952. The Board operates nearly half Britain's coke and by-products plants and is Britain's second largest producer of bricks.

#### DUTIES AND POWERS

The 1946 Act charged the Board with responsibility for securing the efficient development of the country's coal production and with making coal available in such quantities and at such prices as may seem to them best calculated to further the public interest, without giving undue preference or advantage to any consumer. The Board was empowered to mine, treat and sell coal and to prepare and sell coal by-products. It was given a monopoly of coal-mining, but not of distribution of coal or of the preparation and sale of coal by-products. In addition, the Board was especially enjoined to secure the safety, health and welfare of persons in its employment and the benefit of their technical knowledge and experience.

#### PUBLIC CONTROL

The Board is responsible for the general fulfilment of its task to the Minister of Fuel and Power and through him to Parliament and the public. It is required to conform to any special policy directives which the Minister may give it on matters affecting the national interest, and to publish and submit to him an annual report and accounts, which he lays before Parliament. The accounts must be in the form which the Minister directs and must be audited by an auditor, whom he appoints. The Minister has other powers of control—over the use of capital funds, for the appointment and dismissal of members of the Board and certain other persons, and powers of enquiry. He is, in fact, in frequent consultation with the Board on a wide range of matters, though he does not in any way intervene in day-to-day administration.

Parliament exercises a general surveillance over the conduct of the coal industry as over other nationalized industries. Its principal instruments of control have, till now, been debates—including a debate on the annual report and accounts—and Parliamentary questions. A select committee of the House of Commons on the nationalized industries was appointed in 1955 to obtain and clarify for the benefit of Parliament, information about nationalized industries, but its terms of reference proved too narrow. The Prime Minister has announced that a new select committee is to be

appointed 'to examine the reports and accounts of the nationalized industries.'

The Coal Industry Nationalization Act provided for the setting up of consultative bodies to represent the interests of coal consumers. Two coal consumers' councils at the national level have since been set up.

- 1. *The Industrial Coal Consumers' Council* whose members represent consumers, merchants and suppliers of coal, coke and manufactured fuel for industrial and other purposes involving supply in bulk.
- 2. *The Domestic Coal Consumers' Council* whose members represent similar groups concerned with coal for domestic use.

These councils are responsible to the Minister of Fuel and Power, not to the National Coal Board. The composition of the Councils is left to the discretion of the Minister, who includes representatives of the National Coal Board. At present, the industrial council has a chairman and nineteen members and the domestic council a chairman and twenty-five members. The councils are required to make annual reports to the Minister, who lays them before Parliament. Both the councils prefer to meet in private in order to encourage freedom of discussion.

The most important function of the councils is the general consideration of the commercial arrangements and activities of the National Coal Board, and to ensure that the monopoly in the industry set up by the 1946 Act shall have the maximum practical regard for consumers' interest. Quality and adequacy of supplies have been prominent among the subjects discussed.

The councils only consider complaints after they have been first put to the Board or the appropriate authority and a satisfactory answer has not been provided. The councils are therefore more free to discuss questions of a wider importance.

CONSTITUTION OF THE BOARD

The members of the Board are appointed by the Ministry of Fuel and Power and must appear to him to have had experience or shown capacity in industrial, commercial or financial matters, applied science, administration or the organization of workers. The 1946 Act laid down that the Board should consist of a chairman and eight full-time members, each responsible

for a special Department. In 1949 the statutory limits of the Board's membership were changed to eight to eleven persons of whom not more than eight could be full-time and in 1951 the Board was reconstituted to include some part-time members free from departmental responsibilities.

The Board was again reorganized in February 1955, in accordance with the recommendations of a Committee on organization (under the chairmanship of Mr. Alexander Fleck) which it had set up in December 1953. The existing Board's members resigned voluntarily and the Minister of Fuel and Power appointed a chairman, deputy-chairman, six full-time and four part-time members, several members including the chairman being new appointments. The full-time members all share fully in responsibility for the Board's general policy but each of them is also concerned with a special aspect of the Board's activities.

DEPARTMENTAL ORGANIZATION

The Board set up a strong headquarters organization with a number of specialized departments. The Fleck Committee criticised the existing departmental organization. It recommended that 'Personnel' functions should be divided between two Departments, Industrial Relations and Staff, and not as formerly between three, Labour Relations, Manpower and Welfare, and Establishments. It further recommended that a new Purchasing and Stores Department should be set up. Production and Carbonisation Departments at Headquarters strengthened, the Medical Service given independent status, and a new Bricks Department set up. The recommendations were accepted save that for a Bricks Department; instead a Chief Brickworks Engineer was added to the Production Department. The Departments at present are therefore: Staff, Industrial Relations, Marketing, Purchasing and Stores Finance, Production, Scientific, Carbonisation, Legal and Medical Departments.

DIVISIONS, AREAS, COLLIERIES, GROUPS

For administrative purposes the Board from the first divided the coalfields of Great Britain into Divisions (see Table 1) most of which were sub-divided into areas, 48 in all, which formed the main units of management. To run Divisions the Board appointed subordinate non-statutory bodies called Divisional Boards, consisting mainly of the heads of certain functional Departments in each Division and delegated to them considerable authority.

The day to day running of collieries was in the hands of colliery managers who reported to the Area Manager and got help and advice from Area specialists. On the by-products side, there were Carbonization Departments at certain Divisional Headquarters, to whom coke-oven managers were responsible.

TABLE 1  
THE BOARD'S DIVISIONS

| Division                  | Coalfield                                                | No. of Areas | No. of Pits | Approximate Annual Output in 1955 (million tons) |
|---------------------------|----------------------------------------------------------|--------------|-------------|--------------------------------------------------|
| Scottish                  | Scotland                                                 | 8            | 174         | 21.7                                             |
| Northern (a)<br>(N. & C.) | Northumberland,<br>Cumbria and Lancashire                | 4            | 68          | 13.4                                             |
| Durham (b)                | Durham                                                   | 6            | 132         | 25.4                                             |
| North Eastern             | Yorkshire                                                | 8            | 112         | 43.5                                             |
| North Western             | Lancashire,<br>Cheshire and N. Wales                     | 5            | 72          | 15.4                                             |
| East Midlands             | Nottinghamshire,<br>Derbyshire<br>Leicestershire         | 6            | 89          | 45.8                                             |
| West Midlands             | N. & S. Staffs<br>Cannock Chase<br>Salop<br>Warwickshire | 4            | 53          | 17.4                                             |
| South Western             | S. Wales<br>Monmouthshire<br>Dean Forest<br>Somerset     | 7            | 163         | 23.8                                             |
| (South Eastern)           | Kent                                                     | 1            | 4           | 1.5                                              |
| Total                     |                                                          | 49           | 867         | 207.9                                            |

- (a) Northern (N. & C.) and Durham were originally organized as one division.
- (b) Kent, originally organized as a Division, now operates as an Area.

The Fleck Committee suggested no alterations in the number of Divisions or Areas, but they found that too many persons were reporting direct to the Area Managers and they recommended that an intermediate link in the chain of command be inserted between Area

and colliery. They also recommended some standardization of departmental organization at Divisional Headquarters and an end of the practice of appointing part-time members to Divisional Boards. These recommendations have been accepted in principle but existing part-time members were invited to continue in office.

The Board decided that the intermediate level of management between Area and colliery should be called Group, and the men in charge Group Managers. In all there will be about 200 Groups, each comprising not less than two collieries and most groups have now been established. The Group Manager will have only a small supporting staff.

The Committee recommended giving colliery managers assistants to help with administration and staff.

GENERAL POLICY

The main primary sources of energy used in Britain are coal, petroleum and water power, while the main secondary sources are electricity and coal gas.

Output of coal had, when the Board took over, been declining since 1913 and saleable output of deep-mined coal in 1946 was 181 million tons compared with 227 million tons in 1938. The fall in production was partly due to temporary factors arising out of the war and its aftermath and the uncertainty attending the prospective transfer of ownership. Longer term factors were, however, also important. The preceding thirty five years had contained two world wars when development was sacrificed to immediate production and a long period of depression and unemployment between the wars when coal output was restricted, financial returns low and the prospects of capital expenditure in coal far from alluring. After the second world war, only one-tenth of output was coming from mines opened since 1921 and two-thirds was coming from mines opened before 1900. The effect of high extractions without new development had been a progressive and accelerating decline in the capacity of the industry.

The main coal-bearing areas in Britain are (1) the Yorkshire, Derbyshire and Nottinghamshire field (2) the Durham and Northumberland field (3) the South Wales field and (4) the Scottish field and (5) Lancashire and North Wales. The relative importance of these different areas has changed greatly over the

past 75 years. In the Durham and Northumberland, South Wales and Scottish fields many of the best seams have been exhausted, relative costs have been rising and output falling. In the Yorkshire and East Midlands fields, many pits are less than fifty years old, development is continuing and production expanding.

In spite of the decline in total output, coal supplies 85 per cent of Britain's energy needs. Workable reserves of coal are still large and have been estimated at 43,000 million tons, sufficient to last 200 years at present consumption rate, though certain high quality coking coals would be exhausted much sooner. On the other hand, nearly all petroleum is imported; and water power resources are limited. The immediate contribution of nuclear power is negligible and its development inevitably slow: it was expected according to the last published information to supply the equivalent of 5.6 million tons of coal in 1965 and 40 million in 1975, though technical developments recently mentioned by UK representatives at the World Power Conference suggest that these are under-estimates.

Energy demands have been rising steeply and are certain to go on rising. Sources of power alternatives to coal can with difficulty be developed sufficiently fast to meet even the rise in demand. Moreover, coal is still the most economical fuel for many purposes and can still be produced more cheaply in Britain than in most other countries. Investment in development of the coal industry shows a higher return in terms of addition to fuel capacity than any other form of investment in fuel and power.

The first and most important objects of Britain's fuel and power policy remain, therefore, the expansion of coal supplies and the development of the coal industry.

The National Coal Board is thus faced with two major tasks; securing an immediate rise in production to meet current demand and planning and executing a major scheme of reconstruction and new development to meet the increased demands of the future. To some extent, the two aims are conflicting, as development and long-term exploration and research absorb manpower and the output of certain pits is reduced during reconstruction.

#### PRODUCTION

The Board was successful in rising saleable output of deep-mines coal from 181 million tons in 1946 to

212 million tons in 1951 (see Table 7) through increasing productivity by mechanization, simple reorganizations and other short-term measures (see below).

In 1952 the Board was able temporarily to increase its labour force and therefore its production because a trade depression led to redundancy in textile and other consumer industries and thus made it easier to recruit labour to the mines.

The average labour force, however, declined from 716,000 in 1952 to 704,000 in 1955 and deep mined production fell from 214.3 million tons to 210.2 million tons. The published figures are for output of saleable coal and somewhat under-estimate the amount of current production compared with that of earlier years owing to improvements in standards of cleaning coal. For example, about 12½ million tons more dirt and waste was extracted from deep-mined output in 1955 than in 1947.

Throughout this period open-cast coal-getting was carried out by contractors first on behalf of the Ministry of Fuel and Power and from 1952 for the National Coal Board. It produced between 10.2 and 12.4 million tons of coal per year at a low cost in money and men.

#### PRODUCTIVITY

Between 1946 and 1951 productivity rose rapidly (see Table 7). Mechanization of cutting and conveying, which was already widespread, was extended and became the general practice, while improved machines and methods were introduced. Transport development was particularly important. In the six years up to and including 1952, the number of locomotives in Britain's mines increased from 80 to 510 (450 diesel, 60 electric) while many rope haulage systems were replaced by conveyor belts. At the same time some unproductive pits were closed and some of the more productive pits developed, with additional labour and machinery. Some labour savings were made possible both below and above ground by the unification of ownership, while others resulted from improving organization and methods at particular collieries.

By 1951 the process of increasing productivity by these relatively simple and inexpensive methods had been carried almost to its limits. Further progress depended on the development of machines for power-loading the coal cut from the face straight on to conveyor belts so that the processes of cutting, loading

and conveying can proceed simultaneously and continuously; on thorough reorganizations of underground transport, e. g. the introduction of the horizon system of mining, when the main roadways are straight and level instead of following the seams; and on major schemes of reconstruction and new development which were bound to take time to complete.

In 1952 productivity fell somewhat, mainly because of the larger intake of new labour requiring training and not contributing directly to production. Between 1952 and 1954 there was a gradual increase in productivity, and in 1955 productivity was at about the same level as in 1954 and higher than in any previous year. The main reason for the increase in productivity since 1951 is probably the spread of power-loading as the development of new machines made possible its wider application to varied coal-mining conditions.

The main methods of working coal used in Britain are the 'longwall' and 'bord and pillar' methods. In the first method, which accounts for about 85 per cent of output the coal is won along the whole of a long face in the seam and extraction is fairly complete. In the 'bord and pillar' method, however, extraction is only partial and large pillars of coal are left behind to support the roof. This a rapid method, suitable where seams are thick and only light support is needed.

The orthodox British method of longwall working is cyclical, by which three shifts are worked every 24 hours—loading the coal onto the conveyor takes place during only one shift, while the other two shifts are for cutting and bringing down the coal from the face, and for packing and ripping (i. e. packing the space from which coal was removed with waste to support the roof, and ripping down portions of the roof above roadways).

Of recent years attempts have been made to replace the cyclical method by continuous mining. The latter method avoids the necessity of completing the work of one shift before the next can start and also the inevitable dislocation to production in the event of a breakdown or hold-up in one phase of the cycle. Trials of new machines and equipment, including a large number of armoured conveyors, are being made in the process of developing fully mechanized continuous longwall mining. These armoured conveyors play an important part as they can be placed directly against the coal and be moved over section by section as the coalface advances (whereas in normal

working the face conveyors have to be reassembled on each cycle of operation). They can also partially load the coal blown down on to them in conventional working where no power loading machines are used.

The percentage of mined coal, which is power loaded rose from 7½ in 1951 to 11.1 (or 27 million tons) in 1955. This coal was loaded by 544 power loading machines, most of which have been developed since the end of the second world war. The most widely used were the 142 Meco-Moore cutter loaders which loaded 9 million tons. Of the new machines, the most important is the Anderson Shearer loader, which has proved applicable (in conjunction with armoured conveyors) to many different conditions, where power loading was not previously applicable. 83 of these machines were in use in 1955 compared with one in 1952. Other machines include the Trepanner and the Joy Continuous Miner for continuous mining by the room and pillar system.

#### LABOUR

After the war the coal-mining industry had a severely depleted labour force. Many young potential miners had been absorbed into the Armed Forces while many of the youths conscripted to the mines as an alternative to serving in the Armed Forces, and of the older miners who had been asked to remain at work after normal retiring age, began to leave the industry. There was, moreover, strong competition for manpower for other industries and this competition has persisted. In addition to the general shortage there were acute shortages of skilled craftsmen, of mining engineers and of many types of specialists.

To remedy this situation the Board has made vigorous efforts to recruit more men and to reduce wastage. It has improved wages, and conditions, greatly increased facilities for education and training leading to promotion and has paid special attention to housing. The Board has built some 20,000 houses in selected areas, in addition to current housing programmes for miners. It has conducted recruitment campaigns, in which it has publicised these new attractions of a career in the industry.

These measures have had some success in maintaining a high rate of overall recruitment and in stimulating recruitment of boys under 18, but wastage has continued high and has exceeded recruitment in all but three of the years since nationalisation. Recruitment and wastage since 1953 is shown in Table 2.

## WAGES AND CONDITIONS OF WORK

Pay increases introduced by the Board have raised average earnings (including the value of allowances in kind) per man-shift (7½ hours) from 36s. 10d. in 1947 to 63s. 7d. in 1955 for face workers and from 28s. 10d. to 50s. 11d. for all workers.

The Board has not only had to raise wages to meet changes in the cost of living and to attract and hold labour in a competitive labour market, but has had to set about rationalizing the anomalous wage structure bequeathed to it by the many enterprises from which it took over. The first stage of this task was completed in 1955 when a new wage structure was agreed with the National Union of Mineworkers and introduced for 400,000 day-wage men in the industry. The new structure was based on a careful survey which identified 400 different jobs in the industry and grouped them into 13 grades for wage purposes. The new rates were only applied when the men did not lose by them and 30 per cent of day-wage men accordingly stayed on their old rates. Wages of day-wage men were again raised in February 1956. Current shift-rates for adult workers underground now vary from 30s. 1d. to 38s. 1d. according to grade, and weekly minima for the lowest grade of adult male workers are £9. 0s. 6d. for underground workers and £8. 0s. 6d. for surface workers. Investigations preparatory to the negotiations of new rate structure for piece workers and task workers are proceeding but will not be quickly and easily completed.

In May 1947 the Board reached an agreement with the National Union of Mineworkers for the introduction of the five-day week. The normal working week for underground workers is five shifts of 7½ hours each, plus the time it takes to raise the workers to the pithead after each shift. Since November 1947, however, most underground workers have voluntarily worked an additional Saturday morning shift in accordance with an understanding to that effect between the Board and the NUM.

Employees in the industry receive two weeks annual holidays with pay in addition to six statutory public holidays. Under a contributory pension scheme they are entitled on retirement from the industry to a pension additional to any to which they may be entitled under the National Insurance Act.

## EDUCATION, TRAINING AND PROMOTION

The Board's policy is to recruit boys under 18 and train them. Preliminary training takes place partly

at Group training centres and partly at technical colleges and lasts for 16 weeks during which normal wages are paid. After preliminary training, boys are allocated to a colliery where the colliery training officer is responsible for the continuance of training and for supervising the personal welfare of the new entrants. It is customary to give boys an all-round training in underground work so that even those who intend to be face-workers spend time on haulage. Boys who want to become crafts-men serve a five years apprenticeship in their chosen trade and may be sent to part-time day courses at technical colleges to obtain recognised qualifications.

Boys selected for ability are released from work to attend technical colleges for part time day courses of study leading to National Certificates in mining and mining survey and have in this way an opportunity of promotion to colliery manager or under-manager. The National Coal Board also awards 100 scholarships a year tenable at any University for boys inside and outside the industry to enable them to become mechanical or electrical engineers.

## SAFETY, HEALTH AND WELFARE

The safety, health and welfare of workers in mines and quarries are the subject of comprehensive legislation. Protective legislation in mines began with an Act of 1842, which forbade the employment of women underground, and successive measures since then laid down detailed requirements for the safe conduct of operations and dealt with such matters as ventilation, dust suppression, rescue work, first aid and the initial medical examination of certain new entrants by official doctors. The latest stage was reached when the Mines and Quarries Act was passed in 1954. This Act establishes the basic modern principles of safety, health and welfare, leaving the details to be dealt with in statutory regulations; it both consolidates the previous law and brings it up to date. Apart from technical matters, it also covers such subjects as the general responsibilities of owners and managements, the appointments and duties of officials, training, welfare, the powers of official inspectors, statutory qualifications of managers and under-managers, employment of women and young persons, and inspection on behalf of workmen.

The Ministry of Fuel and Power is generally responsible for the administration of these enactments while the Mines and Quarries Inspectorate, which is part of that Ministry, is directly responsible for their enforcement.

The National Coal Board is expressly charged with securing the safety, health and welfare of its employees and has set itself to accomplish this in all practicable ways.

*Safety.* The Board has its own safety organization—a Standing Committee on Safety, a Chief Safety Engineer, and Safety Engineers at Divisions, Areas and the largest collieries. It conducts courses of safety training for workmen and officials and is constantly on the alert for new methods of reducing risks. Its research programme includes a number of projects with a direct bearing on safety. Examples of recent voluntary action by the Board to reduce risks include the use of fire-resistant conveyor belting, the stone dusting of roadways and other dust control measures, and the withdrawal of light alloy equipment from the coal face pending the development of an alloy unlikely to cause dangerous sparks.

The Ministry of Fuel and Power runs extensive Safety in Mines Establishments at Buxton and Sheffield.

*Health.* The health services provided by some of the larger collieries before 1947 have been extended by the Board to provide for the coal industry a comprehensive industrial medical service. The Board's employees, like all UK residents, already have available to them the personal medical service (National Health Service).

The aims of the Board's Medical Service are, briefly, to ensure that new entrants are fit for work in the mines, to help the men in the industry to keep healthy, and to assist in placing disabled workers in suitable jobs. By the end of 1955 there were 66 doctors employed full-time by the Board and 302 medical centres at collieries. Each centre is staffed by a State Registered Nurse usually assisted by a specially trained staff. The centres give first treatment for injuries and illness at work and are visited regularly by the Board's doctors who also see workers by appointment and discuss their health problems with them. There are also first aid posts manned by men trained in first aid throughout the collieries including the smaller pits, and all Divisions have schemes for further first aid training.

During the year 1955, nearly all new entrants to the industry were examined clinically. All new entrants in South Wales had an 'X-ray' of the chest and similar arrangements were also introduced in the Scottish, Durham and Northern (N. & C.) Divisions. An increasing number of periodic examinations were made of men employed at the Board's ancillary plants who, like other

workers involved in producing materials such as tar and pitch, are exposed to the risk of skin cancer.

A major preoccupation of the medical service is to reduce the toll from the occupational diseases of coal-mining. One of the most formidable of these is pneumoconiosis which has been common in the coal-mines of South Wales and became more so as mechanization increased coal dust concentrations. The Board has reduced dust concentration by damping and stone dusting and the use of specially designed drills. These measures have greatly lessened the reported incidence of pneumoconiosis in South Wales, but the figures of its incidence have been rising elsewhere probably because more mine-workers know about the dangers of the disease and the advantages of treatment and so report on this ailment. It is almost certain that the disease is in fact becoming less prevalent as more progress is made with dust suppression measures. No cure of dust diseases is known but it is possible to give considerable relief of symptoms. In some cases, to halt the further progress of the disease, it is thought best to remove the man from further exposure; in others it is thought that the man can safely continue in his old work provided he works only in approved dust conditions and is subject to medical re-examination from time to time.

Measures taken since 1947 have helped to reduce unemployment among sufferers from pneumoconiosis by more than four-fifths. The most important factor in achieving this has been that, under the National Insurance (Industrial Injuries) Act, men may be paid benefits for pneumoconiosis even though they continue work in the process which caused it; there is no automatic suspension from the scheduled occupation as there was under the Workmen's Compensation Acts.

Another factor is that in 1951 the Ministry of National Insurance introduced a scheme whereby persons who had been certified as suffering from pneumoconiosis and suspended under the Workmen's Compensation Schemes could apply to the Silicosis Medical Board for permission to return to work in the coal-mining industry under approved dust conditions.

Colliery managers and personnel experts on the Board's staff co-operate closely with medical and social workers of the Miners' Rehabilitation Service. This service comprises seven residential centres in England and Wales. The first of these centres was set up in 1939 by a group of colliery owners with the co-operation of the National Union of Mine-workers. As

an outcome of this experiment, the Ministry of Fuel and Power three years later requested the Miners' Welfare Commission to develop a nation-wide service. In 1951 the centres were transferred to the National Health Service. Miners have priority for admission, but a small percentage of other orthopaedic patients are taken. There is also one miners' rehabilitation out-patient centre in Scotland under the Coal Industry Social Welfare Organization. All patients admitted to the centres have sustained serious injuries. For the centres in England and Wales, the average period between injury and admission is four months and the average period of total disability is six months.

*Welfare.* Organized welfare in the industry began with the Miners' Welfare Committee set up in 1920 following the recommendations of the Sankey Commission. In 1939 the Welfare Committee became a Welfare Commission. In 1947 the N. C. B. was also made responsible for providing for the welfare and education of its employees, and, to avoid overlapping, a National Miners' Welfare Joint Council was created to direct and plan all welfare arrangements. Welfare expenditure was by this time covered by a 1d. a ton statutory levy on output (providing about £800,000 a year), a 5 per cent levy on mining royalties (about £110,000 a year), and a further 2d. a ton which the N. C. B. volunteered to provide. In addition, the Board took over the responsibility for upkeep of baths and improvements to canteen at an annual cost of £1,500,000 (or nearly 2d. a ton of output). Out of this income, miners have been provided with pithead baths, institutes, canteens, convalescent homes, scholarship funds and a variety of recreational facilities.

In 1952 the statutory levy came to an end and the Board took over responsibility for all colliery welfare (baths, canteens, and so on) while the social welfare side became the responsibility of a new organization known as the Coal Industry Social Welfare Organization, which was controlled jointly by the Board and the miners' trade unions. To finance social welfare the Board make available a first payment of about £1 million held by the Miners' Welfare Commission for social welfare purposes.

An outstanding welfare achievement has been the provision of pithead baths. By the end of 1955 there were baths at 622 pits with accommodation for nearly 677,000 men. It is estimated that the pithead bath programme will be virtually complete by the end of 1956. The Board in 1955 also operated 728 canteens with annual sales of £7½ million.

The Coal Industry Social Welfare Organization is concerned with providing and maintaining buildings and grounds for recreation and sport, with organizing and encouraging sport, indoor recreation, cultural and social activities, with youth work, with the social needs of the sick and disabled and with administering a fund for giving scholarships and exhibitions at universities to promising children of mineworkers. Its activities on behalf of the sick and disabled extend almost into the medical field as it operates a number of convalescent homes as well as the out-patients rehabilitation centre at Uddingston in Scotland. In 1954, it spent nearly £700,000 on social welfare of mineworkers and their families of which nearly £500,000 was for buildings for recreation and sport.

#### NEGOTIATION OF WAGES AND CONDITIONS

Up to 1943, miners' wages were negotiated on a district basis. Each mining district had its own trade union, and negotiations were conducted in England and Wales through boards based on the various coalfields and in Scotland through a conciliation board. The mine-owners, on the other hand, were united in the Mining Association of Great Britain.

The miners' unions were loosely linked in the Miners' Federation of Great Britain, but the Federation had little power and there were substantial differences of practice and output in the different districts.

From 1921 to the general strike in 1926, a national board acted as a court of appeal from district decisions. In 1930 the Government passed an Act providing for national conciliation machinery, but owing to the mine-owners' opposition the machinery was never worked.

In 1942 a Board was set up to investigate wage claims and arrangements for negotiation and conciliation in the coal-mining industry. On its recommendation a national minimum wage was introduced and a national conciliation scheme was agreed. The scheme provided for a national joint negotiating committee of 22 members, to which reference might be made by district joint negotiating committees. If this national committee could not decide a dispute it could be referred to a National Reference Tribunal, consisting of three permanent, independent members and four assessors without voting rights, two representing labour and two from managements.

In January, 1945, the National Union of Mineworkers was formed and took over the industrial activities of the District Unions which were, however, left in being

as District Associations with a limited independence in certain matters. They might, for example, if they desired, raise and administer themselves separate funds for various non-industrial benefits.

In the autumn of 1946, negotiations on machinery for conciliation and wagefixing and for joint consultation were begun between the NUM and the National Coal Board in anticipation of the transfer of the mines to public ownership in January, 1947. Agreements signed in December 1946 and January 1947, continued with certain modifications the 1943 conciliation scheme.

Under the new agreement, which is still in force, the Joint National Negotiating Committee consists of 10 members appointed by the National Coal Board and not more than 14 representatives of the NUM. The constitution of the National Reference Tribunal remains unchanged. District conciliation boards have been set up consisting of six members of the Divisional Coal Board and of NUM representatives whose number is determined at district level. District referees are appointed to adjudicate unresolved differences.

Entirely comprehensive pit conciliation machinery has been established. Disputes that cannot be settled between the workmen concerned and the immediate officials must be discussed within three days with the manager or his representative; after three days, unless a settlement is reached or is in view in the opinion of a trade union official, the dispute must be referred to a pit meeting between representatives of the Union and management. If the pit meeting decides that it cannot resolve the dispute or has failed to do so within 14 days, the matter is referred to the District Conciliation Boards, who refer it to a Disputes Committee appointed for purpose. If once again unresolved within 14 days, the dispute is referred to an umpire appointed by the District Conciliation Board. If he is satisfied that the question is merely a pit question he will examine it with the help of assessors representing management and workers and give his decision, but if he is not satisfied that it is a pit question he must notify the District Conciliation Board, which will deal with it under the District Conciliation Scheme.

Separate arrangements exist for the coke-oven and by-products branches of the industry.

*Incidence of Disputes.* The industry has, since the war, been disturbed by a large number of disputes leading to stoppages of work. All these stoppages, however, have been without the support of the trade unions. In fact, the time lost by disputes in most

post-war years has been less than the average for the previous decades of the 20th century (see Table 3).

#### JOINT CONSULTATION

The Coal Mines Nationalisation Act requires the N. C. B. to enter into joint consultation with its employees. At every colliery there is a consultative committee in which the workmen's representatives are elected by secret ballot. The colliery manager is chairman and nominates three colliery officials to be on the committee. There are also consultative councils at the area, divisional and national levels on which the Board and the four main trade unions are represented. Separate but similar arrangements cover manual workers in coke and by-products establishments.

#### MARKETING

The Board, as the sole producer is bound to make the first sale of coal, whether to a wholesaler, a retailer or direct to the ultimate consumer. Beyond these first sales the Board has no monopoly of distribution though it does act as a wholesaler and has a substantial stake in the retail coal trade in the colliery areas.

It is, however, the policy of the Minister and the Board that the marketing of coal must be controlled centrally. The principal marketing officials of the Board are also Officers of Minister of Fuel and Power's Coal Supplies Organization, whose function is to share out the coal to consumers according to the Minister's determination of the national interest.

#### PRICES POLICY

The Board has sought to establish a pricing system that is fair, consistent and economically sound. It has improved the sorting and grading of coal, largely by mechanization of cleaning and sorting, and has established pithead prices for each grade of industrial coal based primarily on quality i. e. value in use.

House coal on the other hand is sold retail at zoned delivered prices. For distribution purposes the country is divided into sixty zones; throughout each of these the delivered price of a particular grade of coal is uniform, but it differs from one zone to another to cover differences in transport and distribution costs. The price differentials between grades of delivered house coal, are, however, the same in all zones. The general level of prices is so fixed as to be sufficient to meet the Board's costs in total.

## SALES ORGANIZATION

Inland sales were at first handled by the Divisional and Area Offices, responsible for coal production. In 1953 the Board decided to reorganize these arrangements by splitting the inland market into nine sales regions, each with a regional sales office which would control the general flow of coal into the region, co-ordinating all supplies and giving the necessary service to all consumers. These offices now, in fact, sell virtually all the coal going into their regions. Thus the Board's marketing organization is now more closely related to the districts in which the coal is consumed, than to the district where it is produced.

## SUPPLY AND DEMAND

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.

Table 4 shows the sources and uses of coal (under broad headings) in 1953, 1954 and 1955.

## INLAND CONSUMPTION

Table 5 sets out the inland disposals of coal for the main classes of consumer in each of the years 1947, 1950 and 1955.

In round figures, about 20 per cent of the coal consumed in 1955 was used domestically and collieries, 20 per cent went direct to industry and the remaining 60 per cent went to coke ovens and to public utilities (electricity, gas, railways, and water) and for miscellaneous uses. The coke produced by the ovens is used mainly in the iron and steel industry and much of the combined output of electricity and gas is used industrially. Hence, about half the coal consumed in the United Kingdom is used directly or indirectly in industry.

The trend is for the demand from power-stations to increase in spite of higher efficiency and greater use of alternative energy sources. Coke ovens are also using more. On the other hand demand from railways is falling and will fall more rapidly with the wider use of diesel and electric traction. Collieries also are using less coal as a result of the installation of more economical steam raising plant and conversion to electricity.

The level of inland consumption in any year is greatly affected by weather conditions and by the level of industrial activity. It is also influenced by Government restriction schemes. Coal for domestic use is still limited under the Coal Distribution Order, 1943, by the imposition of 'maximum permitted quantities'. These vary according to the seasons of the year and also between the northern and southern halves of the country.

## EXPORTS AND IMPORTS

Since the war there has been a virtually unlimited demand for exports of British coal. Britain has exported all the coal it could spare and has had to balance the needs of overseas customers with the high and rising internal demand. Exports (excluding bunkers) rose from 4.5 million tons in 1946 to 13.9 million tons in 1949. In 1950 there was a slight decline to 13.5 million tons and in 1951 when exports had to be restricted owing to manpower shortages, they declined to 7.8 million tons. Overseas shipments rose in 1952 to 11.7 million tons, in 1955 to nearly 14.0 million tons and in 1954 were 13.7 million. Reckoned by value, exports increased from £9.1 million in 1946 to £50.8 million in 1949, £62.2 million in 1953 and £59.1 million in 1954. In 1955 exports were deliberately cut to 12.2 million tons to reduce the need to import American coal which is expensive and must be paid for in dollars.

The greater part of exports of British coal is sent to Europe, and especially to the Irish Republic, Denmark, Sweden, Germany and Italy. Table 6 shows the quantities of coal exported to different countries in each of the years 1913, 1938, 1946, 1954 and 1955.

Practically all British coal exports since the war are covered by trade agreements and commitments undertaken through the Coal Committee of the Economic Commission for Europe, and the National Coal Board has sought to honour its old customers even when it has meant importing coal at great expense from Europe and the United States and selling at a loss at the prevailing internal prices.

Another factor governing importation of coal has been the need to bring coal by water close to the point where it is required, so relieving congestion on the railways, which at the peak of the winter is very severe. During the winter of 1950—51 the Board imported 1.2 million tons of United States coal and, in addition, about 10,000 tons from India and a similar amount from Nigeria. In 1951—52, 350,000 tons were imported

from India and the United States. In 1953, as an insurance against a shortage of coal during the winter, the Board imported 346,000 tons from France and the Saar, 187,000 tons from Belgium and 24,000 tons from Germany. There were further imports in the winter of 1954/55.

## FUEL EFFICIENCY AND SMOKE ABATEMENT

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. This campaign is gradually altering the character of demand and is helping to make it easier to meet. It is closely linked with the campaign to reduce smoke, which is wasteful as well as unhealthy and dirty. The *Coal Utilization Council* is financed by the National Coal Board, coal distributors and coal appliance manufacturers and consists of representatives of these interests. It was formed in 1932 to give information and advice on the best use of solid fuel appliances to domestic consumers and 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 Committee on Solid Fuel*, consisting mainly of representatives of appliance manufacturers, women's organizations 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 four years. Under a scheme introduced in 1952, loans on favourable terms are available from the Exchequer to industrialists for financing approved fuel-saving schemes. In October 1953 a non-profit making company, known as the *National Industrial Fuel Efficiency Service*, sponsored by the British Productivity Council, was formed to promote fuel-saving in industry. The new company, which took over most of the work of the Industrial Fuel Advisory Service of the Ministry of Fuel and Power, came into operation on 1st May 1954. It offers a wide range of advice and services to non-domestic fuel users. The National Coal Board has undertaken to contribute £250,000 a year for the next five years to the new organization and the Central Electricity Authority and the Gas Council have similarly undertaken each to contribute £100,000 a year. 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 Board has a three-fold interest in fuel efficiency and smoke abatement: as a fuel producer, faced with an excessive demand, as an industrial fuel user, especially in colliery boiler plants, and as the landlord of many thousands of domestic fuel users.

In a year the Board produces these quantities of smokeless fuels:

|                                |                            |
|--------------------------------|----------------------------|
| Anthracite                     | 8,000,000 tons             |
| Dry Steam Coal                 |                            |
| Coke (domestic and industrial) | 7,500,000 tons             |
| 'Phurnacite' carbonized ovoids | 300,000 tons               |
| Gas (sold to Gas Boards)       | 50,000 million cubic feet. |

The Board's development plans provide for expanded production of these fuels, and the Board's Central Research Establishment is concentrating its efforts on finding better processes for making new kinds of smokeless fuel.

As one of the largest single consumers of coal in the country, the Board is doing all it can to bring out greater efficiency in its own boiler plants. About 10 million tons of coal are used every year for steam raising in 4,000 colliery boilers. About 500 of these boilers are Lancashire boilers, of which 2,500 are hand fired. The Board is installing equipment for mechanizing 500 boilers at a cost of more than £700,000—the largest order ever placed for this type of equipment. At the same time, it has introduced control equipment and instruments to increase the efficiency of the plant in use, and has begun a training scheme for its boilermen. An examination and certificate for boilermen has now been instituted by the City and Guilds Institute in London: of the first 116 awards, 107 were to Coal Board students.

Big savings in fuel can be made by electrifying colliery plant and eliminating the direct use of steam, and the Board has continued to instal new electric winders and to convert existing steam-driven engines to electric drive.

During the last few years progress has been made in replacing old and inefficient grates and ranges in some

140,000 houses owned by the Board and many thousand new appliances have been installed. In the new houses being built for mineworkers only approved types of appliances are being installed. Improved insulation to reduce heat losses is also being incorporated in their construction.

## FINANCE

The Board is expected to pay its way taking one year with another, but it is not meant to make a profit for the Government. Any losses which it may make it is expected to make good out of profits later; any surplus must be devoted to the objects of the Board as laid down in the Nationalization Act, i.e., the improvement and cheapening of coal supplies, the development of the coal industry and the welfare of the employees in the industry.

## COMPENSATION

Persons and corporate bodies whose assets were transferred to the National Coal Board have been compensated. For the purpose of assessing compensation to colliery owners, an independent tribunal made a valuation of the coal-mines as a whole on the basis of their earning power and arrived at a global sum of £165 million which was then apportioned to districts and then to individual undertakings. To this colliery compensation had to be added compensation for ancillary undertakings, for mineral rights owned by the Coal Commission and for special losses caused by the transfer of ownership. The total compensation due from the National Coal Board was estimated at £375 million. Compensation has been paid either in Government stocks or in money; the cost of compensation is being recovered from the National Coal Board by the Ministry of Fuel and Power through funded annuities.

## PROFIT AND LOSS

In each year since 1947 the National Coal Board has made an operating profit on the production and sale of coal by-products. In only four years, however, has the Board made a net overall surplus after providing for interest on its debt to the Ministry of Fuel and Power for compensation and money borrowed, for losses on imported coal and for taxation.<sup>1</sup>

In 1954 there was a deficit of £3.5 million and in 1955 of £19.6 million owing to a lag in adjusting prices to the rise in wages and other costs. The cumulative deficit for the whole period 1947—55 amounts to £36.7 million. This deficit is after depreciation provision which has amounted, since vesting day, to about £240 million, so that the Board had in fact some £200 million from its own resources to put towards gross capital expenditure.

## CAPITAL DEVELOPMENT

To arrest the decline in the industry, the Board has a long-term programme of reconstruction and development, and had up to the end of 1955 spent about £442 million on capital account. It plans to spend another £1,000 million by 1965. About half the total sum will be on major schemes, new mines or reconstructions, each costing over £250,000. By 1965 it is hoped to produce about 240 million tons with a labour force of 672,000.

Between 1947 and 1949, the first three years of public ownership, the Board invested some £72 million in capital projects in the industry. By the end of 1951 projects had been approved costing £145 million. These investments represented, however, the 'hard core'—i.e., the basic minimum necessary to replace wasting assets and maintain current output of the different kinds of coal.

To decide what investments should be undertaken beyond this basic minimum the Board made a national study of the expected demand for coal in the markets at home and overseas and of the possible ways of meeting it from various sources of supply. Coal produced in one area often 'competed' with coal produced elsewhere and the future of one producing area depended on prospects in others. There had to be a careful weighing up of the possibilities in all the coalfields to ensure that neither too much nor too little capital was invested in any one of them and to avoid a larger surplus or shortage of coal in future years.

## THE ORIGINAL PLAN

An overall plan of reconstruction and development was required and, on the basis of a pit by pit survey made in 1948—49, the Board set out its programme of

reconstruction for the years 1950—65 in the pamphlet 'Plan for Coal'. In presenting 'Plan for Coal', the Board emphasized its provisional character and the fact that it involved a number of assumptions.

The original plan intended to raise production of deep-mine coal from 203 million tons in 1949 to 240 million tons in 1961—65. In order to achieve this large increase in output it was proposed that more than 250 collieries should be reconstructed and that about 20 new large collieries and 50 new surface mines should be opened, that about 250 collieries should remain basically unchanged apart from minor improvements and mechanization, while the remainder would either be closed or absorbed in the reconstruction schemes. It was envisaged that the reconstructed collieries would provide 70 per cent of the necessary output, and that the new collieries and surface mines would provide a further 10 per cent.

In addition to the colliery schemes it was proposed to develop the industry's ancillary activities and services, such as coke-ovens and central workshops.

It was estimated that, when the reconstruction programme had been completed, the industry would require 80,000 fewer mineworkers than the 698,000 employed in 1950, provided that, throughout the period, the men required would be available at the right time and in the right places. This reduction, it was pointed out, would come about mainly by allowing wastage to exceed recruitment over the period.

The Board estimated that the cost of reconstructing the industry during the years 1950 to 1965 would amount to £635 million at mid-1949 prices. Of this sum, £520 million was to be spent on collieries and activities directly associated with collieries,<sup>1</sup> and £115 million on ancillary activities. Just over half the total £635 million was to be spent by the end of 1955.

The Board reckoned that its own internal financing, in particular depreciation allowances, would provide three-quarters of the £635 million required to implement the full plan. The remainder would have to be obtained by borrowings from the Ministry of Fuel and Power.

The Board's borrowing powers were raised by the Coal Industry Act 1951, to a total of £300 million,

of which not more than £40 million could be borrowed in any one year without Parliamentary permission.

The progress of reconstruction has been somewhat slower than anticipated and the costs somewhat higher, both because of the general rise in wages and prices and of a certain under-estimation of difficulties in the original plan. Of the £442 million (including £65 million spent before 1950) spent on capital account between vesting day on 1st January 1947 and the end of 1955, £128 million was spent on 179 major colliery schemes, each scheduled to cost more than £250,000; £195 million on other capital expenditure at collieries; £25 million on colliery associated activities including health, welfare and research equipment and boring operations; and £74 million on associated development such as coke-ovens and by-product plants, workshops, stores, brickworks, houses, offices and laboratories. Only about half of the capital required had been provided by internal resources and £217 million, out of the £300 million authorized, had been borrowed from the Ministry of Fuel and Power by the end of 1955.

## THE REVISED PLAN

The Board had made an ad hoc review of production possibilities in 1952 following the publication of the Ridley Report<sup>2</sup> and had decided they might be able to increase output to 250 million tons a year by 1965.

By the autumn of 1955, the Board decided that, in view of their growing experience of the difficulties, costs and problems of reconstruction, the time had arrived for a review of the 1949—50 estimates based on another pit by pit survey. On the basis of this survey they put forward a revised plan which provides for an output of coal from all sources, including opencast, of 228 million tons in 1960 and 240 million tons in 1965. They have calculated that an output of 250 million tons a year cannot be obtained before 1970.

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 it is proposed to spend £140 million on ancillaries. A total of £590 million will be spent in the next five years and £410 million in 1961—65.

While the revised plan will achieve a substantial increase in the industry's productivity, the present

<sup>1</sup> The Board is in principle liable to taxation on its revenue surplus but its actual taxation liabilities are not agreed with the Inland Revenue Department.

<sup>1</sup> Report of the Committee on National Policy for the Use of Fuel and Power Resources, 1952 (HMSO, Cmd. 8647).

<sup>2</sup> These include boring, experimental equipment, medical centres, pithead baths for miners and central washeries for coal.

estimates indicate that corresponding decreases in cost of production will be offset by increased capital charges.

About two-thirds of the colliery expenditure (£860 million) in ten years to the end of 1965 is to be on major schemes (each costing more than £250,000). Out of this sum, £430 million is to be spent on schemes to be completed by 1965, including about a hundred which have not yet been started; £40 million is to be spent on schemes now in progress but which will not be completed by 1965; and a further £80 million is to be spent on schemes yet to be started which will not be completed until after 1965—that is to say, there will be £120 million in the 'pipeline' at the end of 1965.

Quite a large proportion of the total investment is on coal preparation plants designed to give the consumer a better product.

The level of capital expenditure for the five years after 1965 can only be indicated on the basis of present knowledge and present prices. The Board's provisional view is that investment in the following five years will not be much lower than the amount they propose to spend in 1961—65. Output from all sources in 1970 might then be about 250 million tons.

The new manpower estimates differ considerably from those of 1950. Instead of the 'Plan for Coal' estimate of 618,000 mineworkers in 1965, the Board now reckon that the industry will require 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.

#### COAL INDUSTRY BILL

A Coal Industry Bill was given a second reading in the United Kingdom House of Commons on 10th May (Hansard Col. 1430). The object of the Bill is to raise the amount which the National Coal Board is authorized to borrow from the Minister of Fuel and Power to £650 million, £350 million more than the present limit of £300 million.

Mr. Aubrey Jones, Minister of Fuel and Power, moved the second reading. He said that he had approved the broad outlines of the NCB plans and estimates, as set forth in their pamphlet 'Investing in Coal'. The detailed estimates involved a number of assumptions but, within those assumptions, had been carefully worked out. They indicated that investment in coal could be effective at a lower capital cost than investment in any other fuel.

#### RESEARCH AND SCIENTIFIC TESTS

The National Coal Board's Scientific department has two main tasks—to provide a day-to-day scientific service and to carry out research.

The day-to-day scientific service is provided by the divisional and area scientific organizations. Part of the service is to help ensure safety in the mines and to control the quality of coal output. In a year about 400,000 samples of mine air and 1,300,000 of mine dust are analysed. In most areas the properties of coal produced are reviewed every three months; elsewhere there is a full review once a year. Some 300,000 samples are examined in this way every year.

The Coal Survey, which operates from nine laboratories in the coalfields studies the physical and chemical properties of the national coal resources. Examinations are made of seams provided by preliminary boreholes and seams already being worked, and special studies to help with the planning of new collieries and the construction of other collieries are made.

The Board has two central research establishments. The first, which was set up in 1948 at Stoke Orchard, near Cheltenham, Gloucestershire is concerned with research into the treatment and processing of coal. The newer establishment at Isleworth, Middlesex, conducts research into underground mining and mechanical and electrical engineering problems met in the coal industry.

The Board has set up a new research and development establishment—a Central Engineering Department at Bretley, Yorkshire. The first task of this new establishment is the development of new coal face machinery. An almost equally important aim is the development of a fully mechanized support system.

Extra-mural research is also carried out by a number of autonomous research associations including the British Coal Utilization 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 Fuel and Power and the Fuel Research Station of the Department of Scientific and Industrial Research, is closely related to coal mining.

The total sum spent on research by the NCB in 1955 was about £1 million of which about half was spent at its two main research establishments.

TABLE 2  
Recruitment and Wastage, 1953—55  
(N.C.B. Mines)

|                                            | 1953    | 1954   | 1955   |
|--------------------------------------------|---------|--------|--------|
| Net Recruitment                            | 19,869  | 20,363 | 19,661 |
| Newly employed boys<br>(under 18 years)    | 11,738  | 16,760 | 17,157 |
| Newly employed men<br>(18 years or over)   | 19,997  | 23,663 | 24,136 |
| Re-employed                                |         |        |        |
| Total                                      | 51,604  | 60,786 | 60,954 |
| Net Wastage                                |         |        |        |
| Medical reasons, deaths<br>and retirements | 23,105  | 20,383 | 21,056 |
| Dismissals                                 | 3,953   | 3,266  | 2,821  |
| Other wastage                              | 35,437  | 37,384 | 42,681 |
| Total                                      | 62,495  | 61,033 | 66,558 |
| Net change in manpower                     | -10,891 | -247   | -5,604 |

TABLE 3  
Stoppages Caused by Industrial Disputes  
(Great Britain)

| Year | No. of stoppages<br>starting in year | No. of workers<br>directly or in-<br>directly involved | Aggregate dura-<br>tion in working<br>days of all stop-<br>pages in year |
|------|--------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------------|
| 1900 | 120                                  | 70,000                                                 | 436,000                                                                  |
| 1910 | 209                                  | 295,000                                                | 5,476,000                                                                |
| 1920 | 213                                  | 1,407,000                                              | 17,415,000                                                               |
| 1925 | 164                                  | 130,000                                                | 3,435,000                                                                |
| 1930 | 150                                  | 148,600                                                | 663,000                                                                  |
| 1935 | 217                                  | 199,700                                                | 1,368,000                                                                |
| 1940 | 381                                  | 189,800                                                | 506,000                                                                  |
| 1945 | 1,306                                | 243,000                                                | 641,000                                                                  |
| 1950 | 860                                  | 141,900                                                | 431,000                                                                  |
| 1951 | 1,058                                | 134,000                                                | 350,000                                                                  |
| 1952 | 1,221                                | 273,500                                                | 660,000                                                                  |
| 1953 | 1,307                                | 168,400                                                | 393,000                                                                  |
| 1954 | 1,464                                | 204,400                                                | 468,000                                                                  |
| 1955 | 1,783                                | 353,600                                                | 1,112,000                                                                |

<sup>1</sup> Workers involved in more than one dispute are counted more than once.

TABLE 4  
Coal Supplies and Disposals

|                                               | (Million tons) |       |       |
|-----------------------------------------------|----------------|-------|-------|
|                                               | 1953           | 1954  | 1955  |
| Sources                                       |                |       |       |
| Deep-mined output                             | 212.5          | 214.0 | 210.2 |
| Opencast disposals                            | 13.5           | 10.7  | 10.5  |
| Import                                        | 0.6            | 3.0   | 11.5  |
| From colliery stocks                          | 0.5            | —     | -0.5  |
| Recovered slurry                              | 0.2            | 0.2   | 0.5   |
| Total                                         | 227.3          | 227.9 | 232.2 |
| Uses                                          |                |       |       |
| Inland consumption                            | 208.6          | 213.5 | 215.3 |
| Exports and bunkers                           | 16.9           | 16.3  | 14.2  |
| Changes in distributed stocks<br>(increase +) | +1.8           | -1.9  | +2.7  |
| Total                                         | 227.3          | 227.9 | 232.2 |

TABLE 5  
Inland Coal Consumption

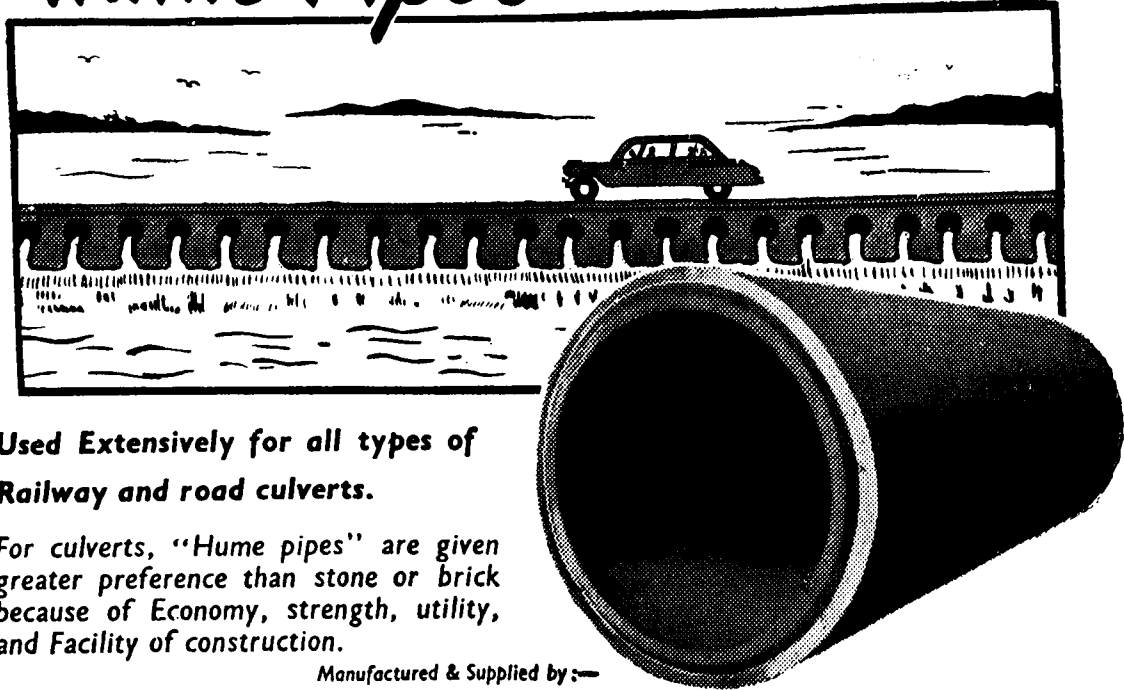
|                   | 1947  | 1950  | 1955<br>(52 weeks) |
|-------------------|-------|-------|--------------------|
| Electricity works | 27.1  | 33.0  | 42.9               |
| Gas works         | 22.7  | 26.2  | 28.0               |
| Railways          | 14.6  | 14.5  | 12.8               |
| Coke ovens        | 19.8  | 22.6  | 27.1               |
| Collieries        | 11.1  | 10.7  | 8.6                |
| Industry          | 35.8  | 40.1  | 40.8               |
| Households        | 31.6  | 32.8  | 32.5               |
| Miners' Coal      | 5.0   | 5.0   | 5.1                |
| Miscellaneous (1) | 17.4  | 17.2  | 17.5               |
| Total             | 135.1 | 202.1 | 215.3              |

(1) Includes shipments to Northern Ireland.

TABLE 6  
U. K. Exports of Coal

| ( million tons )        |      |      |      |      |      | ( million tons ) |      |      |      |      |      |
|-------------------------|------|------|------|------|------|------------------|------|------|------|------|------|
|                         | 1913 | 1938 | 1946 | 1954 | 1955 |                  | 1913 | 1938 | 1946 | 1954 | 1955 |
| Total exports           | 73.4 | 35.9 | 4.5  | 13.6 | 11.7 | France           | 12.8 | 6.2  | .7   | 1.0  | 1.0  |
| Of which                |      |      |      |      |      | Belgium          | 2.0  | 0.7  | 0.2  | 0.5  | 0.5  |
| Canada and Newfoundland | 0.1  | 1.3  | 0.2  | 0.2  | 0.2  | Portugal         | 1.2  | 0.7  | 0.2  | 0.3  | 0.3  |
| Irish Republic          | —    | 2.5  | 1.3  | 1.7  | 1.7  | Spain            | 2.5  | 1.0  | 0.1  | 0.3  | 0.1  |
| Sweden                  | 4.6  | 2.7  | 0.1  | 1.1  | 1.0  | Italy            | 9.6  | 2.3  | .1   | 1.3  | 2.7  |
| Norway                  | 2.3  | 1.4  | 0.1  | 0.2  | 0.2  | Egypt            | 3.2  | 1.6  | 0.1  | 0.0  | 0.0  |
| Denmark                 | 3.0  | 3.0  | .6   | 3.4  | 3.6  | Argentina        | 3.7  | 2.0  | 0.0  | 0.5  | 0.1  |
| Germany                 | 9.0  | 3.7  | —    | 1.5  | 1.1  | Brazil           | 1.9  | 0.5  | 0.0  | —    | —    |
| Netherlands             | 2.0  | 0.9  | 0.1  | 0.8  | 0.8  | USSR             | 6.0  | —    | —    | —    | —    |

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TABLE 7  
THE BRITISH COAL INDUSTRY  
the principal statistics

|                                  |          | 1938              | 1946                                       | 1947                                           | 1948     | 1949     | 1950      | 1951      | 1952     | 1953     | 1954      | 1955     |          |
|----------------------------------|----------|-------------------|--------------------------------------------|------------------------------------------------|----------|----------|-----------|-----------|----------|----------|-----------|----------|----------|
|                                  |          | Private Companies | Private Companies under Government Control | Full State Control under National Coal Board ‡ |          |          |           |           |          |          |           |          |          |
| SALEABLE OUTPUT :                | Mines    | m. tons           | 277                                        | 181.2                                          | 187.2    | 197.6    | 202.7     | 204.1     | 211.9    | 214.3    | 212.5     | 214.0    | 210.2    |
|                                  | Opencast | m. tons           | —                                          | 8.8                                            | 10.2     | 11.7     | 12.4      | 12.2      | 11.0     | 12.2     | 11.7      | 10.2     | 11.4     |
| INLAND CONSUMPTION :             |          | m. tons           | 177.8                                      | 186.2                                          | 184.7    | 193.4    | 195.3     | 202.1     | 209.2    | 208.1    | 208.5     | 213.6    | 215.5    |
| EXPORTS AND BUNKERS :            |          | m. tons           | 46.3                                       | 8.9                                            | 5.5      | 16.3     | 19.4      | 17.1      | 11.7     | 15.1     | 16.9      | 16.2     | 14.0     |
| MEN ON COLLIERY BOOKS :          |          |                   |                                            |                                                |          |          |           |           |          |          |           |          |          |
| Overall                          | thous.   | 781.7             | 696.7                                      | 711.4                                          | 724.0    | 719.5    | 697.0     | 698.6     | 715.8    | 712.9+   | 707.2     | 704.1    |          |
|                                  | thous.   | Not available     | 280.2                                      | 287.9                                          | 292.8    | 296.2    | 288.1     | 287.2     | 293.6    | 292.800+ | 290.400   | 288.9    |          |
| OUTPUT PER MANSHIFT :            | tons     | 1.14              | 1.03                                       | 1.07                                           | 1.11     | 1.16     | 1.19      | 1.21      | 1.19     | 1.22+    | 1.23      | 1.23     |          |
|                                  | tons     | 3. 0              | 2.76                                       | 2.86                                           | 2.92     | 3.02     | 3.11      | 3.17      | 3.15     | 3.22+    | 3.26      | 3.26     |          |
| ABSENCE :                        |          |                   |                                            |                                                |          |          |           |           |          |          |           |          |          |
| Overall                          |          | 6. 4              | 16.0                                       | 12.43                                          | 11.55    | 12.34    | 11.96     | 12.15     | 11.23§   | 12.41+   | 12.21     | 12.54    |          |
|                                  | Coalface | Not available     | 19.3                                       | 15.05                                          | 14.13    | 14.94    | 14.51     | 14.75     | 13.67§   | 14.65+   | 14.36     | 14.70    |          |
| OUTPUT PER MAN PER YEAR :        |          | tons              | 290                                        | 260                                            | 263      | 273      | 282       | 293       | 303      | 299      | 298+      | 303      | 299      |
| AVERAGE PITHEAD PRICE: } per ton |          |                   | 17s. Od. a ton                             | 38s. 11d.                                      | 40s. 3d. | 47s. 3d. | 47s. 11d. | 47s. 10d. | 51s. 2d. | 57s. 3d. | 61s. 2d.  | 63s. 6d. | 68s. Od. |
| Average Pithead Cost             |          |                   | 41s. 3d.                                   | 45s. 3d.                                       | 45s. 7d. | 55s. Od. | 45s. 5d.  | 49s. 2d.  | 56s. 9d. | 59s. 2d. | 61s. 11d. | 67s. 3d. |          |
| AVERAGE WEEKLY EARNINGS :        |          |                   | £2.17s.                                    | £6.3s. 2d.                                     | £6.18s.  | £8.3s.   | £8.14s.   | £9.2s.    | £10.3s.  | £11.5s.  | £11.12s.  | £12.5s.  | £13.1s.  |
| ( including allowances )         |          |                   | 11d.                                       | 9d.                                            | 10d.     | 7d.      | 4d.       | 7d.       | Od.      | 1d.      | 11d.      | Od.      |          |

‡ Opencast transferred from Minister of Fuel and Power in 1952  
§ Absence figures from 1952 are for the 5-day week  
+ = new basis of definition from 1953

TABLE 8  
TYPES OF BRITISH COAL

| Type                                                                          | Main Classes of Use according to size                      |                                                        |                                       | Current<br>Production<br>(as % of<br>total output) | Source of Supply                                                                                                                                                                 |
|-------------------------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------|---------------------------------------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                               | Large                                                      | Graded                                                 | Small                                 |                                                    |                                                                                                                                                                                  |
| 1. Anthracite                                                                 | Special industrial<br>uses, e. g. malt-<br>ing and brewing | Domestic                                               | Steam raising                         | 1½                                                 | South Wales: much smaller amounts from<br>Scotland and North-East Durham                                                                                                         |
| 2. Dry Steam Coals                                                            | Steam raising                                              | Domestic<br>heating                                    | Steam raising                         | 2½                                                 | South Wales                                                                                                                                                                      |
| 3. Coking Steam Coals                                                         | Steam raising<br>including loco-<br>motive                 | —                                                      | Steam raising and<br>carbonisation    | 4½                                                 | South Wales: small amount from Kent                                                                                                                                              |
| 4. Heat-altered and similar coals:<br>(a) Low-Volatile<br>(b) Medium-Volatile | Special Industrial<br>uses                                 | Domestic<br>heating                                    | Steam raising                         | ½                                                  | Scotland and Durham                                                                                                                                                              |
|                                                                               | Steam raising                                              | Steam<br>raising                                       | Steam raising                         | ½                                                  | Scotland: very small amounts from South<br>Wales and Durham                                                                                                                      |
| 5. Medium-Volatile<br>Special Caking Coals                                    | Carbonisation                                              | Carbonisation                                          | Carbonisation                         | 6½                                                 | South Wales, West Durham and Kent: small<br>amount from East Durham, very small<br>amounts from Bristol and Somerset, Scot-<br>land and Lancs.                                   |
| 6. High-Volatile Very Strongly<br>Caking Coals:                               | House and<br>Carbonisation                                 | Carbonisation                                          | Carbonisation                         | 6                                                  | Durham, South Wales and Yorks: small<br>amounts from Northumberland, Lancs,<br>Bristol and Somerset, North Staffs and<br>other coalfields                                        |
| 7. High-Volatile Strongly Caking<br>Coals                                     | House and<br>Carbonisation                                 | Carbonisation                                          | Carbonisation                         | 20                                                 | Yorks, Durham, Northumberland, Lancs,<br>Notts and North Derby, North Staffs,<br>Cumberland and South Wales: small<br>amounts from Scotland, North Wales and<br>other coalfields |
| 8. High-Volatile Medium Caking<br>Coals                                       | House, carbonisa-<br>tion and loco-<br>motive              | Carbonisation<br>steam raising<br>and “pro-<br>ducers” | Carbonisation<br>and steam<br>raising | 13½                                                | Yorks, Notts and North Derby, Lancs, Scot-<br>land, Northumberland, North Staffs, North<br>Wales and Durham: small amounts from<br>other coalfields                              |
| 9. High-Volatile Weakly Caking<br>Coals                                       | House, and loco-<br>motive                                 | Steam raising<br>and “pro-<br>ducers”                  | Steam raising                         | 16½                                                | Yorks, Notts and North Derby, Northumber-<br>land, Scotland, Lancs and North Staffs:<br>small amounts from other coalfields                                                      |
| 10. High-Volatile Very Weakly or<br>Non-Caking Coals                          | House and steam<br>raising                                 | Steam raising                                          | Steam raising                         | 28                                                 | Notts and North Derby, Scotland, Warwicks,<br>Yorks Cannock Chase, Leics, Lancs, South<br>Derby, Northumberland, North Staffs, and<br>South Staffs and Salop                     |

NOTE: “Caking” means become plastic on heating and forming a Coherent residue. Most British coals have this property in greater or less degree. Coals made for making coke suitable for blast furnaces and foundries usually cake strongly; but coke of this kind can also be made from blends of strongly caking coals and others, and not all strongly caking coals make good coking coals. Caking property is also important in coals used for making gas because it has a bearing on the production of coke in gas-works, but the range of caking property can be fairly wide.

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*Cleanliness prevents disease; medicine only attempts to cure.*

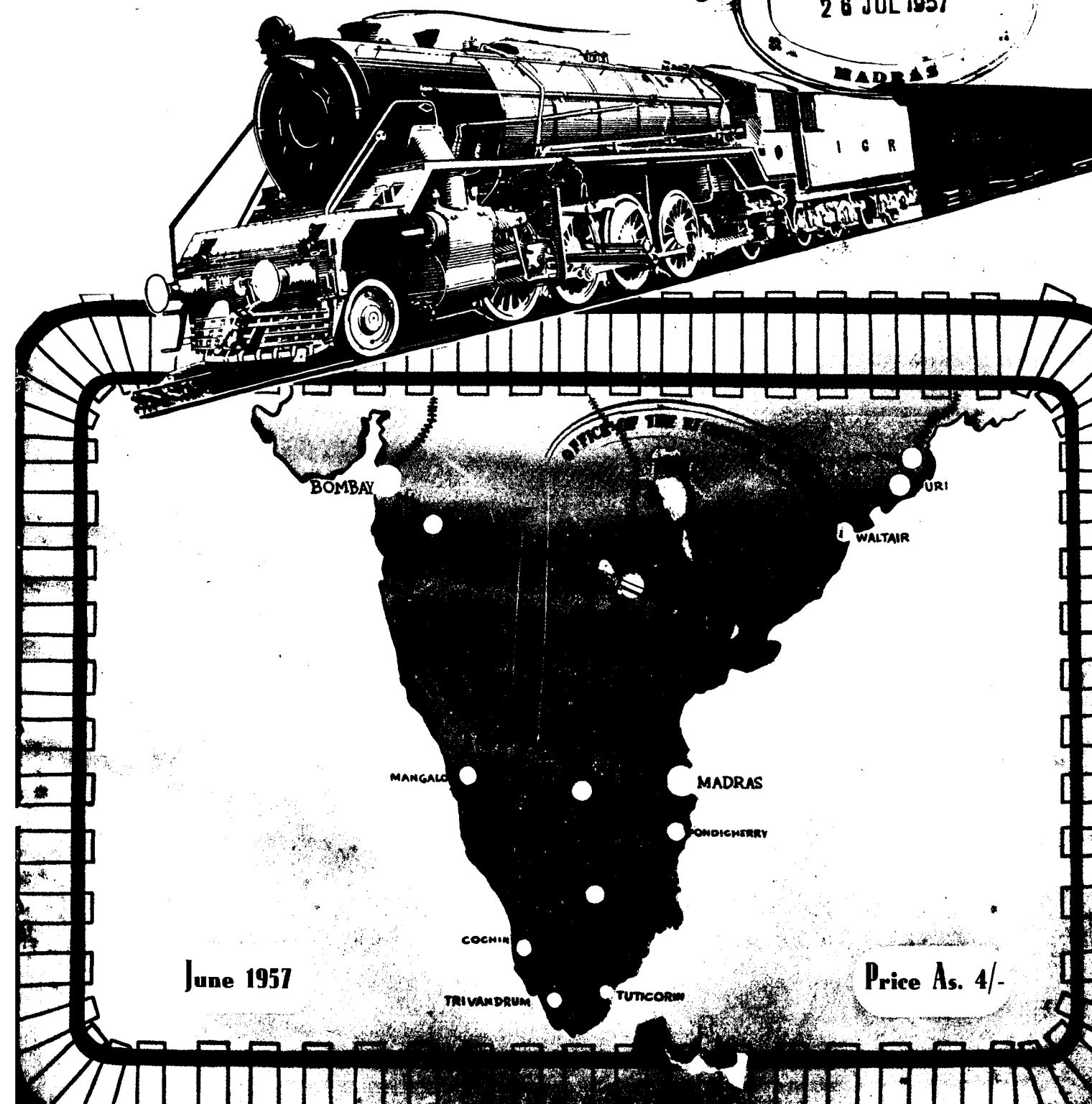
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# SOUTHERN RAILWAYS

*Magazine*



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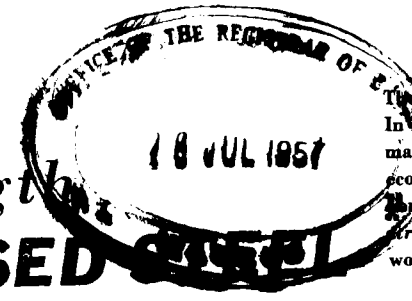
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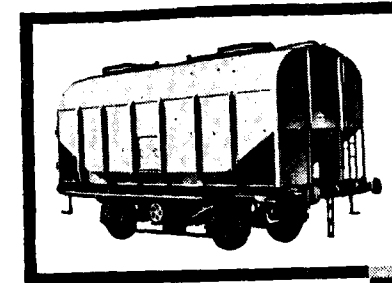
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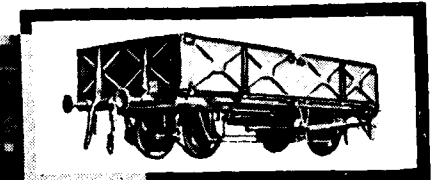
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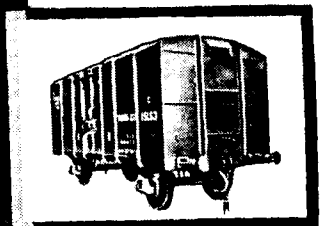
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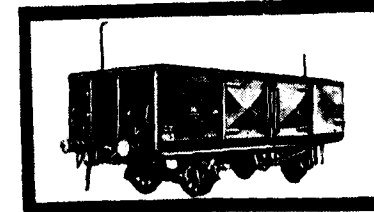
20-ton capacity Bulk Grain Van to the order of British Railways.



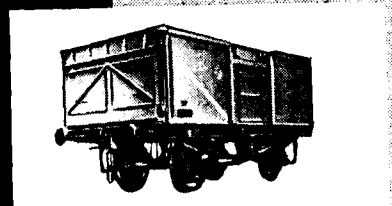
F.J.S. Low-sided Open type Wagon as used by Queensland Government Railways, Australia.



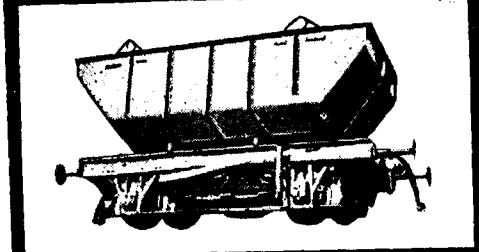
Broad gauge covered Wagon type C.R. as used by Indian Railways.



22-ton G.V. type Wagon as used by Victoria Government Railways, Australia.



16-ton all steel Mineral Wagon, 50,000 of which have already been built in our Paisley works to the order of British Railways.



V. J. M. Hopper type Wagon with Drop Bottom Door as used by Queensland Government Railways, Australia.

# **PRESSED STEEL COMPANY LIMITED**

RAILWAY DIVISION, PAISLEY, SCOTLAND Manufacturers also of  
HEAD OFFICE: COWLEY, OXFORD Motor Car Bodies, Prestcold

London Office: Sceptre House, 169 Regent Street, W.1 Refrigeration Equipment  
and Pressings of all kinds

## New South Wales Railway Electrification

**E**LECTRIFICATION of the main line railway between Parramatta near Sydney and Lithgow in the Blue Mountains a distance 83 miles has been completed and was officially opened by the Premier of New South Wales The Hon. J. J. Cahill on Saturday, 22nd June 1957.

The contract for the supply and installation of the overhead equipment was awarded by the Department of Railways New South Wales to British Insulated Callender's Construction Co. Ltd., London, the work to be carried out in three stages. Stages 1 and 2 which run from Parramatta to Blacktown and from Blacktown to Penrith, were opened for service in February 1955 and September 1955 respectively.

Before deciding to electrify the route alternative methods of increasing the capacity were considered by the Department of Railways. One was to increase the number of tracks and another to carry out extensive civil engineering works on the construction of new tunnels and on the realignment of tracks to ease the curves and gradients. Both these schemes were rejected and electrification by means of overhead conductors was chosen as the most economical solution.

A 1500V D. C. System was selected for this scheme, stages 1 and 2 to be of the simple catenary type. For stage 3, from Penrith to Lithgow, however, a compound catenary construction was used because of the heavy currents demanded by the nature of the route. In the Blue Mountains the track rises to a height of 3,500 ft. above sea level and gradients are encountered of up to

1 in 33, while curves of down to 8 chains radius occur. These features presented special problems to the designers of the equipment and to the erection staffs in the field.

The equipment for this scheme was designed by the BICC Group in England and a team of experienced members of the Traction staff of the BIC Construction Co. went out from the United Kingdom to supervise the installation.

The equipment is supported in the main from portal structures fabricated in England from broad flange beams and a total of 7,000 tons of steel has been used. Most of the fittings involved have been manufactured at the Prescott Works of BICC, while the wires were produced in Australia by Metal Manufactures Ltd. These wires consist of .3 sq. inch cadmium copper contact wires and stranded hard drawn copper catenary wires. In all some 2,300 tons of copper have been used.

Electrification of this line will provide many advantages. The journey times between Sydney and Lithgow will be reduced by one hour for passenger trains and two hours for freight trains, which the traffic capacity will be more than doubled. In addition to providing fast freight services linking the mining and agricultural areas of the Blue Mountains, in which Lithgow is situated, with the Eastern Sea Board, a quick and frequent local service from Sydney to Blacktown and Penrith will mean that these towns will become dormitory areas of Sydney.

### UNPAINTED ALUMINIUM COACHES SAVE MONEY

The experimental use of unpainted aluminium coaches on London's Underground railway has proved a success, and future replacement rolling-stock will not be painted.

Although the initial cost is slightly greater than that of the usual red-painted steel coaches, railway engineers estimate that it will be offset by the savings on paint and maintenance, and lower current consumption because of decreased weight and technical improvements.

Capital saving by not painting a standard seven-coach train is about £ 800, and the consequent drop in maintenance, painting and cleaning is about £ 100 a year, so that, with a life of 30 years, there is an overall saving of some £ 3,800 for each train.

## SAFETY OF TRAVEL ON RAILWAYS

[A resume of the Broadcast Talk by Shri M. Ganapati, General Manager, Western Railway, during Railway Week.]

**A**T the end of over one hundred years of railway working in our country, it should not have been ordinarily necessary to talk about the safety of travel on railways which had been practically taken for granted, especially compared with other modes of travel by sea and air. No one who undertakes a journey by rail would, for a moment, entertain the thought of any risk attendant on such mode of travel, as possibilities of fatal accidents have in the last hundred years of working been so considerably minimised that travel by rail is not looked upon as a hazard" said Shri M. Ganapati, General Manager, Western Railway, in a broadcast from the All India Radio, Bombay, during Railway Week.

"It is indeed most unfortunate that three very serious accidents should have occurred, the first in September, 1954, the second in September, 1956 and the third in November 1956. The causes of these accidents have been the subject of very thorough enquiries. Adequate steps will be taken by railway administrations to follow up the recommendations of the Enquiry Commissions and prevent a recurrence of such accidents to the utmost extent possible. What, however, I intend to detail in my talks to you this evening are the steps taken by railways in preventing the incidence of accidents of all descriptions."

"Accidents on railways may be broadly classified into six different heads viz., collision, derailments, failure of locomotives and rolling stock, i. e., carriages and wagons, failure of permanent way, i. e., the track on which the trains run, fires, and lastly, other accidents which do not come under any of the above five classifications. Coming to the causes of these accidents on railways, they can be broadly put down to failure of staff, failure of track, failure of mechanical equipment, trespass including collisions of motor transport with trains at level crossings and other miscellaneous causes, such as falling from trains, etc."

"Every accident that occurs on railways, no matter how insignificant it may be, and no matter what damage to property and life it may cause, is thoroughly investigated with a view to ascertaining the precise nature and extent of the accident and its causes. The

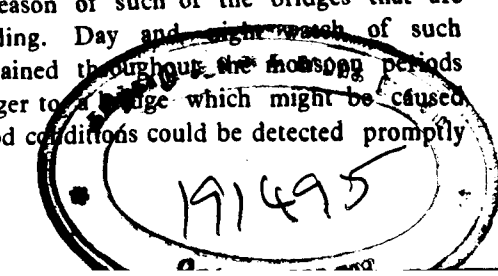
findings and recommendations of the Enquiry Committee as well as the findings and recommendations of the Government Inspector of Railways in the case of major accidents, are given the most careful consideration by railway administrations and prompt action is taken not only in enforcing adequate punishment to any staff who may be found responsible for the accidents through neglect of duty, but also in taking immediate and effective steps to remedy the causes which gave rise to the accident and thus prevent as far as practicable a recurrence."

"In regard to the day to day maintenance of railway track, the failure of which also tends to cause accidents, it is perhaps not widely known that every mile of running track of over 38,000 miles on the Indian Railways, is examined every day by foot by experienced gangmen, called the keymen and that every 3 or 4 miles of track, as the case may be, is under the charge of a gang of men headed by a Mate, who systematically overhaul the track and ensure that the rails, sleepers and ballast on which the sleepers rest are all examined and maintained in a good condition."

"With regard to bridges, big and small, they are inspected thoroughly once a year, by Engineering Inspectors, and again by Assistant Engineers and Divisional Engineers with a view to take note of any deterioration in their condition and set them right. Besides, they are constantly watched by the maintenance gangs, in whose beat they are located as well as by the Engineering inspecting staff during their numerous inspections every month."

"Bridges which are found defective during the routine inspections and bridges which have any history of being badly affected during floods are also inspected by Senior Engineers from Headquarters so that a quick decision can be taken regarding steps to be taken to repair any damages noticed. Besides periodical inspection of bridges, a special watch is kept during the monsoon season of such of the bridges that are prone to flooding. Day and night watch of such bridges is maintained throughout the monsoon periods so that any danger to a bridge which might be caused by unusual flood conditions could be detected promptly

(Continued on page 11)



## Standardisation of Stores Practices

By A. Deb. B.E.

IN the wake of the Audit report on Defence Stores, suggestions have been put forward in a section of the press for Stores Enquiry Committee. May be, we cannot discuss such suggestion glibly, but it offers an opportunity for introspection. We had in recent years Railways Stores Enquiry Committee, Stores Purchase Committee. Suggestions for another enquiry committee may set all store-keepers a thinking, as to what's wrong.

Stores are sinews of any project or industry. Just as in any house, you can assess the prosperity of the family and the ability of the housewife, by a casual peep in the storeroom, so also in a big establishment, one can assess the shape of things by inspecting the Stores Depot. A capable housewife would arrange her stores in a nice and decent fashion like an artist. She would never allow ants or cockroaches to eat up stuff and would recoup stores just in time, with scientific acumen, so that no one in the family is inconvenienced. A capable store-keeper cannot do more than emulate the ideal of a capable housewife. In his case the constituents are comparable with family members. Heterogenous nature of constituents warrants alertness on Store-keepers. Some have compared store-keepers to fond mothers who keep their babies well fed and always anxious for their progress. Others have compared store-keepers to teeth, service of which is recalled only when it fails to serve. When all teeth are functioning no one thinks of them. With such compliments at their back, store-keepers are a category of people who should never fail in service. Without drawings engineers are blind. Without stores Engineers are lame. Stores are, therefore, sinquanon for the progress and Store-keepers too. With such importance for their service, is there any trend for developing the vocation of Store-keepers? Storekeepers have been declared as technical personnel, but little technical knowledge is now imparted to them. Their know-how has no standard. The primary needs for developing the vocation of Store-keepers cannot therefore be too highly exaggerated.

A store-keeper procures and distributes stores for his constituents. Planning for procurement, inspection of supplies, storage of stock, accounting for expenditure—all these are essential to good storekeeping. The profession of store-keeper demands that an incumbent in the post, like an engineer, knows specifications and methods of inspection of the materials he handles; like an accountant, knows the process of accounting for expenditure; like a scientist, knows how to protect his stock from deteriora-

tion, like a factory manager, knows how to handle labour and equipments.

This underlines the need for trained men, as in other countries. But to set standards for the profession, it would be necessary to draw up a syllabus of studies somewhat on these lines:

Basic education—A higher secondary school leaving certificate. Vocational training—(a) theoretical: inspection, specification, care of materials, preparation of catalogues, handling of material—six months. (b) practical: ledger-keeping, accountancy, passing of bills, preparation and disposal of vouchers—six months: works training: millwright, toolroom, electric repairs, foundry, smithy—12 months.

Activities of a stores organisation are divided under two main divisions namely Procurement Division and Distribution Division. There are various names or phases in each division but the principle of operation is the same, whether railways, or ordnance or private concern.

The procurement division invests money by purchase of stores for the constituents. The commitments are for and on behalf of the constituents—a fact, very comfortably forgotten by the constituents themselves. It has aptly been said that stores are not only cash in kind but more than this. Cash in bank earns interest but cash in kind depreciates and herein the constituent should bestow a little thought before placing their demand on stores. Critics of stores often find it convenient to forget this aspect. Utility of stores is manifested through transactions and transaction is always bilateral involving store-keeper and consumer. Any criticism on stores is incomplete, if it does not review the performance of the two parties, in the transaction. Should, however, the constituent fail to exert the degree of care expected of them, before they place their indents on stores, the store-keepers should not fail to exercise their prerogatives and revise the indents, for the best interest of the constituent. Of the many ways for prevention of wastage in stores, the first step is the indenter's care and the second step is the store-keeper's scrutiny. The consumer should consume stores according to pre-planned programme, in right time and in right quantity.

Whenever we think of purchases, we take into consideration, the time lag for the purchase and we

always lay by, the quantity to cover the time lag for purchase. This quantity is called the stores margin in the Ordnance Department and the minimum in the Railway Department. Such fundamental nomenclature should be standardised and more rational one universally adopted. Just as quality control is now a days, indispensable to manufacturer, so also stock control is indispensable to store-keepers and stock control is effected by controlling the stores margin. (Details available in the book 'Stores Manual' by the author). Whether in public sector or in private sector store-keepers should know the technique of stock control by controlling the stores margin and the technique is not difficult to standardise.

Lack of standardisation of stores practice is very apparent among store-keepers of various industries. Even they do not call one item by one name. The Indian Stores Department (W.H.S.) classifies stores according to trade group. The railways classify stores according to purpose. One item thus finds more than one place in stores. How the stores should be classified—whether according to purpose or trade group—should be determined and the standard classification introduced. The Indian Railways may compile one catalogue or catalogues with identical part number and description. Similarly it is for the ordnance to compile one catalogue and items of general purpose stores may again be similar. Nothing will be more helpful to store-keeper than a standard catalogue of stores he holds. The co-operation of Industry is necessary to evolve standard catalogue. The absence of attention in this respect can be illustrated. In the Steel Industry, there is no discrimination between pipes and tubes. What one store-keeper will call pipe, one constituent will call tube and they never know what to indent for or where to look for the stores. Wire, rod, bar, beam, joist are very flexible nomenclature. Compilation of a standard catalogue is, therefore, a herculean task and an impossible task unless the Industries themselves standardise the nomenclature of their products. In the Oil Industry what one calls petrol the other calls aviation spirit. You cannot discern the lubricating oils. Steel and oil have the largest resources and they have scope for research also. But these instances, illustrate the lack of attention, from store-keeper's view. Leave aside the lesser industries where such instances can be multiplied. Should the Industry offer co-ordination in standardising the nomenclature of their product, it would greatly help storekeeping all over the country. If the larger industries take the lead, the smaller one will definitely fall in line. The Indian Standards Institution may also take it on themselves for standardisation of nomenclature of commercial products, keeping in view the

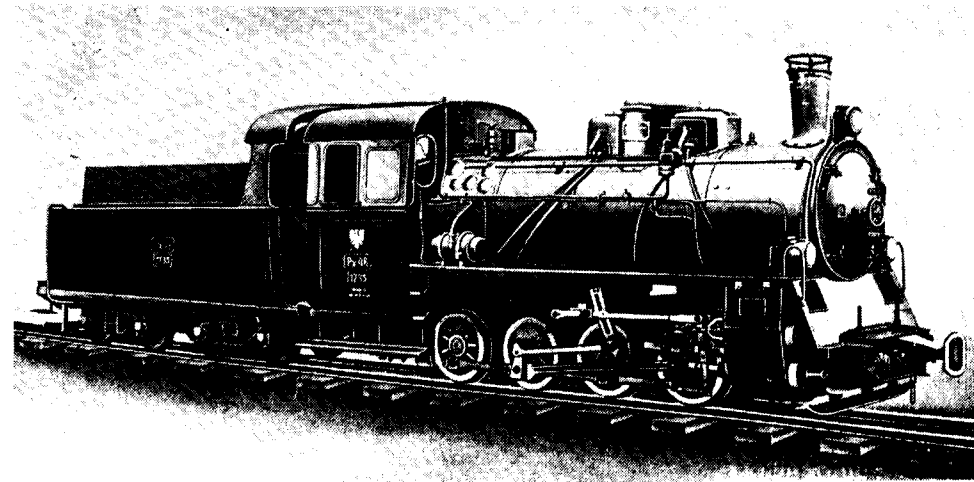
store-keeper's predicaments. With the co-ordinating efforts of Industry, I.S.I. and the Store-keepers, it would be possible to relegate the non-standard nomenclatures, now in vogue, in stores. Equally important is the interest of the consumers to know the standard nomenclature and their specification.

It is very common place to comment about wastage in stores. It calls for efforts to evolve means to prevent wastage in stores—effort on the part of consumer as well as on the part of store-keeper. Standardisation of practice can reduce to a great extent the chance of wastage in stores. Standardisation of classification of stores, standardisation of nomenclature of stores are some of the points which should receive the attention of store-keepers and last but not least is the development of vocation itself.

The manufacturer produces stores, whether it is a toy or turbine, and puts up the products in the market. Manufacturing processes culminate in creation of stores. Commercial concerns deal with them to cater for public needs. The laws of demand and supply guide the out-turn of stores by manufacturers and procurement by Stores Department. If the stores are given rational nomenclature, then it may attract sufficiently, the attention of consumer. It is not that such attempts are sometimes 'overdone'. Some manufacturer have not yet appreciated the need for interchangeability. In the ball bearing industry, whether the bearing is manufactured in Italy or England or Sweden or India, each manufacturer gives a table showing the corresponding numbers of other makes to facilitate interchangeability. Manufacturers of grinding wheels also furnish tables equating their products to other makes. Makers of tool steel also gives composition of the steel to enable the buyer to select the steel. In the lubricating oil industry, interchangeability of make has not been noticed. However advantageous this may be to the producer, it has no advantage to the consumer beyond binding him to one make and not offering the latitude to interchangeability.

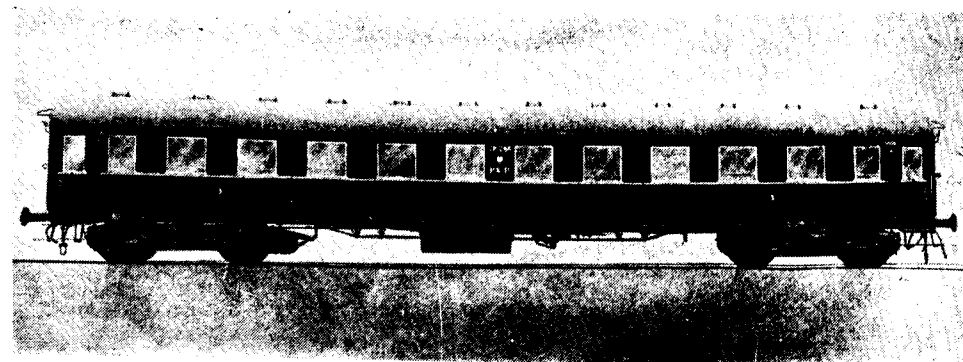
Commercial agents or producers themselves, tender material to the Stores Department against fulfilment of contract. All supplies by contractors are accompanied by a forwarding document which according to commercial terminology is invoice. It is curious that seldom any contractor use the term invoice. They use the term Despatch Memo or Delivery Note or Challan or Packing account or Delivery receipt etc. It passes one's comprehension why they cannot use one standard nomenclature. Standardisations from Store-keeper's point of view have not yet received the attention it merits in our Industries.

## What Metalexport of Poland Can Offer to Indian Railways?



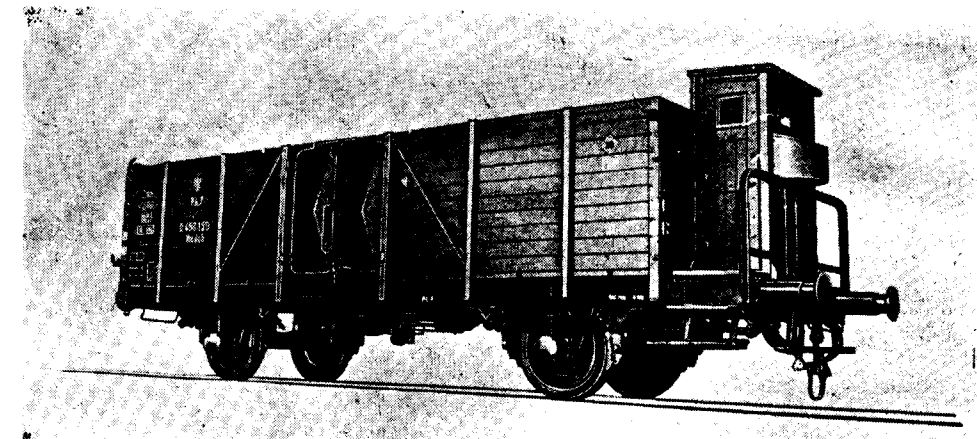
**Narrow-Gauge Steam Locomotive**  
*Type 0—8—0 - Series Px-48*

|                                                        |                  |
|--------------------------------------------------------|------------------|
| Gauge                                                  | 2 ft. 5½ in.     |
| Working steam pressure                                 | 185 lbs./sq. in. |
| Maximum speed                                          | 21.7 miles/h.    |
| Maximum axle load                                      | 5.4 tons         |
| Water capacity of tender                               | 1320 galls.      |
| Coal capacity of tender                                | 3.9 tons         |
| Total length of locomotive with tender over buffers    | 42 ft. 10 in.    |
| Total wheel base of locomotive with tender             | 30 ft. 5½ in.    |
| Weight of locomotive and tender, empty                 | 27.6 tons        |
| Draws at 9.3 miles/h. a loaded wagon-convoy of maximum | 445 tons         |



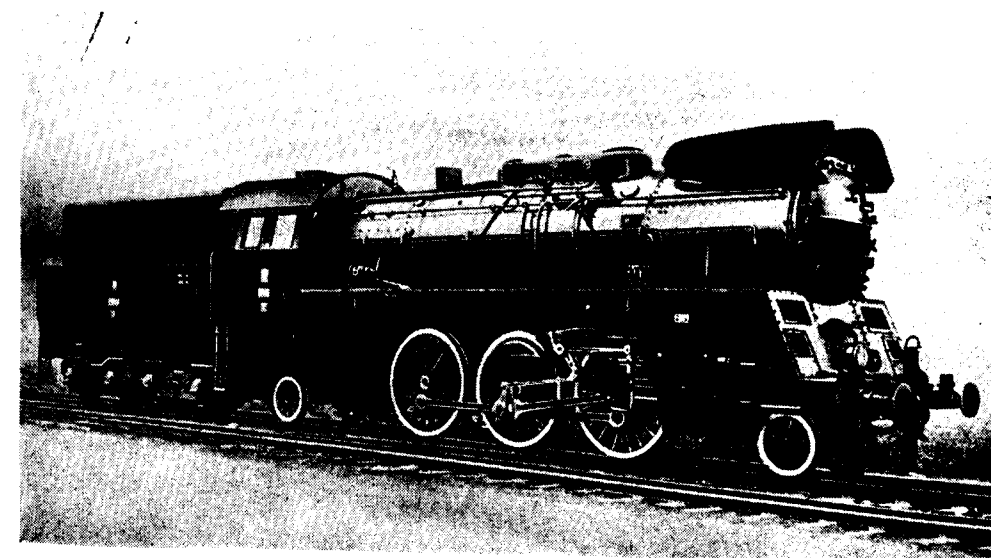
**Third Class Coach**  
*Type 2A*

|                                        |              |
|----------------------------------------|--------------|
| Gauge                                  | 4 ft. 8½ in. |
| Number of compartments                 | 10           |
| Total seating capacity of compartments | 80           |
| Total sleeping capacity of the coach   | 60           |
| Weight of coach, empty                 | 37.4 tons    |
| Length of coach over buffers           | 73 ft. 7 in. |



**Coal Truck with Brakeman's Cabin**  
*Type 10W*

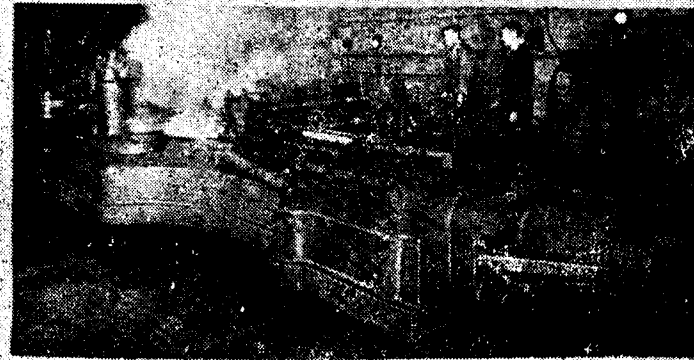
|                                    |              |
|------------------------------------|--------------|
| Gauge                              | 4 ft. 8½ in. |
| Loading capacity                   | 22.6 tons    |
| Loading surface: length            | 26 ft.       |
| width                              | 9 ft.        |
| Cubic capacity                     | 1194 cu. ft. |
| Max. clearance of open door        | 4 ft. 11 in. |
| Weight of empty truck              | 16.1 tons    |
| Total length of truck over buffers | 32 ft. 7 in. |



**Passenger Steam Locomotive**  
*Type 2—6—2 - Series 01-49*

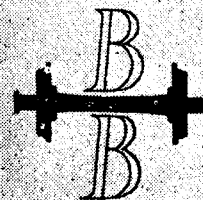
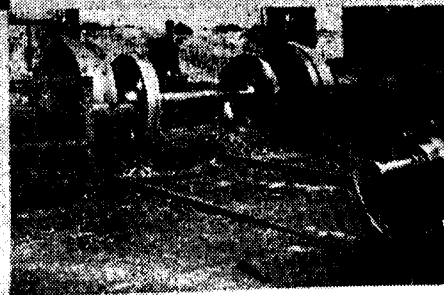
|                                                       |                  |
|-------------------------------------------------------|------------------|
| Gauge                                                 | 4 ft. 8½ in.     |
| Working steam pressure                                | 228 lbs./sq. in. |
| Maximum speed                                         | 62 miles/h.      |
| Maximum axle load                                     | 16.7 tons        |
| Water capacity of tender                              | 5500 galls.      |
| Coal capacity of tender                               | 11.8 tons        |
| Total length of locomotive with tender over buffers   | 67 ft. 10 in.    |
| Total wheel base of locomotive with tender            | 56 ft. 8 in.     |
| Weight of locomotive and tender, empty                | 98.5 tons        |
| Draws at 37 miles/h. a loaded wagon-convoy of maximum | 740 tons         |

# marking the track of India's progress



Railway wheels  
tyres and axles for  
the Indian railways

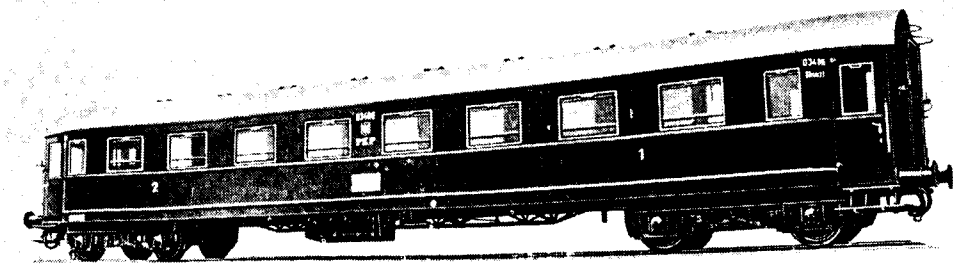
AGENTS FOR THE WHOLE OF INDIA :  
SAMUEL OSBORNE (INDIA) PRIVATE LTD.  
THIRD FLOOR,  
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**JOHN BAKER AND BESSEMER LIMITED**

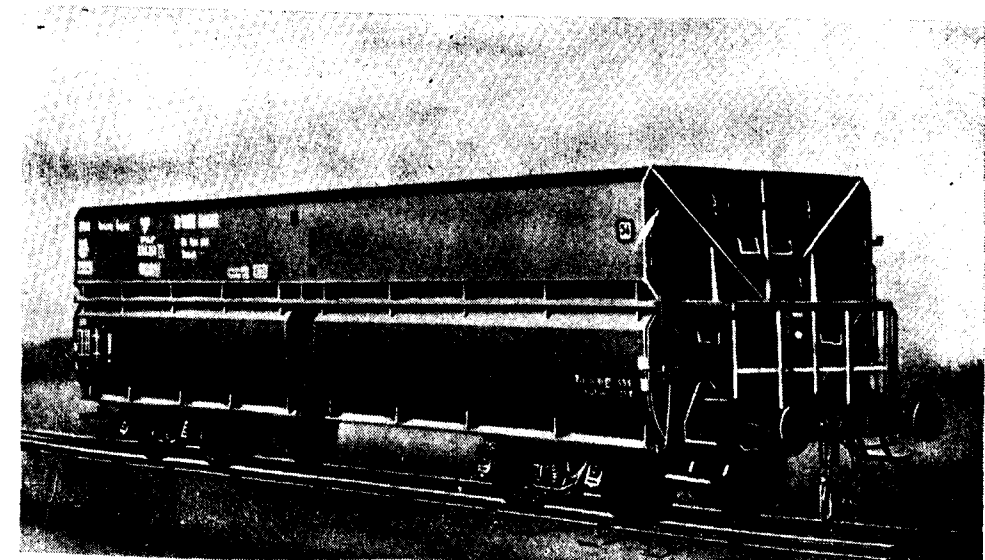
OVER 80 YEARS OF RAILWAY SERVICE

KILNHURST STEEL WORKS ROTHERHAM PHONE MEXBRO 2154-5-6 GRAMS "TYRES" MEXBOROUGH



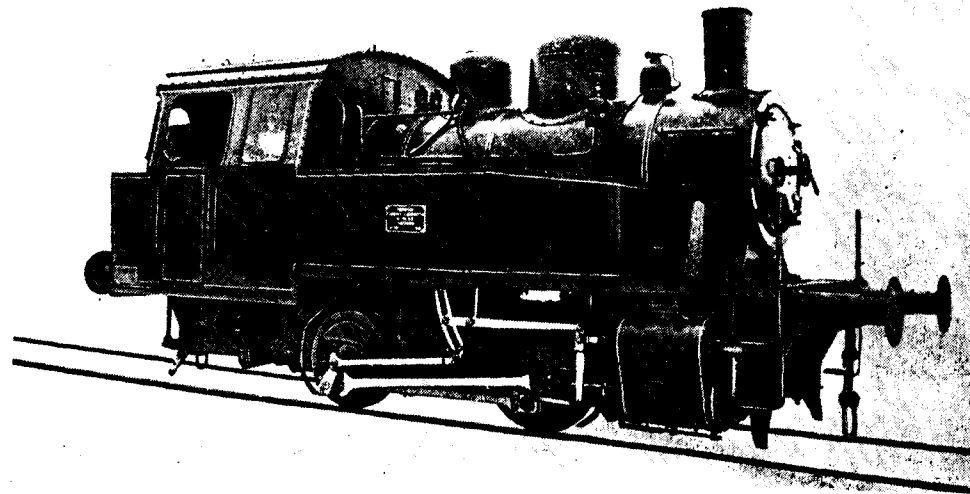
**Composite Coaches**  
*Types 5 A and 6 A*

|                                      | 1st<br>class | 5 A<br>2nd<br>class | 3rd<br>class | 6 A<br>1st<br>class | 2nd<br>class |
|--------------------------------------|--------------|---------------------|--------------|---------------------|--------------|
| Number of compartments               | 2            | 2                   | 4            | 2                   | 6            |
| Seating capacity of the compartments | 8            | 12                  | 32           | 8                   | 36           |
| Number of sleeping berths            | 4            | 8                   | 24           | 4                   | 24           |
| Gauge                                | 4 ft. 8½ in. |                     |              |                     |              |
| Weight of coach, empty               | 36.4 tons    |                     |              |                     |              |
| Length of coach over buffers         | 73 ft. 7 in. |                     |              |                     |              |



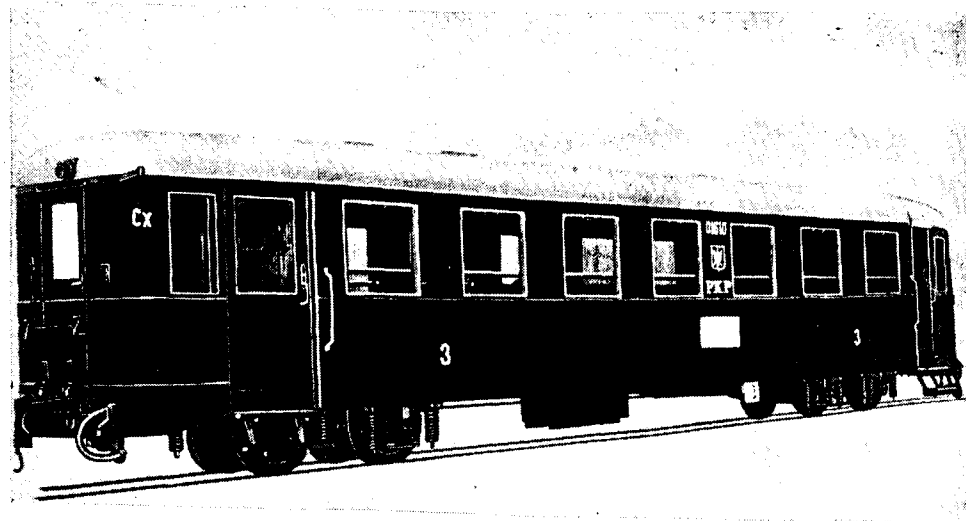
**Self-Clearing Truck**  
*Type 20 W*

|                                    |               |
|------------------------------------|---------------|
| Gauge                              | 4 ft. 8½ in.  |
| Loading capacity                   | 53.1 tons     |
| Weight of empty truck: for coke    | 23.6 tons     |
| for coal                           | 23.1 tons     |
| Cubic capacity: for coke           | 3178 cu. ft.  |
| for coal                           | 2472 cu. ft.  |
| Total length of truck over buffers | 47 ft. 11 in. |



**Steam Tank-Locomotive**  
Type 0-4-0 - Series BA

|                                                        |                                                                                                                          |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Gauge                                                  | 2 ft. 11 <sup>3</sup> / <sub>8</sub> in.—3 ft. 3 <sup>3</sup> / <sub>8</sub> in.—4 ft. 8 <sup>1</sup> / <sub>2</sub> in. |
| Working steam pressure                                 | 200 lbs./sq. in.                                                                                                         |
| Maximum speed                                          | 21.7 miles/h.                                                                                                            |
| Maximum axle load                                      | 12 tons                                                                                                                  |
| Water capacity                                         | 660 galls.                                                                                                               |
| Coal capacity                                          | 1 ton                                                                                                                    |
| Total length of locomotive buffers                     | 23 ft. 3 in.                                                                                                             |
| Total wheel base                                       | 6 ft. 10 <sup>1</sup> / <sub>8</sub> in.                                                                                 |
| Weight of locomotive, empty                            | 18.7 tons.                                                                                                               |
| Draws at 9.3 miles/h. a loaded wagon convoy of maximum | 560 tons                                                                                                                 |



**Narrow-Gauge Third Class Coach**  
Type 1 AW

|                                    |                                         |
|------------------------------------|-----------------------------------------|
| Gauge                              | 2 ft. 5 <sup>1</sup> / <sub>2</sub> in. |
| Seating capacity                   | 38                                      |
| Standing capacity/maximum/         | 62                                      |
| Maximum total number of passengers | 100                                     |
| Weight of coach, empty             | 12.8 tons                               |
| Length of coach over buffers       | 50 ft. 8 in.                            |

(Continued from page 3)

and traffic brought to a stop over the bridge in question."

"Non-availability of materials for replacing worn out assets such as track, which is assuming alarming proportions these days, causes the railway engineer a considerable amount of frustration, but even here no risks are taken. If the condition of track cannot be improved for want of materials, the engineer-in-charge chooses the alternative of imposing a reduction in the speeds of trains which are permitted to travel over such track. If likewise, bridges or culverts develop some defects, immediately a restriction is imposed for trains travelling over them until such time the defects are remedied. The motto under all circumstances is "SAFETY FIRST".

"As regards the failure of locomotives and rolling stock which is responsible for very nearly 50% of the accidents, the utmost care is taken not only in the manufacturing technique and the means and method of testing materials which are employed in the manufacture of rolling stock, but in the day to day maintenance and periodical overhaul of all kinds of rolling stock such as locomotives, carriages and wagons. If in spite of these precautions, materials reach a state of fatigue and escape attention before they are replaced, it can only be attributed to the stress and strain caused by the incessant use to which locomotives, carriages and wagons are put to on the railway systems, an idea of which can be gathered when I state that on all Indian Railways a total of about 250 million train miles are being run per year at present."

"As regards failure of staff, including the engine crew, station staff as well as staff entrusted with the maintenance of track, bridges, and rolling stock, the most careful and constant attention is paid to the proper recruitment and to the training of staff for their respective duties before they are actually put in charge of their work. The attention of staff is also drawn to salient features of safety rules and to the cases where such safety rules are breached resulting in accidents. With all these prophylactic steps which are taken all through the year, occasions do arise when failure of human element causes an accident.

Trespass in which human beings or transport vehicles carrying passengers are involved, also accounts for a number of deaths. In the case of transport vehicles getting involved in accidents, more often than not such vehicles attempt to cross railway lines at unmanned level crossings and thereby face considerable risk to life and property. Not all level crossings are manned, quite a number of them are left unmanned as the traffic across these level crossings does not justify their being manned all the 24 hours. With the increase in road traffic, it does become necessary to review the position now and again and arrange to man some of the level crossings, if the traffic has increased, at the request and cost of the local State Government.

Nothing but the most constant minute and unflagging attention to all matters connected with accidents can ensure in their gradual reduction to negligible numbers, and I can confidently say that all railway administrations look upon the prevention of accidents and the reduction of risks in railway working as their paramount duty.

#### AIR-CONDITIONED TRAIN SERVICE BETWEEN BOMBAY AND DELHI PROVES VERY POPULAR

The bi-weekly Air-conditioned De Luxe train service between Bombay and Delhi is proving very popular with the travelling public and is now running to more or less full capacity.

cheap and wholesome food is provided by Departmental Catering of the Western Railway. Overcrowding is avoided, as only tickets to the extent of the number of seats available are issued.

Apart from the air-conditioning of the entire train, which provides comfortable travel both in summer and in winter, this service affords maximum comfort to third class passengers. The chairs provided for third class passengers are so designed as to give restful comfort. The train is vestibuled giving freedom of movement to passengers from one end to the other. Specially designed air-conditioned Dining Car has been provided where

Public are requested to have their luggage brought to the stations about an hour before the departure of the train to ensure that all luggage is loaded into the luggage compartments of the train in time. Passengers are not permitted to take heavy packages into the compartments as this would cause inconvenience to the other passengers on the train.

\* \* \*

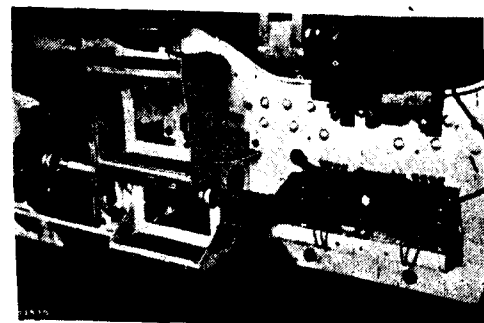
## Diesel-Electric Locomotive Lubricated by Tecaletmit

THE attached photographs are of the standard Type 1 C. O.—C. O. 1 British Railways Diesel-Electric Locomotives, the end bogies of which are automatically lubricated by a Tecaletmit Brentford Oil Pump.



*Diesel Electric Locomotive No. 10201*

This interesting locomotive weighs 135 tons and is capable of a speed of 90 M. P. H. The fuel capacity is 1,150 gallons. The diesel car unit is a 16-cylinder Vee-form engine operating on the 4 stroke cycle and rated at 1,750 B. H. P. The engine is pressure-charged by 4 exhaust gas turbo-blowers. Within the interior of the locomotive, the engine and generator rooms are separated by a partition. On the latter is a filtered air compartment. A self-contained boiler compartment



*This shows the British Railways Diesel-electric Locomotive which has Tecaletmit Automatic Lubrication fitted to the mechanism of end bogies. The Tecaletmit Automatic Pump can be clearly seen here mounted on the left-hand side of each bogie and driven from the end of one axle on a British Railways Type 1 C.O.—C.O. 1 Diesel Electric Locomotive.*

houses an automatically-controlled oil fire boiler, which provides steam for train heating, and for the convenience

of the crews is installed an electric cooker, a tip-up wash basin fed by hot and cold water and also a water closet. The driving compartments at both ends are double-panelled throughout to reduce noise and provide heat insulation. Two automatic alarm systems are embodied in the control equipment, one for fire protection, and the other to give the crew a preliminary warning of an impending shutdown of the power unit due to operation of one or other of the safety devices. A Tecaletmit Brentford Mechanical Pump is mounted on the left-hand side of each bogie and driven from the end of one axle. These two multi-feed pumps provide lubrication for the suspension links, etc. on the leading axles.

\* \* \* \* \*

### LUBRICATION OF SIGNAL GANTRY

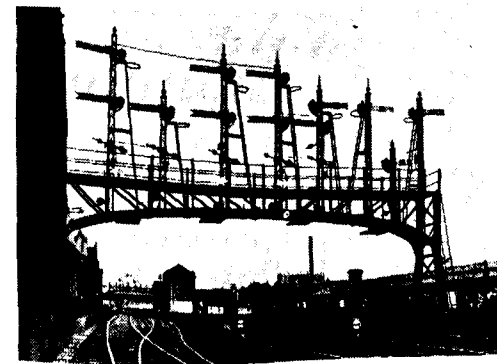
It will be appreciated that the number of bearing points in wire rope pulleys and point rod cranks between a signal box and the ultimate bearing points on semaphore signals is large, and unless these bearings are



*The Tecaletmit Mechanical Oil Lubricator can be clearly seen mounted on one of the signal lattice frames on this signal gantry in use by British Railways.*

properly lubricated, much wear and tear of pins and bushes takes place.

To lubricate such bearings, British Railways installed on a bridge signal situated on the main line junction at Bridge Street, Glasgow, Tecaletmit Automatic Lubrication. It is interesting to note that 55 bearing points are lubricated from a central point by means of a mechanical



*This bridge signal on the main line at Bridge Street, Glasgow, has a Tecaletmit Mechanical Lubricator fitted to it, which has been marked.*

oil pump, actuated by a lever link from the balance lever of one of the signals.

A main pipeline is run from the pump along the side of the gangway. From this main pipeline distribution pipes are run up the various signal lattice frames and branched to each of the signal bearings which are fitted with meter valves to allow a calibrated quantity of oil only to be passed in a given time.

Each time the lever is operated for the particular signal on which the pump is mounted, a definite quantity of oil is discharged into the system.

The definite advantage of this system is at once apparent when it is noted that less than two pints of oil are required during a period of two week to lubricate the signal gantry and the entire system is furthermore insulated against the ingress of foreign and abrasive substances. All bearings, therefore, automatically receive a regular quantity of oil and the danger of overlooking them is eliminated. The time factor is also another important feature as apart from filling the oil reservoirs at a scheduled time and routine inspection, no further attention is required.

## YOUR MAGAZINE

The Southern Railways Magazine offers you a variety of topics—short stories, pictures, historical, humorous articles, news, technical railway engineering in its various aspects every month. It only costs Rs. 3/- per year. For Railway personnel Post-Free. Fill this in and become a subscriber to-day itself.

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## AUTOMOTIVE DIESEL ENGINES

One Hundred and Sixteen years are but a moment in the long history of the ancient land of India.

Travel along any of the shady roads of the mofussil and you may see how short these one Hundred and Sixteen years are, for in the space of an hour or so, the history of road transport in the century rolls before you.

Through the dappled light and shade of the dusty roadway comes the coolie, tramping along on his bare feet, his bundle on his head. Creaking past him in a covered wagon, the bullock driver sits his patient bullocks plodding along slowly with an occasional spasmodic effort at speed as the driver applies his stick or gives their tails a twist. Nearing a temple town, an elephant slouches along—the transport of the ancient and still used on occasions of ceremony and splendour. Passing these age old transporters comes the modern streamlined internal combustion engine powered motor coach, speeding along in safety with its passengers. Diesel Trucks also roll along, all these methods of transport linking up village to village.

And so, in a short hour, more than a century's progress in road transport is bridged over, and we see the ancient and modern side by side.

The firm of Simpsons, Madras, has had the proud privilege of living through these one Hundred and Sixteen years of India's life, beginning with the manufacture of the Howdah, Litter and Palanquin, then Travelling Vans, State Carriages, Pony Tongas, Landaus, Victorias, etc., always keeping abreast with improved methods of road transport.

The year 1903 ushered in a new era in road transport in India with the introduction of internal combustion engine propelled vehicles and since that time, the firm specialised in Automobile Engineering, including Motor Car, Motor Coach and Motor Truck body building, in which field they have achieved and maintained an excellent reputation throughout India.

The advent of the Diesel Engine for Road Transport Vehicles was one of the most important developments in recent years and as Simpsons realised the popularity diesel transport would quickly gain, they entered into

## ANNOUNCEMENT

*We have pleasure in announcing to all our Readers and Advertisers that we propose to bring out a special Supplement to our Magazine entitled "ALLOYS, FERROUS & NON-FERROUS METALS" sometime in October 1957. For the first time in the history of Indian Railways such a splendid Supplement is being published by us.*

EDITOR.

an agreement with F. Perkins Limited, Peterborough, as Distributors for the whole of India for the famous Perkins "P" Series Diesel Engines. Subsequently, they entered into a manufacturing agreement with the approval of the Government of India, following which a Phased Manufacturing Programme was submitted to the Government of India and on June 5, 1955, the Chairman of Simpson & Co., Ltd., Shri S. Anantharamakrishnan, the noted South Indian industrialist, gave an assurance to Government that by December 1956, i. e., in the remarkably short period of 18 months, Simpson & Co. would achieve complete indigenous manufacture of the Perkins P6 Automotive Diesel Engine to a capacity of 3,000 Engines per annum.

This was a tremendous task and under the able direction and control of the Company's Director & General Manager, Mr. A. J. Lund, a Chartered Engineer, possessing considerable administrative, organising and production ability, the programme was fully completed.

The utmost co-ordination and co-operation of all administrative staff, draughtsmen, jig & tool designers, other technical, managerial and general staff, Workers' Union, and every employee of the Company was most essential for such an undertaking, and it is undoubtedly a great credit to all that a project of such magnitude was accomplished in the very short space of 18 months.

Specifications and capacities of all plant and machinery had to be worked out to suit all machining operations for each and every component part of the Engine. Orders then had to be placed for deliveries Madras to suit the respective phased periods of the Manufacturing Programme. Complete factory layout plans for positioning of the machinery for flow-line production had to be prepared, excavations made and machinery foundations laid ready for installation of machinery on arrival. Additional electric power supply had to be provided including purchase and installation of additional Transformers, new electric power cables and feeder lines together with distribution boards and switch gear. The entire lighting arrangements throughout the factory had to be re-planned.

Jigs, Fixtures and special Toolings had to be designed and manufactured at their Madras Works to the tune of nearly 3 lakhs of rupees value. Simultaneously, necessary labour force had to be trained, especially for the manufacture of high precision work involved in the production of Jigs and Fixtures. And high tribute should be paid to Indian labour for their remarkable

adaptability and progress in this specialised sphere of engineering.

### SIMPSONS' WORKS

A massive modern construction, double-storied building houses the Administrative Offices, Financial and Cost Accounts, Drawing and Design Office, Sales Department, Central Stores, Purchasing Department, Material Control and Planning Office. And behind this building is the spacious and most modern Workshop. The factory area covers approximately 2,50,000 sq. ft.

### THE PERKINS P6 AUTOMOTIVE DIESEL ENGINE

This is a 6-cylinder unit, having cylinder bore 3.1/2" and stroke of 5". Swept volume is 4.73 Litres (288.6 cu inches) and develops a maximum commercial vehicle rating of 83 b. h. p. at 2,400 r. p. m. Maximum torque is 202 lbs. ft. (27.9 Kgms.) The weight of the Engine with electrical starting equipment but without flywheel and starter ring is 696 lbs. In its power range, Perkins P6 is unquestionably the most popular diesel transport engine in the World and in India alone about 40,000 of these engines are operating with extreme reliability and efficiency.

### THE MANUFACTURING PLANT

The Perkins P6 Diesel Engine consists of nearly 1,800 component parts, and, of these, 20-odd items are still not manufactured in the country, viz., Proprietary items consisting of Motor Starter, Dynamo, Fuse Box, Venturi, Timing Chain, Starter and Heater Switch Assembly, Etc.

### PLANNING FOR PRODUCTION

The organization of the Planning Department has been done on the modern lines, using very extensively the Graphdex Board Charting System and with this the day-to-day stock position of the various engine components and also the flow of the manufacturing programme can be gauged at a glance.

Job Control Boards are operated by the Loading Section of the Planning Office and this method ensures very proper loading of the various production machines and also helps to keep an effective eye on the planned and actual production hours for doing various machining operations. The efficient organization of the Planning Department and co-ordination with the Works and the Cost Office facilitate accuracy in determining the manufactured cost of the component parts day to day.

## PLANNING OF CUTTING TOOLS

The various cutting tools required by the Machine Shop are planned and procured, taking into consideration the tool life and the monthly tool consumption. The tools are properly numbered and as per the Operation Sheet, these are stocked in the Tool Stores for easy delivery. The procurement of tools has become a very important function to keep the Machine Shop running uninterruptedly, especially in view of the country-wide shortage of and import restrictions for various cutting tools. In the selection of various cutting tools, factors governing maximum production and tool life, and also the materials to be machined are taken into consideration.

## MATERIAL CONTROL DEPARTMENT

The different types of raw materials required for the production of P6 Engines are procured through the Material Control Department. This Department is responsible for the location of suitable materials and ordering them as required. They take very suitable steps to contact various suppliers and ensure that only the right type of material as specified in the designs are procured. All raw materials received at the Works are bonded until material and chemical analyses as required have been taken. This procedure is rigidly followed to ensure that only approved materials to specification are used for the production of the Engine.

This Department also looks after the procurement of various purchased components and also maintains a close liaison with Messrs. F. Perkins Ltd., Peterborough, England, and their Resident Chief Inspector, for obtaining their approval for these items. In the case of completely machined purchase items, a rigorous inspection is instituted in our inward goods section and these goods, like parts manufactured in Simpsons' Works, are constantly under review by F. Perkins Ltd.'s Resident Chief Inspector and his assistants.

## MACHINE SHOP

The Machine Shop is broadly divided into two sections: one section manufacturing miscellaneous component parts and the other is laid out for flow-line machining of Cylinder Blocks with Main Bearing Caps, Cylinder Heads, Connecting Rods, Camshafts, Crankshafts, Lubricating Oil Pumps, Water Circulating Pumps, etc. The arrangement of Plant and Equipment has been carried out with a view to obtain a good deal of flexibility in production. Various Capstan Lathes and Automatics have been grouped in one section and several Radial and Pillar Type Drilling

Machines in another and in this manner general purpose Milling Machines including Gear Hobbing Machine and SS & SC Lathes have been arranged in different groups.

Four of the Machine Shop bays extend lengthwise within the buildings and this arrangement enables very effective supervision and easy flow of components from machine to machine to be achieved. Manual handling of the components is minimized by necessary mechanization and goods, wherever possible, are palletised and the movement of components at various stages of machining is carried out by the employment of a large variety of specially designed pallets.

## CYLINDER BLOCK BAY

The rough castings are delivered at one end of the bay and these are first washed with paraffin in a cleansing tank.

Gravity Roller Conveyors are arranged all along the bay and the castings travel on these from machine to machine, thus reducing to the minimum physical handling. This also helps to avoid 'stock piling' of components on the floor at the various machine stations.

After fettling and washing, the castings are inspected with necessary inspection fixtures to ensure the correct locations of cores, jig location points and machining allowance, and placed on the roller conveyor.

From these the work is loaded directly into the fixture on the first machine, this being a Duplex Miller provided with 2 Nos. 16" dia. inserted tooth carbide cutters. After this operation the work is moved on the roller conveyor to the next operation, i. e., drilling of sump and head faces. In this operation two locating holes are drilled and reamed on the same face for jig location purposes for subsequent operations.

In the Cylinder Block Bay there are several special purpose machines of the modern type such as 6-spindle Snout Borer specially designed for the rough boring of all the cylinder bores, Special Horizontal Drilling Machine for drilling the pressure rail hole in one setting and the wide base Miller for straddle gang milling the Crankshaft bearing sides and also for form milling the Crankshaft bore. 2 Nos. specially tooled Borematrics are stationed for finish boring the parent bore of the Block and the Liners with hydraulically-operated 3 station fixtures. The Honing Machines are positioned next to the Borematrics for rough and finish honing the Cylinder bores after finish machining of the Liners.

Most of the other operations are carried out on general purpose machines including Radial Drilling Machines, Vertical and Horizontal Milling Machines, Radial Arm Tappers, etc. All machines have been tooled up for doing particular operations through suitably designed jigs and fixtures.

The Crankshaft and Camshaft bores are finish bored in a Horizontal Boring Machine after fitting the main bearing caps which are processed alongside the Block and brought over to a fitting station. When the machining operations on the Block are completed, the Main Bearings are fitted and line bored.

At every stage of machining, strict inspection is maintained by well trained stage Inspectors to ensure that only correctly machined Blocks are allowed to move forward to their next operations.

Before finishing the Blocks these are water tested and also the pressure rail paraffin tested to ensure that the Blocks are leakproof in every respect.

Completely machined Cylinder Blocks before delivery for assembly are inspected by Final Inspection Department, although rigid stage inspection has already been done at different stages of production.

## CYLINDER HEAD BAY

The various machines for processing this component are arranged operation-wise. The rough castings are fed from one end and the completely machined heads are delivered to assembly from the other end. The work travels on roller conveyors and arrangements have been provided for lifting the work from machine to conveyor and conveyor to machine with the help of overhead lifting gear. For the machining of Cylinder Heads Vertical Milling Machines, Radial Drills, Radial Arm Tapping Machines, etc., are used, all of which are specially tooled and jigged for rapid production and interchangeability of the component. As in the case of Cylinder Block, rigid stage inspection is maintained and the completely machined Heads are delivered to Assembly only after passing 100% final inspection.

Before commencing the first machining operation, the castings are thoroughly inspected on the production line itself for jig location points, machining allowance and to detect any casting defects.

After completing the machining operation, the Heads are also hydraulically tested and steam-cleaned.

## CONNECTING ROD AND CAMSHAFT BAY

The Connecting Rod stampings, made out of Nickel Chrome Molybdenum steel, are first inspected very thoroughly in the materials inspecting wing of the Inspection Department to detect twists and other stamping flaws. Only approved stampings are then released to the production line and before the commencement of the first machining operation, the stampings are fettled and crack detected on a Magnetic Crack Detector.

In this bay also the machines are stationed on operation basis and, therefore, the Connecting Rods move from one machine to the other in perfect sequence resulting in the least amount of handling.

Specially designed pallets are used for this bay instead of roller conveyors and the components are placed vertically on these pallets by the operative after completion of each operation.

The various milling operations are done by employing negative rake milling cutters as the material has over 65 tons tensile strength.

After the rods are completely machined, steel backed small-end bush is press fitted and then finish bored to size on a precision specially-tooled Fine Borer. On completion of all operations the rods are again crack detected and demagnetised before delivery to final inspection where these are individually weighed and matched. Specially trained Stage Inspectors vigilantly watch for any process variation at different stages of production.

P6 Engine Camshafts are machined on journals which are ground to micro-finish. The Cam Lifts are profile ground and a specially designed Cam-o-matic Grinding Machine, specially tooled, give correct profile of all cam lifts. Cam contour and respective cam lifts are checked on a specially designed fixture during process of manufacture.

## CRANKSHAFT

The P6 Crankshaft is machined from high tensile Nickel Chrome Molybdenum steel drop forgings. This most important component has been tooled up with utmost care as the efficient performance of the P6 Engine depends to a very great extent on the precision of the Crankshaft.

Most modern equipment is installed for the production of Crankshafts, the general sequence being crack

detection of Crankshafts before passing into Machine Shop, centering for turning operations, rough and finish turning main bearing journals and crank pin journals, rough grinding all journals, drilling lubrication oil holes, induction hardening all journals by a special induction hardening plant, tempering after hardening, finish-grinding, balancing the Crankshafts and final crack-detection before being passed for assembly. Very rigid inspection is employed throughout the various machining and grinding stages and 100% inspection is carried out after all the operations have been completed.

#### GENERAL SECTION

In the General Section in the Machine Shop, various component parts such as Water Pump, Fuel Pump Drive, Lubricating Oil Pump, Starter Ring, Timing Case, Exhaust and Induction Manifold, Sprockets, etc. are manufactured. The Starter Rings are electrically butt-welded and passed through the Crack Detector before going forward for machining and cutting of teeth. The Starter Rings are again crack detected before 100% final inspection and utilisation in assembly.

Two special Hobbing Machines are utilised for cutting teeth in all Chain Sprockets, Spiral Gears, and all gears are tested by means of a Goulder Gear Testing Machine fitted with chromium plated master gears.

#### TOOL ROOM

The Tool Room is equipped with excellent high precision machinery, including a Jig Borer. Special grinding machines are used for maintaining necessary supplies of correctly ground milling cutters, reamers,

drills, taps and other small tools. All jigs and fixtures are periodically checked for wear and are carefully maintained to ensure absolute interchangeability and maintenance of very close machining tolerances.

#### ASSEMBLY OF ENGINES AND TESTING OF ENGINES

The Engines are assembled in the well laid out Assembly Section on a line assembly basis and every Engine, after complete assembly, is subjected to very rigorous functional tests utilising Hydraulic Dynamometers. Fuel and Lubricating Oil Consumption figures are checked to ensure that each and every Engine complies with the very rigid standards laid down. Each engine averages 5 to 6 hours of actual functional test. After test, each and every Engine is very carefully examined, after finish painting and packing prior to despatch from the Works.

The production of an automotive type diesel engine of the Perkins P6 type calls for very efficient technical planning, extreme skill and supervision and also the adoption of modern production methods. The Perkins P6 Engine is world famous for its simplicity, rigidity, accessibility, economy and high quality. and Simpsons have taken every care to ensure that each and every component fitted into the Madras-manufactured Engine is, in every respect, equal to, if not better than, the previously imported product. From the manner in which the various machining operations on the several components of the Engine are produced in Madras and the excellent administrative co-ordination, one can very boldly state that the Perkins Engine being produced in Madras is not, in any way, inferior to the foreign product.

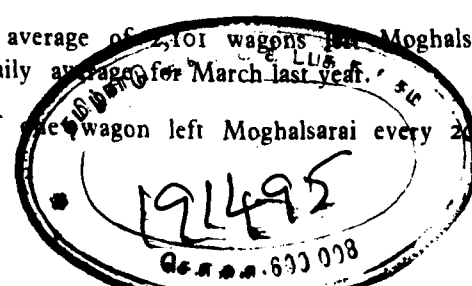
#### A Wagon Every 20 Seconds — India's Largest Rail Yard Creates A Record

India's largest railway marshalling yard at Moghalsarai, near Banaras, in April set up a record of operating performance, which has never before been achieved in its long history.

Daily during March, an average of 2,082 wagons were despatched to a multitude of destinations on the Northern, Central and Western Railways, marking a 17 per cent increase over the performance in March last year, and a 24 per cent increase over March 1955.

In the opposite direction to the Eastern Railway an average of 2,101 wagons left Moghalsarai daily during March, an increase of nearly 20 per cent over the daily average for March last year.

During the last 11 days of March, an average of one wagon left Moghalsarai every 20 seconds. This process continued all round the clock.



## HOW TO RESERVE ACCOMMODATION

Unless you reserve your berth (I Class) or Seats (II and 3rd Class long distance) in advance, you may not be sure of getting accommodation on the train you wish to travel by.

Application should be made to the Station Master of your starting station at least 3 days in advance specifying the date and train by which you intend travelling and the tickets must be bought in advance. The reservation fee leviable is 8 Annas per seat or berth.

Reservation by I and II Class from intermediate stations by Express trains can also be made similarly, but reservation ticket can be issued only after getting an advice from the Reservation Centre that the reservation has been made.

Tickets will be issued only if accommodation is available.

If the reserved seats or berths are not occupied at least 5 minutes before the booked departure of the train the reservation will be cancelled and the seat or berth given away to another.

*Reservation fee is not refundable.*

III Class seats are also reservable on Express and certain other important trains for long distance passengers from the train-starting stations on payment of a reservation fee of 4 Annas per seat.

Do not occupy a berth or seat reserved for another, as you are liable to be displaced at the last moment.

If you find another person occupying the berth or seat reserved for you and if he will not vacate it on demand, report it to the Guard or Station Master. They will help you.

*( Inserted in the interests of Travelling Public )*

## **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.*