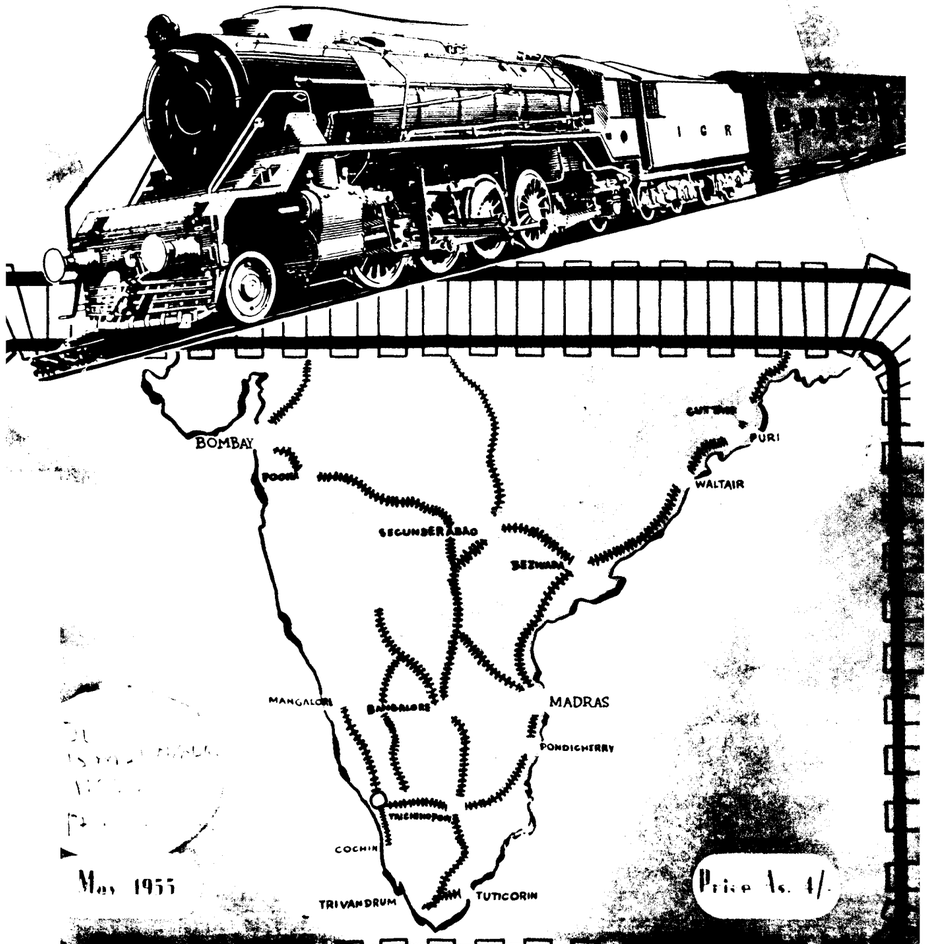
SOUTHERN RAILWAYS *Magazine*



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SOUTHERN RAILWAYS MAGAZINE

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Prospects of Indian Railways' Self-Sufficiency in Equipment

WHILE the Railway Minister Shri Lal Bahadur Shastri has declared that the Indian Railways had advanced very considerably towards the achievement of the goal of self-sufficiency in Rolling Stock yet much has to be done to make India independent of Foreign Imports.

One Committee has already investigated and reported on spare capacity for manufacture both in Government and Private Industry.

Another two Committees are at present engaged in carrying out further investigations. One in the expansion of Railway Workshop Capacity to undertake more work and the other under the Chairmanship of Mr. Kotak, the Chairman of the Stores Purchase Committee to advise Government on the more intensive utilisation of indigenous capacity for the manufacture of railway equipment particularly for the manufacture of special type of wagons, narrow gauge locomotives and other stock and fittings which are still being imported.

The terms of reference of this latter Committee which include the self-sufficiency in indigenous production cover specifically :-

(a) Locating of Capacity in India for the manufacture of railway equipment and rolling stock which are at present imported, and

(b) Suggesting ways and means of expanding the existing plants and or setting up of new industries in India for producing items of railway equipment which cannot at present be manufactured with existing resources.

It would appear from the steps now being taken that the Railway Ministry is in earnest to encourage local established industries and such other new ones that are of anxious to enter into the field of indigenous manufacture on behalf of Railways.

The Railway Minister has further stated " It would be in the fitness of things that new factories in the private sector should come up and I can assure them that they will get the needed encouragement from us ".

Mr. Kotak realises the importance of his task too as he has said that " the economic development of the country would throw the maximum strain on the country's railways and the fact that the Railways are planning to increase transportation capacity by 50% during the Second Five Year Plan period indicates their increased requirements ".

There are still many problems that confront both the Government and the private industry which must be resolved before any progress can be expected and among them the one that looms the largest is the shortage of Steel.

That the problem of Steel so vital to the development of railways requires early solution is realised by all concerned both on railways and in private industry and Government will have to undertake imports of all types of Steel in larger quantities during the next 3 years until, our promised Steel plants go into production if any railway equipment is to materialise at all.

Two other problems which require tackling immediately if there is to be no time lag in the production of railway equipment are :—

(a) A large enough pool of trained artisan staff to be drawn upon both in the private and public sector and

(b) A high standard of quality production.

The first requires the establishment of many more artisan training schools and schools for Supervisors, Foremen and Managers. For this purpose Government and the Private Industry should jointly find the funds in 50–50 proportion if necessary.

Government should collect information of all its retired employees who though they may no longer be able to do strenuous work would be eminently, fitted if sufficient inducement is offered to them, to train the younger generation of budding artisans. Further a few schools where the Supervisors and Foreman could receive intensive training by means of refresher courses in modern workshop methods, labour relations and labour control will be required in the principal cities of the country like Delhi, Calcutta, Bombay and Madras.

Part time courses in all the ramifications of Management should be offered to those in Government or Private Industry who are holding or aspiring to hold higher positions in Management. It is only by these steps that we can expect real progress.

With regard to a high standard of quality production, the Indian workman can hold his own in skill against the best of his class anywhere, but he requires guidance, owing to his lack of education. It is, therefore, necessary that the higher supervisors should have sound knowledge of the techniques of production. They should also be imbued with the spirit that only the best in quality is good enough and that shabby work will not pass the inspection stage after manufacture.

The size of the orders to be placed by the Railway or the DGS&D on the trade should be of such a size, even if they total upto the annual consumption of a standard item, that they make manufacture attractive to the producing firm.

It is very necessary that new industries should be founded on right lines which should include among other things Research, because it is only by this means that improvements can be expected in industrial production and quality.

The Railways should also be prepared to give price preference to indigenous articles until such time that they come upto the required standard.

If such co-operation can exist between the Government and the Industrialists then the day will not be far off when India can hope to be self-sufficient in her Railways - the biggest industrial enterprise of the country.

DUSSELDORF PLASTICS-EXHIBITION

EXTENSIVE testing of new building material went hand in hand with building activity in Germany after a normal living standard had been restored. Without exaggerating it may be said that the "GroBbaustelle Deutsche Bundesrepublik" have gathered experiences which are unlikely to find their equals elsewhere.

Though plastics may not be able to compete with the usual building material they have found good prospects when compared with coloured metals, or other relatively expensive building material on account of their special qualities. There are scarcely any new premises in Germany in which plastics have not been introduced to a considerable extent. Plastic lamps and plastic floors justify the term "from top to bottom".

Examples: Steel tubes covered with a shrinkable skin of Vinyl-plastic provide dirt-resisting door-handles agreeable in use. Doors have often received panels made of safety glass with fine inlaid wire. Banisters are provided with soft plastics, the bars covered with shrinkable plastic tubes. Lamps largely consist of organic glass shapable in various ways. Table-plates are being manufactured of tasteful plastics in layers which are very infugitive. Pillars in halls are often panelled with bright plastics. Armchairs have artificial leather coverings, their stuffing being made of foam rubber.

Also building insulations, for instance, stopping of surface water very often consist of plastics in the way of foils. Vinyl-plastic tubes have been introduced in water supply, when muddy soil or huminacidiferous foundation will exclude iron tubes, or when water has to be absolutely free of taste (springs) or when acidiferous waste water is to be brained. After the war the plastic spattle floor has met with very much favour in Germany. It might be called tinned floors. They have largely been applied in building dwellings. As it depends a lot on preventing spattle substance from being changed certain prescriptions regarding quality have been introduced in Germany. Properly laid-out spattle floors have proved very good indeed.

Also plates covered with soft vinyl-plastic are being applied. Generally the plates are welded into large surfaces. The edges of steps, the spaces on each side, and the ledges are connected by welded covers. Soft profiles of vinyl-plastic adapt any bends through warm shaping. Banister covers being heated with an infrared apparatus are able to adapt any bends.

Great experience in the way of plastics has been gathered in the lines of lighting and illumination. German experts will gladly place these experiences at the disposal of international expert circles. The large Plastics Fair taking place in Dusseldorf from October 8 to October 16 this year, the second big German plastics fair after the war will offer opportunities to meet with the latest German experiences in plastics in the building line, and also provide possibilities for discussions with German experts. It cannot be doubted that building must be carried on in a very different way in our modern time of jet planes and atom power. Dusseldorf will show you how to apply the latest achievements of material technique.

BRITISH FIRM TO SUPPLY CRANES TO INDIA

The Government of India has placed a £200,000 order for eight large cranes of varying sizes with a British firm of railway-plant manufacturers. The firm gained the contract in the face of keen competition from firms all over the world.

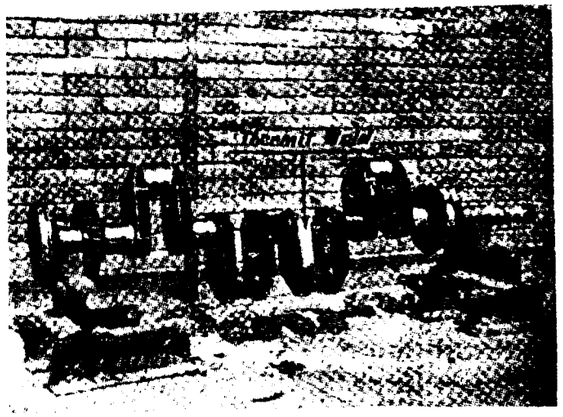
It is expected that the order, one of many from India, will be completed at the end of 1956 or early in 1957. The contract for the cranes is part of the Indian Government's programme for the re-equipment of its railways.

Thermit Welding of Rail Joints & Broken Steel Parts

By Gokul Das Nagory

LOWER MAINTENANCE AND REPLACEMENT COSTS

THE discovery of Thermit Reaction by Dr. Hans Goldschmidt of Essen (Germany) just before 1900 revolutionised the production of certain heavy metals from their oxides. A few years later, it was realised that Thermit reaction which depends on the chemical phenomenon of great affinity of Oxygen for aluminium can be used for chemical welding. When Thermit basically a mixture of finely divided aluminium with iron oxide in suitable proportions is ignited, chemical reaction takes place, the oxygen in the iron



oxide units with the aluminium forming a light aluminium slag and setting the iron free. The heavy iron concentrates in the lower part while the lighter thermit slag ($Al_2.O_3$) corrundum — swims on the top. The Chemical reaction is expressed by the formula.

$$2Al + Fe_2O_3 = 2\,Fe + Al_2O_3 + 18{,}150 \text{ calories of heat.}$$

A Temperature of about 5000 F is developed by this reaction and a supply of molten steel at a tremendous super-heat is thus provided for welding. If this high temperature molten steel is poured into a mould surrounding the parts to be welded, it has sufficient heat to fuse the sections so that the thermit steel and the parent steel amalgamate to form a homogeneous Mass or a perfect fusion weld.

A wide range of steels of different physical and mechanical properties are produced by thermit method and intensive researches have made available steel of 45/50 Tons per square inch tensile strength by this process. The fatigue strength compares favourably with the fatigue strength of the medium carbon steels and the brinell hardness and mechanical wearing properties can be adjusted to suit any particular purpose.

SIMPLE EQUIPMENT

The modern Thermit Chemical Welding has revolutionised the welding of rail joints and repair welding of broken steel parts such as crank shafts, steel housings, ship frames, gears, pinions and other big machine parts. Worked by a very simply equipment which is easy to handle this process is easy to work and has caught the fancy of engineers in all modern countries of the world, to economise maintenance and replacement costs and to assure smooth running of trains and industries.

Since the beginning of the era of Rail transport, the Railway engineers have advocated use of longer and longer lengths of rails to minimise fishplated joints which are the weakest points in the track and which are the cause of early deterioration and consequent replacement of track. The ideal track has always been considered to be without any fishplated joint. However, the maximum length of the rail which can be used in the track has been restricted by:—

(a) Limitation of the steel mills for rolling long lengths of rails.

(b) Difficulties in transporting long rails.

(c) Limit of the maximum safe gap allowable between two rails which restricts maximum rail length to be used depending on variation of temperature.

(d) The quality of the track.

There has always been a limit beyond which rails could not be rolled in the Rolling Mills. Of course, this limit is going up from year to year and today the maximum length rolled in India is 42′ and in Continental countries about 60′. The transport of big rails is also a problem and the maximum length that can be easily transported is at present 100′.

At one time it was thought that rails of lengths bigger than 30′ or 40′ would not be used as the rails expand and contract with temperature. There is a limit to the maximum gap that can remain between the two rails and this limits the maximum length of the rail which can be used in the track. Experiments in recent years have proved that with the improvement of ballasting, sleepers

and rail fastening, the fractional resistance to the expansion and contraction of rails in general has increased and this has so improved the permanent way that the forces of expansion and contraction are arrested by the strength of the permanent way track. The expansion and contraction of rails is greatly reduced from the end of the rails towards their middle. Beyond a certain length of rail on a good permanent way it is only the ends which are able to expand while the middle remains motionless. It has been observed on the Continental Railways that if the permanent way is sound and if ten rails of 40′ are welded together and put in the track, then only the end 40′ rails expand and contract while the other 8 rails in the middle are not affected. It was therefore observed that it is not necessary to provide any extra gap for bigger rails. Rails have been welded to lengths of 1 Kilometer and more by Thermit process and they have given good results in the track with permissible gap.

The track having been so improved that it can bear the long rails it is natural that the engineers like to use only long rails. Short rails with joint gaps to allow expansion and contraction create conditions which lead to the early and premature destruction of the track. The fishplated rail joints may be the best and new, yet the impacts caused by the Rolling Stock running over the joint gaps will bend the ends of the rails downwards, will loosen fishplates and bolts, will affect the position of the sleepers and loosen ballast. These impacts will also deteriorate the rolling stock badly and cause discomfort to the traveller and damage to the goods transported.

ADVANTAGES OF THERMIT METHOD

However the long rails could not be used due to the limitations of the mills to roll big lengths and the transport difficulties involved. Naturally if some welding method could be evolved for welding the rails in the track these difficulties could be solved. Thermit method gave the answer.

There are only two methods by which the rails can be welded safely :

(1) Flash Butt and (2) Thermit.

The Flush Butt method has a disadvantage; it requires heavy appliances and enormous amount of electrical energy and in this process one rail has to be moved to and fro during the welding process. The welding operation is therefore executed in stationary welding works specially established for this purpose. Mobile or portable flash Butt welding plants capable of welding the rail joints at the site of the track have so far failed to be introduced. In contrast to this Thermit Welding Process requires only an exceedingly small amount of materials and implements. Thermit welding materials and equipments are made in India and cost of such an equipment is hardly 1% of the cost of same capacity Flash Butt welding equipment. One weld is completed within 25 30 minutes by Thermit process depending on profile. It can be applied in rail yards or in other suitable places and with adequate organisation

the output is highly satisfactory. It is therefore that all railways should advocate the thermit welding of rail joints.

Thermit welding affords a number of advantages to the Railways :—

(1) Saving in track sleepers due to even spacing of sleepers throughout the welded track.

(2) Longer life of rails due to elimination of end batter.

(3) Decreased wear and tear to rolling stock.

(4) Labour saving in laying rails due to increased life of rails.

(5) Better conductivity in track circuits.

(6) Elimination of joint bonds for signalling.

(7) Smoother riding track providing greater comforts to passengers and greater safety for the materials to be transported.

(8) Huge saving in maintenance and replacements costs particularly in consumption of steel which can be used for other important purposes.

All railways in the world where welding of rail joints is being done on a big scale have reported sizeable savings in maintenance and replacements costs. The following figures of savings made by German Railways on Thermit Welded Tracks are interesting :

		Saving between 1945 to 1951	Average
1.	Saving on Thermit welded track by sparing maintenance in track and switches.	15,00,000 day Work (one day work-8 hrs. of man work)	700 men per day.
2.	Saving by sparing switches & rails.	13,00,000 day Work	600 men per day.
3.	Saving by sparing steel for rails and Fishplates.	1,07,000 Tons of steel.	15,000 Tons steel per year and 22,500 tons coal per year.
4.	Saving by sparing transport of steel	110 Goods Trains.	16 Goods Trains per year.

With this background and to be of some service to the Indian Railways, The India Thermit Corporation Ltd., and its parent institution started Thermit welding in India from indigenous materials. So far over 45,000 joints have been welded, the maximum length being 419′ against 39′ to 42′ ordinary rail length. The welding has been done for Main Line Tracks between Bombay and Baroda and Phulera and Ahmedabad on Western Railway, between Gaya and Dehri-on-Sone, and Howrah and

Kharagpur on Eastern Railway, and between Allahabad and Mirzapur and Delhi and Ferozepur on Northern Railway. Thermit welding has also been adopted by Calcutta Tramways and Martin's Light Railway. The first Thermit joints welded in India by local materials have given over 5 years of service and all concerned are satisfied with the work.

It is important to note that welding does not involve any extra cost as the saving of extra sleeper provided for fishplated joint, together with the saving of fishplates and bolts practically off-sets the initial cost of welding.

Indian Railways have been so far hesitant to allow normal sleeper spacing below the Thermit Welded Joints, but this is universal practice on the Continent. Closer spacing at the Fishplated Joint is provided because at the Fishplated Joint the continuity of the rail is broken and in its place we have a pair of Fishplates. The strength of the Standard Fishplate in Bending is about 30% that of the Solid Rail. At this point, therefore, the rail is quite incapable of effecting longitudinal distribution of the load. The load, therefore, is carried on a few sleepers near the joint. By putting two joint sleepers closer together and slightly reducing the space between the 1st and 2nd sleepers—it is tried to compensate for this. The nett result is that while the stiffness of Fishplated Joint is reduced by about 70% in comparison to rail — the number of sleepers affording support in the vicinity of joint is increased some 25 or 35% i. e. the rail is weakened about 70% and the sleepers are locally strengthened about 30%. The Thermit Joint however has the same Bending Strength as the Rail and as such no closer spacing is required below it. There is however another factor, which the Railway Engineers have to consider and that is the possibility of accident due to the chance failure of some welded joint. Even though, so far no accident has been reported from anywhere due to such failure, it is safer to proceed cautiously in the beginning. Plans have, therefore, been submitted to Railway Board, and it is expected that they would be approved by Railway Engineers. On the basis of these plans — there is saving of sufficient sleepers on welded track which together with the saving of cost of Fishplates and Bolts and the cost of drilling holes, which are not necessary when welding rails, off sets the cost of welding.

SAVINGS

The application of thermit welding to repairing broken shafts, rollers and other steel parts has been developed considerably on the Continent and America. In India our firm has welded several crank shafts and gears which are working satisfactorily. The Thermit welded part is as good as new while the cost is roughly only 25% of the new. This work has been started in India only recently in Kanpur and Calcutta and it is expected that when the Indian Industries start to take full advantage of this process there can be a saving of 10 Million rupees a year to them in Replacement Costs in addition to their minimising losses due to stoppage of work on account of difficulties to replace immediately the broken parts. The saving of foreign exchange will also be considerable as most of the two and more throw crank shafts which are at present being imported to replace broken shafts need not be imported—the broken ones can be easily and economically welded by Thermit Process.

RISE IN EAST AFRICAN RAIL AND WATER TRAFFIC

The East African Railways and Harbours Administration's rail and water services in 1954 increased their ton-miles for public traffic by 410,000,000 to 1,270,000—a record.

The Administration's annual review, just published, reveals increases in income, goods carried, train mileage, and the construction of railway extensions.

Total income reached £18,270,000 which was £2,810,000 higher than in 1953. Deadweight tonnage of goods carried on trains, road and marine services increased by 136,000 to 3,530,000 tons. Train mileage rose from just under 8,000,000 in 1953 to 8,210,000 in 1954.

Meanwhile, the first of 34 new "59" class locomotives has arrived at Mombasa. These locomotives, the heaviest and most powerful in the whole of Africa, are made in Manchester and their total cost will be £2,000,000.

How Britain Supplies the World's Railways

By a Technical Correspondent

Britain was the first country to develop the locomotive and British engineers pioneered railway development in most parts of the world. By virtue of its wide oversea interests, spread over a long period, Britain's locomotive industry has evolved over the years into an engineering and production group which can meet the most diverse conditions required abroad. —Editor.

WHATEVER the railways of the world want in the way of locomotives — steam, diesel or electric — Britain can supply the best their money can buy. Since the war Britain's locomotive manufacturing industry has exported locomotives and component parts to the value of no less than £100 million.

Today Britain can offer deliveries of locomotives as speedily as any foreign competitor. During the last five years, the industry has exported no fewer than 405 locomotives to India, 468 to Africa, 395 to Australia and 356 to other parts. These were all main line steam locos, including some of the largest ever exported.

Diesel locomotive orders have also been high. These orders include 30 for Brazil, 25 for Ceylon, 94 for Ireland and 75 for the Netherlands together with a much larger total of industrial steam locomotives.

Electric locomotives have also been produced in increasing numbers, and these include very large main line locomotives for South Africa, Spain and Brazil. In 1953 no less than 92 per cent of the total production of the industry went overseas.

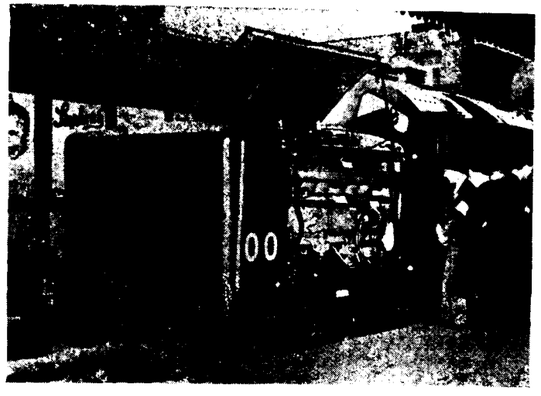
LONG EXPERIENCE

The U. K. industry by virtue of its wide oversea interests has evolved naturally over the years into an engineering and production group which can meet the most diverse conditions required abroad. The limitations of load gauge, axle-loading, gradients, and climatic conditions impose a considerable degree of restraint on standardisation of design. The industry has long experience of "design for the job" and does not attempt to force a standard product on oversea customers which may or may not meet their needs.

For example, diesel locomotives are produced today to meet almost every possible requirement. The range of diesel-mechanical-and-hydraulic types, formerly limited to a ceiling of 275-300 h. p., has now been extended (through the development of advanced forms of transmission by British firms) to include production models of 625 h. p.; designs exist for higher ratings, and an experimental 2,000 h. p. unit developed in conjunction with British Railways is in trial service. Diesel-electric locomotives up to 2,000 h. p. have been built in Britain, and more powerful models are under development.

DIESEL ELECTRIC

The production of locomotives other than steam is one of the most interesting post-war developments. Among the largest manufacturers of diesel electric locomotives in Britain are the English Electric Co., Ltd., Marconi House, Strand, London, W. C. 2., who have also had long experience in this field. They produced their first locomotive of this kind in 1928. This organisation are unique in one respect in that they manufacture on one site complete locomotives. Engines, electrical equipment and mechanical parts are all produced at the



The most powerful diesel-mechanical locomotive yet built for use on British Railways, No. 10,100, is a 2,000 H. P. unit capable of a maximum speed of 78 m.p.h., and having a relatively light axle-load enabling it to be used over a wide range of main line routes. It is of the 4-8-4 wheel arrangement and is powered by four 13-cylinder diesel engines of each of 500 H. P.

Preston factory, although, as occasion demands, some mechanical parts are bought out. Locomotives manufactured today range from 350 to 2,000 h. p. (higher powers are under development) and include a standard 350 400 h. p. shunter. This latter has been produced since 1933.

At the end of 1953, the firm's output of complete locomotives and diesel-electric locomotive equipment, without mechanical parts, had increased by 800 per cent, in terms of horsepower. Locomotives scheduled for completion in 1955 will bring the percentage increase to 1,200.

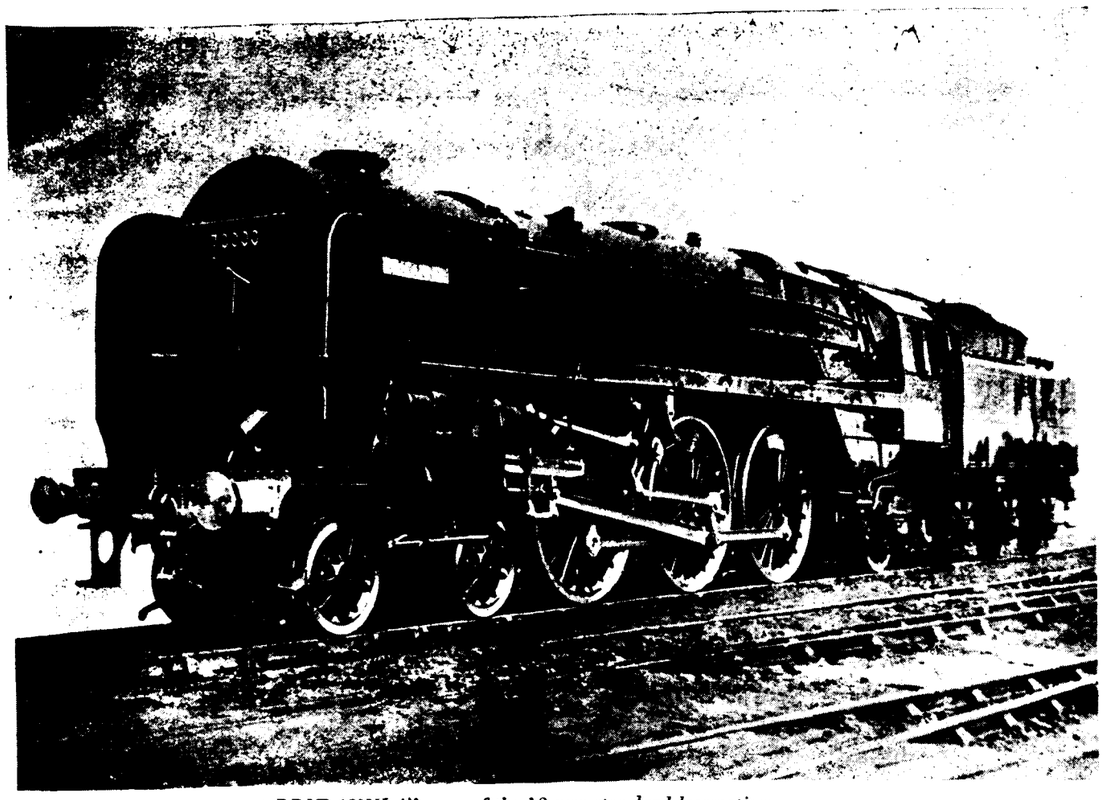
Important recent oversea orders secured by the firm include a contract to supply thirteen 1,000 h. p. diesel electric locomotives for passenger and freight service on the metre gauge system of the Rede Ferroviara do Nordeste, of Brazil. The diesel electric power equipments are being built by the English Electric Co., and the mechanical parts by the Vulcan Foundry.

Twenty-five 2,400 h. p., 1,500 v., d. c. mixed traffic locomotives of the "Co-Co" type are also being built by English Electric for service on the Gippsland main line of the Victorian Government Railways. They ar equipped with rheostatic electric braking.

LARGE OVERSEAS ORDERS

The only company in the U. K. which manufactur diesel-hydraulic locomotives, the North British Locomo tive Co., Ltd., Glasgow, have been making them sinc 1950 and sales of these both for home and export hav continued to expand steadily. One oversea orde recently completed was for two 0-6-0 diesel-hydrauli locomotives built for the Mauritius Government Rail ways. These have successfully completed trials, an will operate on a steeply inclined 32 miles route betwee Port Louis Central Station, Curepipe and Makebourg Recent reports indicate that North British an Metropolitan-Cammell Carriage and Wagon Co., wi respectively receive orders from the U. S. Foreign Opera tions Administration to supply 25 locomotives and 2,000 wagons for India.

Formed in 1949 by Metropolitan-Vickers Electric Co., Ltd., and Beyer, Peacock and Co., Ltd., for th manufacture of electric, diesel-electric and gas-turbo electric locomotives, Metropolitan-Vickers-Beyer,



"BRITANNIA" one of the 12 new standard locomotives.

cock, Ltd., Stockton-on-Tees, Durham have completed a number of 1,010 h.p. electric locomotives for Brazil; and 1,105 h.p. diesel-electrical locomotives are in course of construction for the Western Australian Government Railways.

At the same time, one of the largest contracts for ctric railway equipment ever placed was awarded last ır to Metropolitan-Vickers Electrical Co., Ltd., Traf- d Park, Manchester. The Central Railway of Brazil dered 200 complete railway coaches to be built in itain and equipped and a hundred sets of electrical ıipment for fitting to coaches built in Brazil.

AULED ROYAL TRAIN

When the Queen and the Duke of Edinburgh visited ylon during their Royal Tour last year, diesel electric omotives supplied by the Brush Bagnall Traction Ltd., ghborough hauled the Royal train. These were lied to the Ceylon Government Railway under a ract for 25 locomotives obtained by The Brush Electrical Engineering Co., Ltd. Each of the locomotives weighs some 87 tons in full working order.

The history of this contract underlines the way in which group organisation is of value in completing a project of this kind, utilising the facilities of various companies within the group. While Brush Bagnall Ltd., were responsible for the design and erection of the locomotives, the electrical equipment was manufactured by Brush Electrical Engineering Co., Ltd., the diesel engines by Mirrlees, Bickerton and Day Ltd., and the mechanical parts by W.G. Bagnall, Ltd. The locomotives are capable of a maximum speed of 55 m.p.h. which is the track limit in Ceylon at the present time.

Another important firm in this field is the Birmingham Railway Carriage and Wagon Works Ltd., Smethwick, which has been engaged in the production of 14 diesel electric locomotives, each of 955 h.p. for the Australian Commonwealth Railways for the use in the Alice Springs, Adelaide, and Port Augusta areas. Ten of these have

A general view of a locomotive erecting shop.

been shipped and the remainder are being delivered early this year. Five similar vehicles were dispatched to Sierra Leone at the end of the year. The company are also building twelve 960 h.p. locomotives for the Irish Railways in conjunction with Sulzer Brothers (London) Ltd., 31 Bedford Square, London, W.C. 1.

For the New Zealand Railways the company are also building 35 twin car articulated diesel mechanical trains in association with the Drewry Car Co., Ltd., who are responsible for the engines. The first of these was shipped in December. The Nigerian Railways have ordered 44 cars of various types, while three elaborate Pullman cars are being made for the Antofagastan and Bolivian Railways.

Two recent important contracts worth about £ 800,000 for 797 24-ton railway wagons have been placed by the British Transport Commission. These are of hopper ballast type. The Metropolitan-Cammell Carriage and Wagon Co., is supplying 398 of them, and Charles Roberts and Co. the other 399.

BRITISH RAILWAYS

Apart from the direct sale of British locomotives of various types, railway coaches, freight cars and components of all kinds, the British export industry has an important interest in the major scheme to modernise, re-equip and reorganise Britain's State-owned railways at an estimated cost over the next 15 years of about £ 1,200 million.

Today British railways are the busiest in the world, run 40,000 passenger and goods trains daily and carry, on average, 2,702,000 passengers daily and nearly 1,000,000 tons of freight every 24-hours. By comparison, they carry more than twice as many passengers as U.S. railroads. More mileage is travelled by railway passengers in the U.K. than in any other country in Europe. Britain has more railways per square mile than any other country in the world except Belgium. During 195 British railways carried nearly 285 million tons of freigh This included 15½ million tons of iron ore, over 2 million tons of iron and steel and scrap, over thre million tons of grain and of bricks, and nearly thre million tons of manure and timber.

Every day, too, British railways are operating 42 express freight trains — 138 more than before the wa between such centres as London, Birmingham, Bristo Glasgow, Newcastle-upon-Tyne, Manchester, Liverpoo Exeter, Plymouth and Cardiff.

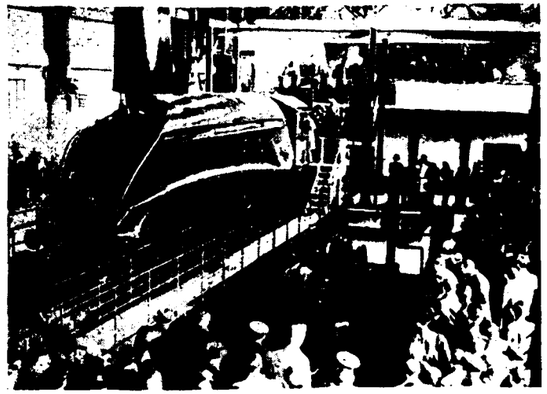
STANDARDISATION

The number of different types of wagons has bee reduced from 480 to 90, yielding big economies i construction repairs and stocks of spares. Among ne design is the 24½ tons all-steel mineral wagon. Withi

Photograph shows the new locomotive at the Vulca Foundry being inspected by various visitors.

the total of a million wagons in use are varieties designe to suit all kinds of traffics. They range from eight-tonners to a giant 56-wheel vehicle capable of carrying loads up to 150 tons.

Open and covered containers are used for a wide variety of traffics, and there are ventilated and insulated containers for meat, fish and fruit. Special types are also available for bicycles, building materials, cement, chemicals, furniture and grain in bulk. Extended use is being made of highly insulated containers for the conveyance of commodities requiring very low temperature transport, such as quick frozen foods and ice cream.



The special feature of this British Locomotive testing station built at a cost of £200,000 is a roller bench on which engine can be driven up to 230 m. p. h. stationary. A locomotive on the test-bed running at speed during a demonstration

Container services are operated between Britain and the Continent.

Major works costing many millions of pounds are already in progress. Among the main schemes is electrification, improved signalling schemes, reconstruction work at Parkeston Quay, Harwich, improved handling equipment at Clyde Coast piers, reconstruction of inner berth at Mallaig, and schemes to improve freight working in many places. These latter include modernised goods terminal facilities at Liverpool (Hukisson).

RESEARCH

Considerable research, based on Derby, is also being undertaken, and 10 laboratories are maintained throughout the country where research is conducted on a wide variety of both technical and non-technical problems.

Stationary plants are also maintained for testing locomotives up to the highest speeds. These are situated at Swindon and Rugby. A mobile testing train, electrically controlled and the only one of its kind in the world, is also used to obtain data under actual running conditions. This comprises a dynamometer car and three braking units each absorbing 1,500 h.p. Both methods are used to assess the relationship between fuel consumption, power output and speed.

The possibilities and potentialities of new kinds of motive power like the gas turbine and atomic power, are not being overlooked. Already two gas turbine locomotives have been introduced experimentally. One, built in Britain, of 3,000 h.p., is the most powerful passenger locomotive in the U.K. It is now undergoing tests. The impact of atomic energy on railway operation in the future is still not clear. With the development of increasing electrification of railway services in the U.K., coupled with the generation, in time to come, of vast quantities of cheep electricity by atomic means, it may well be that British railways will be the first to benefit in this way. And there is, of course, the prospect of actual atomic units to draw the load. Whatever happens, British railways are looking ahead and the time may not be too for distant when British passengers will be able to travel by Atom Express.

SECUNDERABAD DIVISIONAL RAILWAY USERS' CONSULTATIVE COMMITTEE MEETS

The 9th meeting of the Secunderabad Divisional Railway Users' Consultative Committee was held on 11th March, 1955 at Secunderabad and was presided over by the Divisional Transportation Superintendent.

The question of opening Babupeth Station on the Chanda-Balharshah Section for goods traffic was discussed and the members were informed that the matter was being examined. The proposals regarding accepting indents for wagons to be registered without specifying particular commodities and of sending copies of the restriction notices to Merchants' Associations were discussed. These proposals are being examined further. The suggestion to set apart a small quota of berths for passengers from Secunderabad and Hyderabad in the third class sleeper coach on the North-bound Grand Trunk Express train was accepted.

The statement showing the number of passengers found travelling without tickets and persons killed while travelling on footboards of trains for the quarter ended 31st December, 1954, the progress of amenity works, the report on inspections of Refreshment Rooms and Tea Stalls, financial results and claims statistics were noted to be satisfactory.

Power Saw Designed for High-speed Steel Band Sets New Production Records

DoALL's First Entry in Power Saws is Distinguished by Unique Hydraulic Controls Plus Optional Full Automatic Operation.

THE extraordinary cutting rates achieved by the recently developed Demon high-speed steel saw band on contour sawing machines, has prompted The DoALL Company's design of a new type power cut-off saw—their first, and notable entry into this field.

Long established as a leader in the design and manufacture of contour sawing machines for metal, DoALL has incorporated into this new power saw, significant new features and improvements to meet the acknowledged cutting capabilities of this new H.S.S. band tool.

The new power saw is in addition distinguished by a whole set of exclusive adjustments and hydraulic controls for feed pressure, band tensioning and infinitely variable speed change which together constitute one of the most radical advances in many years in the design of this commonly used shop tool. These make the cut-off task considerably more simple, faster and more accurate and less costly in man hours and tool use. The new machine outperforms power hack saws at least 2 to 1 and is available with either manual or completely automatic stock indexing. Standard automatic indexing affords production of blanks up to 24" long. With slight modification automatic indexing for blanks of any reasonable length can be provided.

Adding to its efficiency are the inherent advantages of the band machining method in parting materials—the use of a continuous band tool moving always in a cutting direction; distribution of wear over hundreds of teeth for relatively longer tool life and the not-to-be ignored savings in material because of the narrower path cut by the more slender saw band.

MORE POWER, SPEED, STRENGTH

The high-speed steel saw band, like the high-speed steel tools used on other types of machine tools is capable of accepting greater work loads. It accepts greater feed pressure at considerably greater tool speeds because of its "red heat hardness" characteristic that enables it to retain tooth hardness and sharpness at the extremely high temperatures created by strenuous cutting. This increased load capacity, as is well known, requires the use of a machine capable, in turn, of accepting such loads. The DoALL Power Saw was designed to meet this requirement with extra rugged, steel box-frame construction, and extra horsepower and speed.

PACE SETTING FEATURES

Many adjustments either ignored or regulated manually on cut-off sawing machines, are maintained hydraulically and with great accuracy on the new DoALL Power Saw, thereby reducing operator effort and *responsibility* while assuring optimum cutting results. Included among these features are:

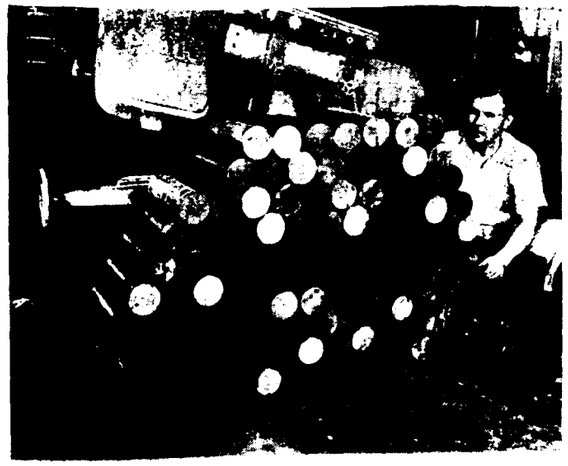
(A) *Automatic feed pressure control*—maintains pressure of blade against work at value set by operator—automatically compensates for greater resistance as saw encounters thick cross-sections—allows adjustment for optimum production commensurate with desired tool life, or accuracy and finish requirements.

Range of adjustment is so broad that cutting efficiency is obtained on all structural forms ranging from thin-wall tubing to heavy bar stock.

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 "SOUTHERN RAILWAYS WORKSHOPS" sometime in October 1955. For the first time in the history of Indian Railways such a splendid Supplement is being published by us.

PUBLIC RELATIONS OFFICER.



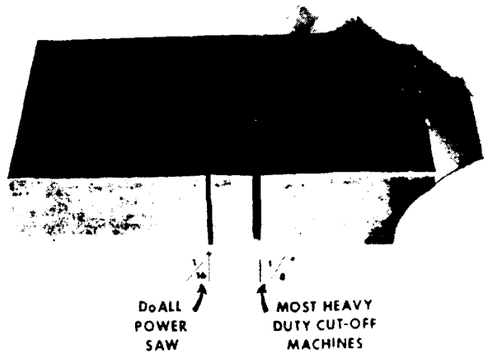
The significantly rapid cutting obtained with the DoALL Power Saw using the Demon H.S.S. blade for which it was designed, is unmistakably reflected in greater output per unit time and longer tool life. A nationwide demonstration program is being conducted by DoALL to establish this fact.

(B) *Infinitely variable tool speed*—a "first" on continuous band power saws. Used on DoALL contour metal cutting saws for years, it permits selection of proper tool speed for optimum cutting results on a given material which considerably broadens the range of materials that may be cut with efficiency—also helps to prolong tool life. The variable speed ranges from 90 to 350 feet per minute and changes are made effortlessly with a simple control on operation panel. No heavy cranks or levers to turn, speed adjustment is accomplished hydraulically.

(C) *Hydraulic band tensioning*—Another exclusive feature on continuous band power saws that eliminates another operator factor. Blade tension is automatically maintained at the proper level for efficient cutting and reasonable tool life. No need for wrenches, gages or adjustment—proper tension is regulated at the factory. The tool is not under tension when the machine is not in use but sufficient tension is provided to keep the tool in place.

CONTROLS - CAPACITIES - ACCURACIES

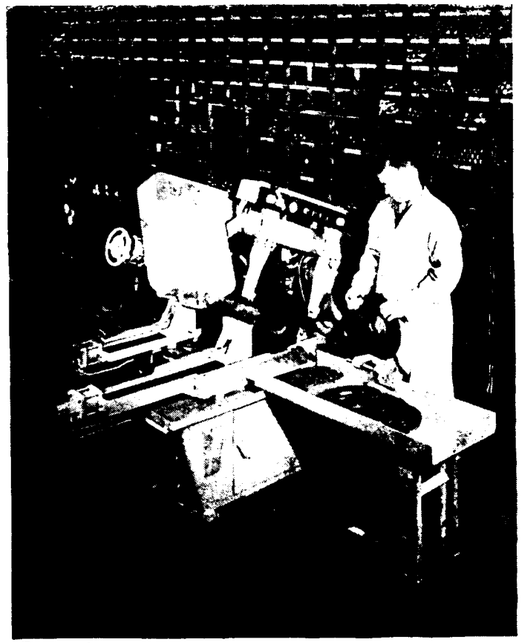
Levers and knobs controlling every phase of machine operation are centred on an attractive panel on the saw head. By simple hand manipulation the operator adjusts (1) up or down direction of saw head; (2) sawing or feed pressure (thereafter hydraulically maintained by machine); (3) blade speed; (4) rate of coolant flow; (5) automatic or manual indexing (on automatic machines).



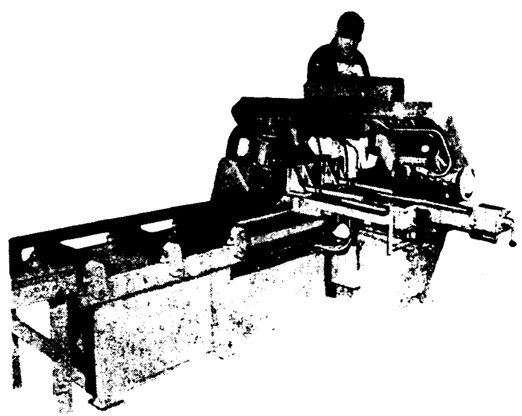
Material is saved with the band sawing method used on the new power saw. Cut on left made by DoALL saw band is half the width of cut made by many power saws. Therefore, less material is reduced to useless chips by the saw band in parting materials.

A graphic example of savings in material effected with the power band saw. In cutting 1" blanks as shown, the thin gage blade of the band saw will produce 17 pieces to the hack saw's 16 pieces ***from the same amount of stock.*** **In essence, the thicker hack saw blade reduces a possible 17th piece to chips. With other cut-off methods, the waste is even greater.**

The machine accepts rounds up to 12 inches in diameter and rectangular or square bars up to 12×20 inches (up to 12×12 inches on the automatic index model).



Front view of the C-56, a completely automatic model in DoALL's line of new-type power saws. Designed for Demon high-speed steel saw band, these will automatically produce blanks up to 24" long and stop upon depletion of stock. They are intended for high production cut-off operations.



Side-rear view of the DoALL automatic model power saw showing the automatic index table.

Squareness of cut to axis of bar is maintained within .002″ per inch of diameter.

THE AUTOMATIC POWER SAW

The addition of the "automatic stock indexing table" to the basic power saw adapts it to full automatic operation. Added to the advantages offered by the use of Demon high-speed steel blade and the machine features enumerated above, the automatic feature affords unsurpassed cut-off production. It is intended to fit the needs of mass-production industries confronted with the ever-present problem of reducing raw stock to workable sizes at minimum cost. So self-sufficient are these automatics that one man can reload and tend a sizable battery. Standard automatic operation provides for the cutting of blanks up to 24 inches long and remarkable accuracy is maintained by the automatic indexing unit. With minor modification, blanks of any reasonable length can be automatically indexed.

SAFETY

A careful regard for safety has governed the design of the machines with automatic stoppage in the event of tool breakage. In the automatics, stoppage also occurs on depletion of stock. A limit switch prevents machine operation in the event of improper band tension. The sawing head locks regardless of position if the control circuit is interrupted and so the machine may be stopped in the middle of a cut with the assurance that the sawing frame will not "drift" down and damage blade or work.

FLEXIBLE DESIGN

While an extremely rigid, box-frame steel construction is employed, a most pleasant, modern and eye-appealing design is achieved. Steel hydraulic tubing is used throughout. The hydraulic pump is the "*variable delivery*" type, adjusting its output to the drain on the system. This contributes to efficient use of the common drive motor and reduces power waste and heat loss since the drain on the hydraulic system is greatest when the machine is not sawing that is, during the automatic cycle—and lowest during sawing when the working blade requires more power

Farsighted design of the basic chassis of this power saw permits ready factory adaptation of this unit into four distinct models. These encompass every industrial application from intermittant use employing manual stock indexing to sustained high production sawing on an automatic index basis for long periods.

The four basic models are:

Model	*Stock-Indexing*	*Transmission*
C-55	Manual	Single Speed
C-56	Automatic	Single Speed
C-57	Manual	Variable Speed
C-58	Automatic	Variable Speed

DEMONSTRATION PROGRAM

Acting on the presumption that "it has to be seen to be believed", The DoALL Company has inaugurated a nation-wide demonstration program to show the capabilities of this new type power cut-off saw. The demonstrations will be conducted from the 38 DoALL stores throughout this country and Canada. Requests for demonstrations should be addressed to The DoALL Company, Des Plaines, Illinois.

SPECIFICATIONS

Capacity	Rounds, 12″ diameter; Flats, 12″×20″, (12″×12″ with automatic index). Maximum weight–4000 lbs.
Over-all Height	Minimum 49½″; Maximum 78½″
Floor Space	86⅛″×92¾″ (Index table included)
Indexing	Manual or Automatic (Standard—for any blank size up to 24″ long. With slight modification, blanks of any reasonable length can be indexed.)
Operating Controls	located in a single enclosure on sawing head.
Blade	1″ high-speed steel, 144″ long (carbon steel blade may be used).
Blade Tension	Automatic, factory set.
Blade Speed	Fixed, Stepped or Infinitely Variable (90 to 350 FPM). Infinitely variable speed is adjusted at control panel; tachometer speed indicator calibrated in blade FPM
Blade Feed Pressure	Infinitely variable throughout range with direct reading gage at control panel.
Job Selector	Slide rule type, listing suggested feeds and speeds for SAE steels and other materials.
Accuracy	Under average conditions, accuracy of plus or minus 1/64″ per blank and .002″ per inch diameter on squareness of the cut face.

FACTS AND FIGURES

1. Nearly 2,600 new goods wagons, all manufactured within the country, were delivered to the Indian Railways during January, 1955.

2. The total shipping tonnage of vessels that entered Indian ports was nearly two crores N. R. T. (Net Registered Tonnage) during 1953-54.

3. Thirty-nine industrial schemes were sanctioned by the Government of India during 1954 in which Indian firms were required to pay royalties amounting to Rs. 44.6 lakhs to foreign firms for technical 'know-how'.

4. The production of ammonium sulphate at the Sindri Fertiliser Factory during April-September 1954 amounted to 1,35,000 tons as against 1,28,000 tons during the corresponding period in 1953.

5. Up to September 30, 1954, 9,100 houses were constructed and 95,287 reconditioned in the Community Development Blocks sanctioned in 1952-53.

6. The total output of iron ore mines in India increased to 3,62,330 tons in February 1955 from 3,58,510 tons in January 1955.

COOLING SYSTEMS IN FACTORIES

By W. P. Niyogi, G.I.Loco.E., M.I.I.S., A.A.R., A.R.E.A., V.D.I.

HUMAN constitution demands on atmospheric temperature of 60°F. to enable it to obtain the maximum energy and to give the topmost output in work. But due to the geographical condition of India, the most parts of the country have a much higher temperature during the major portion of the year. So, the Indian factories, if they desire to have the maximum work out of their employees, should adopt some cooling systems in their buildings to maintain that particular temperature needed.

But, the general practice of refrigeration, as adopted in most of the big factories, is very expensive and, hence, is unsuitable for the smaller ones. So, we should now think of some simpler methods, which may be easily adopted and are effective at the same time. Similar problems are also worrying the American engineers and, hence, the American Railway Engineering Association have had some researches on these problems and have approved of some simple cooling systems.

In general, the cooling systems may be broadly grouped as (i) air cooling and (ii) water cooling. In air cooling, due to a sudden change in the volume of air by expansion and contraction, a circulation of cold air is executed and thus a cooling effect is obtained. Whereas, in water cooling, due to the evaporation of water, heat from the atmosphere is localised to a particular area and, that causes a fall in the temperature of the surrounding air of the atmosphere. Now, I would like to discuss some of those simple cooling systems as mentioned above.

AIR COOLING

Air cooling or air conditioning, as it is generally termed, may be sub-divided in two smaller groups; as (a) Direct expansion mechanical refrigeration, and (b) Indirect mechanical refrigeration.

DIRECT EXPANSION MECHANICAL REFRIGERATION

Direct expansion refrigeration has also four different methods.

Zoned distribution of air—This method requires two air distribution systems, generally running in adjacent ductwork; one for refrigerated air and the other for re-circulated air. Mixing dampers are located at strategic locations; each serve a small portion of the building. Each mixing damper is controlled by a thermostat which may function either by electricity or by compressed air.

Distributed refrigerant under pressure—This metho of air conditioning confines compressor and condens equipment to conveniently isolated spot. A freon-typ refrigerant is distributed to fan and direct the coolin coil stations throughout the building. Circulation of a around the coils is constant, and by thermostatic contr at the expansion valve admitting refrigerant to the coil room temperature is regulated. Refrigerant pressur remains constant.

Water cooled 'package type' air-conditioning units- This type of air conditioning can be best described dividing a building in two or more air conditionin systems. This method of air conditioning is currentl popular because of the economies inherent in the mas produced 'package units'. Minimum installation labou is required, depending upon the reduced ductwor requirements.

Window type air conditioners—This method of a conditioning eliminates all piping and ductwork bu requires the maximum possible number of air condition ing units. In a large installation this is the ultimate i creating a big number of air conditioning zones, bu comfortwise, maximum zoning is not most effective.

Air distribution within a room is difficult with th window type conditioning units. Since the units usual fit about 3 ft. above the floor, cold air must necessaril be directed upward to avoid draughts. Thus it becom impossible to give air a 'throw' to direct cooling of remote portion of the room. However, window ai conditioning units are useful for minimum cost installa tions and for installations where cooling water is no available.

INDIRECT MECHANICAL REFRIGERATION

With indirect mechanical refrigeration, cooling i effected by circulation of a chilled liquid, such as water The liquid is generally chilled close to the compresso and the cooling coils are located at remote points.

Circulation of chilled liquid is generally constant, an control of room temperature is through face and by-pas dampers at each cooling coil. Any required proportio of air, around the cooling coil, between modulatin dampers and by-pass, afford a very satisfactory control o room temperature. Operation of blower fans is als nearly constant.

Indirect refrigeration supercedes the direct refrigera tion in suitability as that the insulated chilled wat

piping is much more dependable than the refrigerant piping, since there is less chance of loss of expensive refrigerant and no necessity for long runs of copper pipes.

WATER COOLING

There are generally three types of systems as adopted in water cooling. They are grouped as (i) once through, (ii) open recirculating, and (iii) double recirculating.

Once through system—In the once through system, the water passes through the heat exchanger equipment, absorbs heat, and then discharges as waste. Where the plant is relatively small, or in large plants where the available water supply is unlimited, this type of system is preferred. It is economical to install and produces less difficulty from corrosion and diposits in the heat exchanger than the circulating system. No evaporation or concentration of solids takes place because the cooling water passes through only once.

Open recirculating system—The open recirculating systems are installed using spray ponds or cooling towers to release the absorbed heat to the atmosphere by evaporating a portion of the cooling water. This system saves water, as the only losses are those caused by evaporation, wind and blowdown. Evaporation of water results in the concentration of the dissolved and suspended solids present in the make-up water.

Double recirculating system—Double recirculating systems are installed where the available water is very limited in quantity, or where it contains an excessively high concentration of solids. In such systems, the primary water that absorbs heat from the plant equipment is kept in a closed cycle and is not exposed to the atmosphere. The warm water in the closed system is cooled by secondary recirculating water passing through a heat exchanger and the open cycle water is cooled by a cooling tower or spray ponds. A double recirculating system avoids evaporation and concentration in the closed cycle. The amount of make-up water for the closed system is thereby negligible, and condensate or properly externally treated water may be employed.

The above systems may better be described in the following different ways of operation, which are termed as follows :—

COOLING BY CHILLED WATER FROM NATURAL RESOURCES

Underground springs or wells with water colder than 52°F. may be availed for such cooling purposes. Such water in sufficient quantity will help in solving the cooling problems; however, the hardness of such water should be ascertained and necessary treatment to the water should be done. Mineral encrusted cooling coils become most inefficient. Ocean water is difficult to use in small diameter cooling coils because of salt encrustation and its corrosive action.

EVAPORATIVE COOLING

The evaporative cooling has two ways. Air passes through an open spray of water and air passes through a loosely packed water saturated material. The principle is that, air, in taking up water vapour, loses 'sensible heat', which causes a drop in temperature and is proportionate to the dryness of the surrounding air.

STEAM-JET VACUUM COOLING

This system depends upon chilled water produced by creating a vacuum in a partially filled tank of water. As the pressure of the atmosphere is reduced, a low boiling point is reached, causing a loss of heat as the water vapourises. A steam jet maintains this vacuum in the chilled water tank, and it is the resulting steam wastage from this jet which makes for excessive cost of operation.

ABSORPTION COOLING

In this system, cooling is obtained from a heat transfer process accomplished under two different stages of high vacuum. A solution of lithium bromide and water is heated while under a pressure of about 1/15th of an atmosphere, and much of the water distills off and is condensed. The resulting concentrated chemical solution overflows and is utilised. The condensed water vapour becomes the refrigerant which passes to expansion coils under a vacuum of about 1/75th of an atmosphere and flashes into vapour in the presence of heat to be extracted. The water vapour then flows to the absorber where it is quickly taken up by the concentrated lithium bromide solution, having a great affinity for water.

SCALES

In the above discussed cooling systems, ofcourse, there are some draw-backs which need a good attention. They are the formation of scales in the coils and the corrosion effects on them. In general, the following scales are found to form in the water circulating coils :— (a) Calcium carbonate, (b) Calcium sulphate, (c) Iron oxides and hydroxides, and (d) Mud and silica.

Calcium carbonate is formed due to the decomposition of calcium bicarbonate present in water with the effect of heat. Reactions take place as follows :—

$$Ca(HCO_3)_2 + Heat = CaCO_3 + H_2CO_3$$
$$H_2CO_3 + Heat = CO_2 + H_2O$$

Calcium sulphate is formed only in special sulphur rich water or when sulphuric acid is used to remove the temporary hardness of water.

Iron oxides scale is formed by the decomposition of ferrous bicarbonate in iron-bearing well water as follows :-

$$Fe(HCO_3)_2 = FeCO_3 + CO_2 + H_2O$$
$$4FeCO_3 + O_2 = 2Fe_2O_3 + 4CO_2$$

Iron oxide may also be formed from corrosion in the cooling system.

Mud and silica are formed due to the presence of suspended solids in the make-up water or dirt and dust contamination from the atmosphere. These can be removed by external methods, as coagulation and filtration.

PREVENTION OF SCALES

The formation of scales can be prevented by the addition of any sequestering agent, as polyphosphates and tannins. The addition of 3 to 5 parts per million of polyphosphates will prevent any deposition of salts in ordinary water in once through system. If the water is too hard, addition of sulphuric acid will remove the carbon hardness.

The prevention of scale formation in open recirculating system is more difficult. The water is concentrated as a result of evaporation loss, which increases the mineral solids content. While calcium carbonate is the principle offender, it is also possible to encounter other scaling solids due to calcium and magnesium silicates and calcium sulphates. For this reason, excessive concentrations in the water system must be avoided by blowdown process.

The formation of scales can also be prevented by some external methods, as (a) Cold line treatment, (b) Zeolite treatment, (c) Acid treatment, or (d) Blowdown control. Of these the zeolite treatment is very effective on ordinary hard water. The hard water is softened by the addition of sodium zeolite. In the acid treatment, sulphuric acid is used to convert calcium bicarbonate to calcium sulphate with the evolution of carbon dioxide as follows :—

$$Ca(HCO_3)_2 + H_2SO_4 = CaSO_4 + 2CO_2 + 2H_2O$$

While preventing the scale formation, it should also be remembered that the presence of scale provides a protection against corrosion of ferrous heat exchange surfaces.

CORROSION

There are several types of corrosion which take place on the system. 'General attack' is a type in which the entire surface of the metal is corroded. Attacks of this type are generally due to low pH value or acid water, e.g., from sulphur gases or carbon dioxide. 'Pitting' is a form of attack which is localised. Attacks of this nature result wholly from the presence of dissolved oxygen or some other localising effect. In many cases, pitting is accompanied by tuberculation. 'Micro-biological attack' is sometimes referred as sulphate reducing bacteria. This type of corrosion generally occurs in the form of pits. 'Stray current electrolysis' is an attack in which the metal is eaten away, specially where the current leaves the system.

PREVENTION OF CORROSIONS

There are quite a number of chemicals which may be used as inhibitors for preventing corrosions. Though none of them is 100 per cent effective, but one may be better than the other on a particular aspect. So, a good deal of attention has got to be paid in determining the right inhibitor, by studying the individual cases.

Soda ash and caustic soda are used to reduce the corrosiveness of various waters. These chemicals and many others, as lime, alkaline phosphates, silicates and borates, are utilised to neutralise acidity. By neutralising corrosion can be lessened but it is never stopped. An objection to soda ash is the danger of building too thick a carbonate layer on the heat transfer surface or clogging the narrow passages.

Sulphites have been reported to reduce some forms of corrosion. Molecularly dehydrated phosphates are also very good inhibitors which prevent harmful deposits. They have cleaning actions which tend to remove deposits and surface incrustations. They help to keep the water clean in appearance by eliminating 'red water'.

One of the best phosphates for this purpose is sodium hexametaphosphate. It may be used in two ways. The first is the threshold treatment which introduce 1 to 10 parts per million of phosphate. The second method is to introduce a much larger amount, in excess of that required to hold in solution all metal oxides. Intermediate proportions may cause precipitation of insoluble phosphates. In recirculating systems, the lower pH values are advantageous, not only in changing the form of corrosive attack, but also in permitting the use of sufficient polyphosphate treatment to overcome the most severe corrosion problem without danger of the polyphosphate reverting to orthophosphate form. The best results are obtained by maintaining the pH value

of the water in the range of 6.0 to 7.0 and the polyphosphate concentration at from 70 to 80 parts per million at all times.

Borates have softening and sequestering properties, but less pronounced than phosphates. They have neutralising properties but a bigger amount of borate is required for the purpose than soda ash. The advantage of using borates is that even a large excess of it is harmless to certain metals which would be easily attacked by an overdose of any other caustic compound.

Sodium silicates function in somewhat the same manner as soda ash to neutralise acidity, but they have the additional property of forming siliceous compounds which may be deposited to form protective films. They also possess desirable cleaning and sequestering properties. Unlike other inhibitors, sodium silicates may be prepared in slowly soluble form, making their use desirable in small units which are serviced at long intervals.

Chromate inhibits corrosion by forming a thin passivating film on the surface of the metal exposed to chromate solutions. This treatment is usually employed where ferrous metals must be kept entirely free from scale, and at the same time, be protected from corrosion. A concentration of about 300 to 500 parts per million of sodium chromate maintained in the circulating water forms a uniform thin barrier between the metal and the oxygen in the water. Unlike the phosphate treatment, the water used in this treatment should be slightly alkaline, and the concentration of dissolved salts should be less than 1000 parts per million.

Sodium nitrite inhibits corrosion through anodic polarisation in much the same manner as chromates. In protecting the metal the nitrite serves as an oxidant, being reduced to ammonia. Organic chromates, as chrome glucosates, are true passivators, inhibiting corrosion through anodic polarisation very much the same as inorganic chromates. Their effectiveness is roughly proportional to their hexavalent chromium content; but since they are a little less reactive than inorganic chromates, they last a little longer, particularly when hot. These organic chromates tend to produce an adherent film which may be very dark in colour, sometimes black.

These are, ofcourse, only a few aspects of the cooling systems discussed herein. The reader has to consider something more while installing a system.

HOW TO RESERVE ACCOMMODATION

Unless you reserve your berth (I and II Class) or Seat (Inter 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 four 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 by the Public Relations Officer, Southern Railways Magazine)

IN YOUR OWN INTERESTS

HOW TO PURCHASE TICKETS

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

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

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

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

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

(Inserted in the interests of Travelling Public)

CLEANLINESS LEADS TO HEALTH AND HAPPINESS

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

Cleanliness prevents disease; medicine only attempts to cure.

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

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

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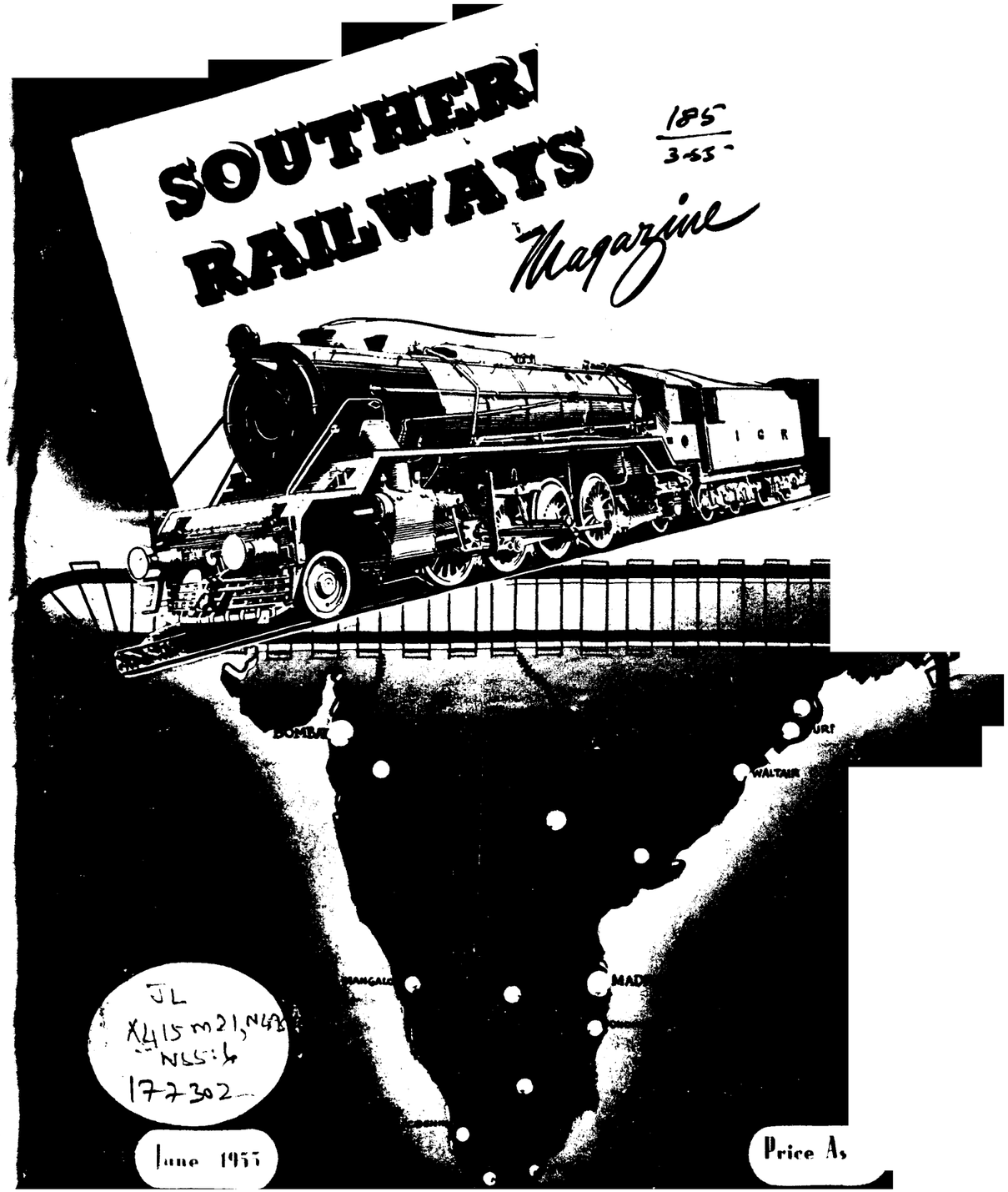


HOW TO RESERVE ACCOMMODATION

Unless you reserve your berth (I and II Class) or Seat (Inter 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 four 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 by the Public Relations Officer, Southern Railways Magazine)

CONTENTS

Editorial Notice

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

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

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

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

RESERVICING OF WIMET TUNGSTEN CARBIDE TOOLS

THE NATURE OF CEMENTED CARBIDE

IN order to understand the special technique required for reservicing tungsten carbide tools an understanding of the nature of cemented carbide is necessary. It is produced by a powder metallurgical process and consists essentially of minute particled of tungsten carbide cemented together by a metal of lower melting point, usually cobalt. Tungsten and carbon powders are mixed and processed to produce tungsten carbide powder. This is then mixed with cobalt and subjected to pressure to produce moulded blanks. The moulded blanks are then heated to a temperature which causes the cobalt to melt and cement the minute grains of tungsten carbide into a hard solid mass. This explanation is, of necessity, elementary. There are many refinements in the processes through which the materials pass, and at every stage of production the material is subjected to careful inspection, to control the quality of the final product.

The material may be likened to a stone wall where the stones represent the grains of carbide, and the mortar, the cobalt or cementing material.

Tungsten carbide possesses great hardness and also has great compressive strength and rigidity. But, just as the stone wall to which we have likened it, is strong and hard when properly supported, so it is with carbide.

Because tungsten carbide has no grain such as is present in steel or wood the direction of pressure must be carefully controlled. A stone wall will crack and break if pressure is applied in direction without opposite support because the stones are merely held in tension by the mortar. Material with grain, such as wood for example, will stand relatively high pressures because the grain running through the entire length is able to absorb and withstand the pressure.

For this reason, when applying carbides, never allow pressure to be exerted in such a way that the carbide is unsupported. A tool with a lip ground on the top surface of the tool, while quite usual when employing high-speed steel tools, is quite unsuitable for carbide tools. This in effect greatly increases the cutting rake, and thus changes the direction of the chip pressure. The absence of support in the direction of pressure will lead to early tool failure.

A tool which has been ground on the periphery of a grinding wheel and left with a concave front clearance will also lead to early breakdown of the cutting edge for the same reason.

A front clearance of 4 or 5 degrees, which has been found sufficient for general work provides full support to the cutting edge irrespective of the cutting rake applied.

The granular structure of tungsten carbide is also the reason why it is desirable when grinding Wimet tools for the grinding wheel to rotate INTO the carbide tool and not away from it. If the grinding wheel rotates away from the tool as shown in the lower pictures here, particles of unsupported carbide grains may flake off from the cutting edge leaving minute irregularities which can seriously affect the tool performance.

Let us now discuss the type of equipment which is required for the satisfactory reservicing of carbide, dealing first with grinding wheels and laps.

GRINDING WHEELS AND LAPS

Grinding is the cutting action of thousands of abrasive grains in the face of the wheel, which actually cut chips out of the work. Every grinding wheel has three physical characteristics :—

(1) The grains that do the actual cutting.
(2) The bond to hold the abrasive grains in place.
(3) The voids to provide clearance for chips cut by the abrasive grains.

Grinding wheels used for the grinding of high speed steel are not generally suitable for grinding Wimet, because the strength of this bond of this type of whee is sufficient to hold the grains in position until they ar blunted and the wheel become glazed.

It is known that a hack-saw blade in good conditio will cut steel without generating undue heat in th material because the heat generated is in the chip. A the blade becomes blunted, however, and rubs withou cutting, heat is generated in the material itself.

The same principles apply to the cutting action of grinding wheel. While the abrasive grains remai sharp the wheel will cut without inducing undue hea But the hardness of Wimet so quickly blunts thes particles that unless the wheel is redressed it wi

generate excessive heat in the tip and cause hair-line cracks. The left, lower picture shows a wheel whose particles are worn as shown by the glazed appearance. The photomicrograph above the wheel shows the surface worn smooth and in need of redressing to remove the blunted particles. The surface of the wheel on the right is in good condition, being rough and sharp as illustrated by a similar photomicrograph. Both wheels have been used to grind tungsten carbide. What is the difference between them? It is the nature of the bond. The wheel on the right has a much *softer* bond so that the grains are dislodged during the action of grinding, immediately they become dull.

This continual breakdown of the surface (one could call it a self-sharpening action) presents new sharp particles to the tool enabling the removal of carbide without heat generation.

DIAMOND WHEELS

The search for the perfect cutting edge has been assisted by the development of diamond-impregnated wheels and laps. The photomicrographs show typical cutting edges produced by various methods. The length of the magnified portion which is seen is actually only 25 thou. so that the degree of magnification will be appreciated.

Diamond-impregnated grinding wheels are available with resinoid or metal bond. Resinoid bonded wheels have an exceptionally fast, cool cutting action, and are preferred for *machine* sharpening any type of tool, since grinding pressures are thus controlled. When used for *off-hand* grinding care must be taken not to groove the wheel.

Metal bonded wheels possess advantages of long life and resistance to grooving, and rounding of corners, and although their cutting action is slower than resinoid bonded wheels they are recommended for off-hand rinding single-point tools, because the variation in ressure arising from hand grinding can severely damage resinod bonded wheel.

ARGE OR SMALL GRINDING WHEELS ?

Large diameter wheels are more economical when inding or lapping, and are also much more efficient. The grinding area of a six-inch wheel with a one-inch grinding face is approximately sixteen square inches. The grinding area of a fourteen-inch wheel with a three-inch grinding face is approximately one hundred and four square inches, or about seven times the area of six-wheel.

Therefore, the heat generated during grinding is spread over a much greater area, and is more quickly dissipated, so that the wheel remains virtually cool during even continuous use. In addition, wheel wear is much less noticeable. In fact, larger wheels have been proved to outlast many more smaller wheels than would be obtained for the cost of the larger wheel, so that direct cost savings result from their use.

MACHINES FOR OFF-HAND GRINDING

There are many machines available especially designed for sharpening carbide tools accurately, rapidly, and economically.

For off-hand grinding the machine should be equipped with a tilting table, of ample size, that can be set at various angles by means of an easily read, graduated quadrant, and capable of adjustment towards or away from the wheel to compensate for wheel wear.

A protractor type work-holder or universal vice can be used on a fixed tool rest table to ensure the production of accurate tool angles.

Driving spindles should be free from vibration, end-play, or run-out, to prevent rapid uneven wear of the grinding wheel and unsatisfactory grinding conditions. Means for reversing the direction of wheel rotation enabling both right and left-hand tools to be ground by the same wheel is a necessary feature.

All machines for off-hand grinding should be fitted with a coolant system since a steady flow of coolant directed upon the face of the wheel prevents over-heating of the tool, keeps the wheel clean and free-cutting, and prolongs wheel life. A copious supply of coolant is always necessary because a trickle or intermittent flow results in alternate heating and quenching and generally results in cracked tips. If a good flow of coolant is not available it is better to grind dry.

Water, to which a little soda has been added, is preferable to soluble oil.

Now for the actual grinding procedure.

OFF-HAND GRINDING OPERATIONS

Rough Grinding

For the purpose of illustration we will describe the off-hand grinding operations from the preliminary rough grinding, through to final lapping. Starting with the preliminary rough grinding, first rough grind the required cutting rake on the top surface of the tip. This operation should normally be avoided to preserve overall depth of

tool. Chipped or broken cutting edges will usually clean-up during the rough grinding of side and front clearances.

Next, grind secondary front and side clearance angles on the steel shank on an aluminium oxide wheel. The secondary angles should be 2 to 4 degrees greater than the clearance angles required on the tip and will prevent the shank contacting the wheel when the tip is subsequently ground on the silicon carbide wheel.

If the tool is required with a 4 degrees primary clearance, the grinding machine table should be set at say 8 degrees for secondary clearance. Now, using a soft-bond silicon carbide wheel, rough grind primary side clearance on TIP, followed by primary front clearance. Notice here how the secondary clearance produced at the previous stage enables the tip to be ground wihout the shank contacting the silicon carbide wheel.

Finally, rough grind nose radius, if required. Using the same soft-bond silicon carbide wheel as was used for the last operation, moving the tool in a radial movement as shown. It is important in all off-hand grinding to move the tool across the face of the wheel during grinding.

Finish Grinding

Now follows the finish grinding on the slightly harder bond silicon carbide wheel, or if preferred finish lapping on a metal bonded *diamond* wheel. When tools are withdrawn from work at the right time, finish grinding or lapping only is necessary to resharpen them for further use. The procedure is the same as for rough grinding.

The secondary clearances are of course not ground again. It should be remembered that in all carbide grinding operations, particularly when grinding free-hand, the *lightest* possible pressure should be used. Excessive pressure induces great heat in the tip, subjecting the carbide to thermal shock which may lead to minute cracking.

GRINDING PRIMARY RAKE

Primary and secondary cutting rakes are proving extremely successful in improving carbide tool performance, and the primary rake when required should be produced at the last grinding stage. The width of the primary cutting rake will normally be three to four times the feed, ground as a land along the cutting edge and at the angle required, with the secondary rake 4 degrees or more greater.

MODIFYING STANDARD TOOLS

Off-hand Grinding

It sometimes happens that jobs require tools of a shape not available in the range of standard tools, or the work may be of such urgency that although a tool of standard shape would suffice, such a tool is not carried in your firm's stock. In such cases it is usually possible to modify a standard tool to the shape required. Tools which have become badly chipped or broken in service can usually be modified to a new shape.

Select a tool which can be modified with the least amount of grinding and carbide wastage. An approach angle for instance need only be of sufficient length to accommodate the depth at which it is proposed to cut.

Some modifications, such as alterations to cutting rake plan approach or plan trial angles, or clearances, are performed by off-hand grinding in the manner already described.

If a large amount of material MUST be removed, try to do this in stages, in order that a single face of the tool will not be subjected to continual grinding and thus high heat generation.

It will be necessary to relieve the shank material on an aluminium oxide wheel during the course of grinding the modification required.

Machine Grinding

More complex modifications may require the use of tool and cutter grinder, surface grinder, or possibly profile form grinder.

This form tool, with an internal radius, is produced from a standard bar turning tool, by machine grinding on a tool and cutter grinder. In this example, it is not possible to relieve the shank material on an aluminium oxide wheel, so both carbide and steel shank must be ground together. Set the tool in a universal vice at an angle to produce the desired clearance angles, noting carefully that the wheel must always grind into the cutting edge to avoid minute flaking of the carbide.

Grind downwards and outwards. This reduces the rate of wheel wear which is usually very high on this type of work, and for this reason it is unnecessary to form the wheel until the final shape is nearly reached.

If a precise form is required the wheel must be formed with a radius dressing attachment. Where limits of form permit, the wheel may be dressed by hand with a carborundum stick.

It is sometimes advisable when form grinding to finish with a slightly harder grade wheel in order that the finishing cuts may be carried out with as little wheel wear as possible.

Here's another example showing the modification of a standard bar turning tool to a parting and chamfering tool.

Set the tool in a universal vice at an angle to produce the required clearance angles, using an aluminium oxide wheel to grind away excessive shank material.

Then grind downwards and outwards with the unformed silicon carbide wheel until the point is reached where the radius is to be produced at the neck of the tool. Form the radius on the wheel in the manner previously described and finish grind.

The tool will then be reset in the vice for grinding the opposite edge and the same procedure carried out, ending with the chamfer produced by the formed wheel.

The tool shape has now been completed and it only requires the front clearance to be applied. This is performed by off-hand grinding in the same manner as described for the normal reservicing of tools.

GRINDING MULTI-TOOTH TOOLS

We shall now describe the grinding procedure for reamers, milling cutters and similar end-cutting tools. Such tools are always reserviced on tool and cutter grinders and for this purpose resinoid bonded diamond-impregnated wheels are recommended.

End Mills, etc.

Here, we show a spiral end mill mounted between centres. A spring-loaded finger attached to the wheelhead locates on the tooth being ground.

With a tooth resting on the finger, raise the table to obtain the desired clearance. Grind to remove between half-a-thou. to one thou. per pass, keeping the spiral flute in contact with the spring-loaded finger the while. Proceed until all cutting edges are sharp.

Next, lap end of tool.

The spring-loaded finger is now attached to the work-table as shown. Tilt the work-head to give the required end clearance angle and lap each tooth until all evidence of wear is removed.

Milling Cutters

The procedure for grinding milling cutters is outlined below. In each case the cutter should be indexed from blade to blade against the spring-loaded finger. Grind small, equal amounts from each blade until all are resharpened, and check for concentricity.

(1) Lap the faces of the blades, if necessary. Mount the cutter on the work-head with the blade face in the same plane as the face of the lapping wheel.

(2) Lap the diameter. Attach the finger to the wheelhead. Raise or lower the table to obtain the desired clearance.

(3) Lap the face. Attach the finger to work-head. Tilt the work-head to give desired clearance angle.

(4) Lamp the chamfer. Attach the finger to the table and adjust to give the correct clearance. Turn the work-head to 45 degrees and lap chamfers to the required width.

Now we come to the reservicing of a face milling cutter. With the cutter attached to work-head set at the required helix angle and radial rake, the face of each blade is lapped in turn. Swing work-head over to the required bevel angle, and with finger attached to work-head, adjust to obtain the required clearance. Lap bevel angle on each blade in turn.

With work-head at 45 degrees, finger attached to work-head and cutter at required clearance angle, lap chamfer on each blade.

Set work-head at 90 degrees less the amount required to give inrake or dish, with cutter tilted to require clearance, and grind blade clearance.

When should tools be withdrawn from service for resharpening?

Allowing carbide tools to operate until they become excessively dull consumes increasingly more horse-power for operating the machine, produces inaccuracies and an inferior finish on the work, requires more time for sharpening and causes rapid deterioration of the tool, often resulting in tool failure due to increased pressure and friction between the tool and the work. In addition, the more carbide that has to be removed during sharpening, the greater the danger of generating heat and ing cracks.

(Continued on page 6)

How Britain Supplies the World's Railways

By a Technical Correspondent

Britain was the first country to develop the locomotive and British engineers pioneered railway development in most parts of the world. By virtue of its wide oversea interests, spread over a long period, Britain's locomotive industry has evolved over the years into an engineering and production group which can meet the most diverse conditions required abroad.

WHATEVER the Railways of the world want in the way of locomotives—steam, diesel or electric—Britain can supply the best their money can buy. Since the war Britain's locomotive manufacturing industry has exported locomotives and component parts to the value of no less than £ 100 million.

Today Britain can offer deliveries of locomotives as speedily as any foreign competitor. During the last five years, the industry has exported no fewer than 405 locomotives to India, 468 to Africa, 395 to Australia and 356 to other parts. These were all main line steam locos, including some of the largest ever exported.

Diesel locomotive orders have also been high. These orders include 30 for Brazil, 25 for Ceylon, 94 for Ireland and 75 for the Netherlands together with a much larger total of industrial steam locomotives.

Electric locomotives have also been produced in increasing numbers, and these include very large main line locomotives for South Africa, Spain and Brazil. In 1953 no less than 92 per cent of the total production of the industry went overseas.

LONG EXPERIENCE

The U.K. industry by virtue of its wide oversea interests has evolved naturally over the years into an engineering and production group which can meet the most diverse conditions required abroad. The limitations of load gauge, axle-loading, gradients, and climati tions impose a considerable degree of restr standardisation of design. The industry h experience of " design for the job " and does not to force a standard product on oversea customers may or may not meet their needs.

For example, diesel locomotives are produced t meet almost every possible requirement. The r diesel-mechanical-and-hydraulic types, formerly to a ceiling of 275–300 h.p., has now been e (through the development of advanced forms mission by British firms) to include production of 625 h.p. ; designs exist for higher ratings, experimental 2,000 h.p. unit developed in con with British Railways is in trial service. Diesel locomotives up to 2,000 h.p. have been built in and more powerful model are under development

DIESEL ELECTRIC

The production of locomotives other than steam is one of the most interesting post-war developments. Among the largest manufacturers of diesel electric locomotives in Britain are the English Electric Co., Ltd., Marconi House, Strand, London, W.C. 2., who have alsc had long experience in this field. They produced thei first locomotive of this kind in 1928. This organisation are unique in one respect in that they manufacture on one site complete locomotives. Engines, electrical equipment and mechanical parts are all produced at the

(Continued from page 5)

It is, therefore, in the interest of carbide tool users to withdraw tools from service for resharpening at the right time. Carbide tools should be sharpened as soon as they become slightly dull and before the cutting edges start to break down or crumble, or the faces begin to crater.

Tool life and reservicing should be regarded as a function of tool engineering. Operation sheets should state that tools should be removed from machines after a certain number of hours of operation, or after they have cut a fixed amount of work. The length of time, o amount of production, will be based on experience o tool behaviour gained from performance reports from machine shop and reservicing department.

Planned tool life and centralised reservicing such a this reduces the time spent on grinding and save valuable carbide, since only a few thousandths of an inch need be ground from a slightly dull tool to obtain a clear sharp cutting edge. In addition, grinding wheel costs ar reduced, and overall efficiency greatly increased.

eston factory, although, as occasion demands, some echanical parts are bought out. Locomotives manuctured today range from 350 to 2,000 h.p. (higher owers are under development) and include a standard 0/400 h.p. shunter. This latter has been produced nce 1933.

At the end of 1953, the firm's output of complete locootives and diesel-electric locomotive equipment, witht mechanical parts, had increased by 800 per cent, in ms of horse-power. Locomotives scheduled for mpletion in 1955 will bring the percentage increase 1,200.

Important recent oversea orders secured by the firm clude a contract to supply thirteen 1,000 h.p. diesel ctric locomotives for passenger and freight service the metre guage system of the Rede Ferroviara do ordeste, of Brazil. The diesel Electric power equipnts are being built by the English Electric Co., and mechanical parts by the Vulcan Foundry.

Twenty-five 2,400 h.p., 1,500 v., d. c. mixed traffic comotives of the " Co–Co " type are also being built English Electric for service on the Gippsland main e of the Victorian Government Railways. They are uipped with rheostatic electric braking.

RGE OVERSEA ORDERS

The only company in the U.K. which manufacture el-hydraulic locomotives, the North British Locoive Co., Ltd., Glasgow, have been making them since o and sales of these both for home and export have tinued to expand steadily. One oversea order recently pleted was for two 0–6–0 diesel-hydraulic locomotives t for the Mauritius Government Railways. These e successfully completed trials, and will operate on a ply inclined 32 miles route between Port Louis tral Station, Curepipe and Makebourg. Recent orts indicate that North British and Metropolitanmell carriage and Wagon Co., will respectively receive ers from the U.S. Foreign Operation Administration upply 25 locomotives and 2,000 wagons for India.

ormed in 1949 by Metropolitan-Vickers Electrical , Ltd., and Beyer Peacock and Co., Ltd., for the manure of electric, diesel-electric and gas-turbo-electric motives, Metropolitan-Vickers-Beyer, Peacock, Ltd., kton-on-Tees, Durham have completed a number of 0 h.p. electric locomotives for Brazil ; and 1,105 h.p. el-electric locomotives are in course of construction the Western Australian Government Railways.

At the same time, one of the largest contracts for electric railway equipment ever placed was awarded last year to Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester. The Central Railway of Brazil ordered 200 complete railway coaches to be built in Britain and equipped and a hundred sets of electrical equipment for fitting to coaches built in Brazil.

HAULED ROYAL TRAIN

When the Queen and the Duke of Edinburgh visited Ceylon during their Royal Tour last year, diesel-electric locomotives supplied by the Brush Bagnall Traction Ltd., Loughborough hauled the Royal train. These were supplied to the Ceylon Government Railway under a contract for 25 locomotives obtained by The Brush Electrical Engineering Co., Ltd. Each of the locomotives weighs some 87 tons in full working order.

The history of this contract underlines the way in which group organisation is of value in completing a project of this kind, utilising the facilities of various companies within the group. While Brush Bagnall Ltd., were responsible for the design and erection of the locomotives, the electrical equipment was manufactured by Brush Electrical Engineering Co., Ltd., the diesel engines by Mirrlees, Bickerton and Day Ltd., and the mechanical parts by W. G. Bagnall, Ltd. The locomotives are capable of a maximum speed 55 m.p h. which is the track limit in Ceylon at the present time.

Another important firm in this field is the Birmingham Railway Carriage and Wagon Works Ltd., Smethwick, which has been engaged in the production of 14 diesel-electric locomotives, each of 955 h.p. for the Australian Commonwealth Railways for the use in the Alice Springs, Adelaide, and Port Augusta areas. Ten of these have been shipped and the remainder are being delivered early this year. Five similar vehicles were dispatched to Sierra Leone at the end of the year. The company are also building twelve 960 h.p. locomotives for the Irish Railways in conjunction with Sulzer Brothers (London) Ltd., 31 Bedford Square, London, W.C. 1.

For the New Zealand Railways the company are also building 35 twin car articulated diesel mechanical trains in association with the Drewry Car Co., Ltd., who are responsible for the engines. The first of these was shipped in December. The Nigerian Railways have ordered 44 cars of various types, while three elaborate Pullman cars are being made for the Antofagastan and Bolivian Railways.

Two recent important contracts worth about £800,000 r 797 24-ton railway wagons have been placed by the ritish Transport Commission. These are of hopper allast type. The Metropolitan-Cammell Carriage and Wagon Co., is supplying 398 of them, and Charles Roberts and Co. the other 399.

BRITISH RAILWAYS

Apart from the direct sale of British locomotives of various types, railway coaches, freight cars and components of all kinds, the British export industry has an important interest in the major scheme to modernise, re-equip and reorganise Britain's State-owned railways at an estimated cost over the next 15 years of about £1,200 million.

Today British railways are the busiest in the world, run 40,000 passenger and goods trains daily and carry, on average, 2,702,000 passengers daily and nearly 1,000,000 tons of freight every 24-hours. By comparison, they carry more than twice as many passengers as U.S. railroads. More mileage is travelled by railway passengers in the U.K. than in any other country in Europe. Britain has more railways per square mile than any other country in the world except Belgium. During 1952, British railways carried nearly 285 million tons of freight. This included 15½ million tons of iron ore, over 21 million tons of iron and steel and scrap, over three million tons of grain and of bricks, and nearly three million tons of manure and timber.

Every day, too, British railways are operating 429 express freight trains—138 more than before the war between such centres as London, Birmingham, Bristol, Glasgow, Newcastle-upon-Tyne, Manchester, Liverpool, Exeter, Plymouth and Cardiff.

STANDARDISATION

The number of different types of wagons has been reduced from 480 to 90, yielding big economies in construction repair and stocks of spares. Among new designs is the 24½ tons all-steel mineral wagon. Within the total of a million wagons in use are varieties designed to suit all kinds of traffics. They range from eight-tonners to a 36-wheel vehicle capable of carrying loads up to 150 tons.

Open and covered containers are used for a wide variety of traffics, and there are ventilated and insulated containers for meat, fish and fruit. Special types are also ilable for bycycles, building materials, cement, chemicals, furniture and grain in bulk. Extended use is be made of highly insulated containers for the conveya of commodities requiring very low temperature transp such as quick frozen foods and ice cream. Contai services are operated between Britain and the Contin

Major works costing many millions of pounds already in progress. Among the main schemes is elect cation, improved signalling schemes, reconstruction w at Parkeston Quay, Harwich, improved handling eq ment at Clyde Coast piers, reconstruction of inner b at Mallaig, and schemes to improve freight workin many places. These latter include modernised gc terminal facilities at Liverpool (Hukisson).

RESEARCH

Considerable research, based on Derby, is also b undertaken, and 10 laboratories are maintained throu out the country where research is conducted on a v variety of both technical and non-technical problems.

Stationary plants are also maintained for testing loco motives up to the highest speeds. These are situated a Swindon and Rugby. A mobile testing train, electricall controlled and the only one of its kind in the world, i also used to obtain data under actual running condition This comprises a dynamo-meter car and three brakin units each absorbing 1,500 h.p. Both methods are use to assess the relationship between fuel consumptior power output and speed.

The possibilities and potentialities of new kinds c motive power like the gas turbine and atomic powe are not being overlooked. Already two gas turbine loc motives have been introduced experimentally. One, bui in Britain, of 3,000 h.p., is the most powerful passeng locomotive in the U.K. It is now undergoing tests. Th impact of atomic energy on railway operation in th future is still not clear. With the development of incre sing electrification of railway services in the U.K coupled with the generation, in time to come, of va quantities of cheap electricity by atomic means, it ma well be that British railways will be the first to benefit this way. And there is, of course, the prospect of actu atomic units to draw the load. Whatever happen British railways are looking ahead and the time may n be too far distant when British passengers will be able travel by Atom Express.

— *The British Trade Journal and Export World*, Londo

CENTRAL RAILWAY PLANS TO CARRY MORE TRAFFIC

The Central Railway has drawn up plans which are already being implemented for carrying 20 per cent. more traffic during the next busy season commencing from November, 1955 in its endeavour to meet the country's transport requirements concurrently with the development in all the sectors of the nation's economy. Planning for providing this phenomenal increase in transport capacity in the short space of time that lies ahead has been given topmost priority.

More steam engines of the new powerful 'WP' and 'WG' type on the broad gauge and of the YG' type on the metre gauge over and above the number that will be required on mere replacement account are to be added from increased deliveries from home and abroad. Line capacity is to be stepped up in sections of dense traffic where saturation has been reached to enable this additional traffic to be moved. This will be achieved by doubling of lines n certain cases, putting in of new stations in others, improvements in terminal and marshalling yards, modernisation of signalling and the like. This will involve bringing forward of some works, so that, with their timely execution, the Central Railway will be able in the ensuing busy season to cater to the increased traffic.

Wagons under or awaiting repairs in sick lines are to be reduced to the minimum in number, whilst the time taken in turn-round at marshalling yards and originating stations is to be cut down thus making a greater volume of wagon space available for transport of goods. Besides this, the out-turn from workshops is being stepped up to enable a quicker release from shops of rolling stock undergoing regular scheduled overhauls.

Measures for improved efficiency in various directions, but principally in operation and mechanical out-turn have been introduced and are continuing to be introduced to enable the targets set being worked to. Additional suitably trained staff will also be provided to ensure satisfactory movement of the increased traffic.

Britain's Biggest Railway Electrification

Scheme Nears Completion

WORK on the first main line railway in Great Britain to be electrified for the movement of all classes of traffic is now nearing completion. The opening this month of the third section of the newly electrified Manchester-Sheffield-Wath line means that, of the total distance of 68 route miles, only three miles—between Sheffield (Victoria) and Rotherwood sidings—remain to be electrified and these are expected to be finished by January next year.

The Manchester-Sheffield line is one of the main communicating routes between the north-west, the east coast and the Midlands. It carries an immense tonnage of mineral traffic from the coalfields of Yorkshire, Derbyshire and Nottinghamshire to the industrial areas of the north-west. In addition, passenger services connect Manchester with Sheffield, the Midlands and south-east ports and holiday resorts.

The line is approximately 68 route miles in length consisting of 300 single track miles of main lines and sidings. The 1500 volt D.C. overhead line equipment has been designed, supplied and installed by British Insulated Callender's Cables, Ltd., and their associate firm British Insulated Callender's Construction Company Limited, under the direction of and in colloboration with the Engineers of British Railways, using similar equipment to that installed by them on the London–Shenfield lines. It is of the compound catenary type and comprises a main catenary of hard-drawn stranded copper from which is suspended by means of solid copper dropper wires, a hard-drawn stranded copper auxiliary catenary. From this, in turn, is suspended a solid grooved cadmium-copper contact wire.

Most of the catenaries are supported by steel structures spaced at a maximum distance of 220 feet. The contact wire for each tract is held in position by a steady arm at each structure. Diabolo insulation is used for suspension of the catenary and at terminations; cap and pin insulation is used for registration of the contact wire. The majority of the structures are of the portal type with broad flange beam members. For anchor structures and for supports at complicated junctions and large groups of sidings, lattice structures are used. Sometimes up to twenty tracks have had to be spanned and in these places the overhead equipment is supported by cable head-spans between tall steel masts erected on each side of the tracks.

The first section of the electrified line, between Dunford Bridge and Wath, is of particular importance because of the large marshalling yards at Wath through which pass thousands of tons of coal every day en route for the north-west. The heavy trains were previously drawn up an 850-foot climb to Dunford—with a maximum gradient of 1 in 40 - by two steam locomotives with another two acting as bankers on the steepest stretch. Now, with the line electrified, only one hauling and one banking locomotive are needed. The result - a considerable saving in crew and fuel costs.

Another interesting feature of this section is that the wath area suffers occasional subsidences owing to underground colliery workings and the overhead equipment is designed to allow subsidence of up to 4 feet to occur without anything more than an adjustment being necessary. After a subsidence the tracks are lifted to ensure that the grading remains reasonable and then the overhead equipment is raised until the normal height of the contact wire is regained.

The second section of the route, between Manchester and Dunford, includes the recently opened Woodhead Tunnel, the first major railway tunnel to be built in the United Kingdom since the beginning of the century. For the 3 miles of the tunnel the catenary wires are supported on diabolo insulators fixed to steel bridges in the tunnel roof, any necessary side registration being effected either from small dropped vertical members bolted to the supporting bridges or from recesses in the tunnel wall directly beneath the bridges.

The electrification of the Manchester-Sheffield-Wath line is a most important step towards greater modernization of the country's railways and is likely to demonstrate clearly the particular advantages of railway electrification for routes of this kind.

IN YOUR OWN INTERESTS

HOW TO PURCHASE TICKETS

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

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

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

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

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

(Inserted in the interests of Travelling Public)

What the "State of Emergency" Means

By Ernest Atkinson

BRITISH GOVERNMENT'S SPECIAL POWERS

THE British Government, faced with the threat of a dislocation of the nation's economy by the rail strike, has taken on emergency powers. It needs them to keep essential supplies for the nation's life moving. But the word "emergency" can be misleading.

Proclaiming a state of emergency is a precautionary measure. The wisdom of the Government in 1920, in the disturbed times after the 1914-18 war, provided later governments—in times which generally were much less disturbed domestically — with a supple and simple procedure with which they could meet either a sudden or a foreseen threat to the ordinary life of the nation.

The present Government, therefore, is using powers made available to it under the Emergency Powers Act of 1920. In the English language, the word "emergency" has a variety of meanings. Any little household crisis calling for a quick decision can be termed an emergency. But at the same time, a world war lasting six years and overthrowing the economies of many nations is also called an emergency.

The word comes into the present context because the Parliament of 1920, in its wisdom, drafted the Emergency Powers Act. The last war apart, governments have resorted to it only four times in the whole 35 years, and in circumstances of varying seriousness. The gravest was certainly the general strike of 1926. There was another, less difficult occasion in 1921. And since the last war, the dock strikes of 1948 and 1949 prompted the Government of the day to resort to the Act. The powers then used lapsed with, or soon after, the emergency.

Here, a constitutional observer might say, is an interesting example of the care for constitutional forms that characterizes British governments and peoples. Governments in Britain do not have readily at hand the kind of powers that have to be specially taken when an emergency seems to threaten.

EXTRAORDINARY CIRCUMSTANCES

They cannot without going through special procedures do what is being done now: for example, relax regulations controlling the number of people who can be carried in vehicles of a public transport system, or the uses that can be made of one or another type of goods-carrying vehicles. The Postmaster-General, without specific authority, cannot greatly vary the kinds of packages the postal services must accept. Public gas and electricity supplies cannot vary the quality of their services or restrict the use the public can make of them. The Minister of Agriculture cannot regulate the distribution of food for people or for animals. And so on.

For such things to be done, the Queen must be satisfied that there is a state of emergency, and this can only be proclaimed at a meeting of the Privy Council. That body — instituted in 1895 — is the oldest instrument of government in Britain after the Crown itself. All senior Ministers, and certain other distinguished citizens, belong to it, and it still has important functions in Britain during an emergency.

In this instance, the meeting of the Privy Council at which the state of emergency was proclaimed had to take place in Scotland, since the Queen was there, and the Lord President of the Council and other Ministers who also are Privy Councillors, with the Clerk to the Council, flew there to lay the matter before her.

Given the authority there bestowed, the Government can make any regulations it finds necessary. But it cannot do even this without parliamentary control. The regulations made under the new authority require the positive approval of Parliament. They must be laid before both Houses at the earliest possible moment, and they cease to be effective if both Houses, independently, do not approve of them within seven days.

Parliament at the moment is dissolved, but members will be arriving at Westminster on June 7. They will be sworn-in on that day and the next. But, so that the regulations made under the Emergency Powers Act of 1920 may be authenticated by a decision of Parliament within the necessary time, the Queen has consented to open Parliament in State earlier than had been planned. The State opening will, therefore, take place on June 9, instead of in the week following.

25 ORDERS

It may well not be a very long or difficult business to secure parliamentary approval for the orders the Government has passed. There are but 25 of them.

(Continued on page 14)

Economical Efficiency of Double Acting Swage Forging Hammers Versus Conventional Drop Stamp Hammer

By V. Smeiser, Service Engineer, Francis Klein & Co. Ltd. Calcutta.

ONE of the principal aims of applied Mechanical Laws is to achieve a maximum effect with a minimum effort and thus to attain more economical efficiency, irrespective of work involved.

Whilst this aim had been eagerly followed up everywhere in the metal cutting machine tool line, the same had not been so carefully exploited by works engineers in the case of swage forging plants, which have always been, and are still today, the neglected department in many workshops.

The reason for this policy may perhaps be due to the fact that most of the engineers connected with production of components from die forged steel do not care to consider the swage forging operation sufficiently important, and, therefore, in many instances wrong equipment and wrong methods are applied in the process of swage forging.

Such practices will inevitably affect the production output as well as the quality of die forged products. After all, swage forging represents the first step in the sequence of a number of machining operations, and, therefore, should be treated on equal level with any subsequent milling, boring, turning or grinding operatio whichever of them may be required to finish the di forged component.

In order to improve the production output and tl quality of swage forgings, Messrs. Beche & Gro G. m. b. H. of Huckeswagen, Germany, have develop their line of Double Acting Hammers to such an exte that their Counter Blow Principle is today recogniz by all modern smithy shops as leading swage forgi method.

The above drawing indicates the difference the flow of material and production output in t manufacture of railway draw hooks as obtained Conventional Drop Stamps of 40 cwts. capacity a BECHE Double Acting Hammer Model DGH-8 58000 ft. lbs. capacity. The production data w taken as an average output obtainable on equipme arleady installed in India.

No doubt, not only every engineer but even laym will appreciate the possibilities of larger output and bett flow of forged metal as can be achieved on double acti hammers.

(Continued from page 13)

They are patently directed only to securing the maintenance of the essential services. They are not, in the main, restrictive. They are intended to relax restrictions that in normal times are reasonable and proper.

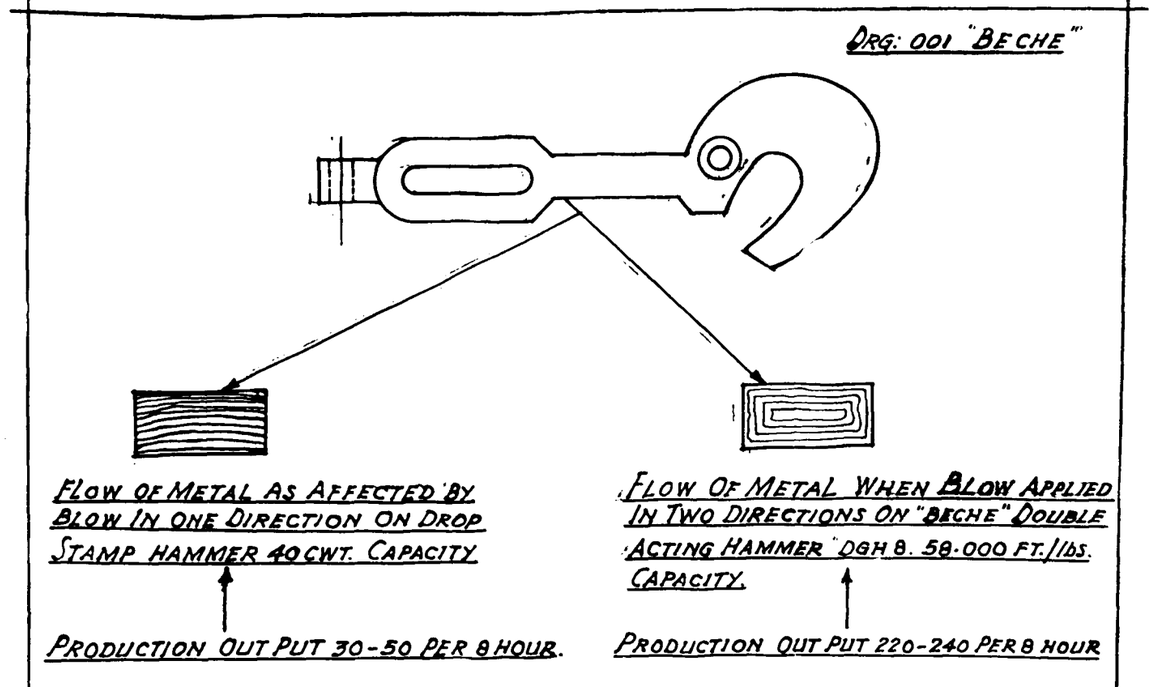
Dealing with these regulations will not, therefore, impede the normal working of Parliament on the opening of this new session. The Government is preparing its programme, which will be presented, on the Prime Minister's advice, in the Queen's Speech.

During the general election, both sides were very cautious about seeming to make any kind of issue of industrial relations. For the present troubles were impending, and both sides knew that they were more than likely to deal with them if they came to office.

Moreover, on the Labour side there was the knowledge that the Trades Union Council was working hard for industrial peace. It would be mistaken, therefore, suppose that there was any political element—at a rate, so far as any major political party in Britain w concerned—in the present industrial troubles. Th are of industrial origin.

But, however caused, they had created a situati which any responsible government must tackle. And seeing that it had appropriate powers, the Governme has done what would be expected of any governme No government could do less.

And when Sir Anthony Eden and his colleagues fa the new Parliament, they will be able to claim not or that they have taken no more than the minimum acti the situation required, but also that they have act adequately and in good time, as their duty demands, maintain the nation's essential supplies and services.

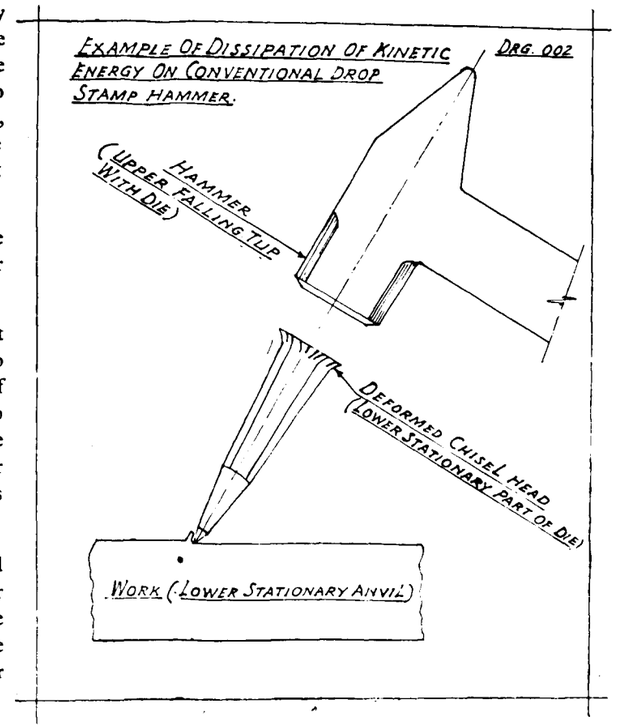


The idea of counter blow principle originated firstly from the necessity of avoiding the vibration of the blows, transmitted through the foundation in the case of conventional drop stamp hammers, and secondly to utilize the available effect of blow to maximum capacity, without the use of unusually large anvils, which are impracticable for transport and cumbersome during installation.

Another important point, which has also had to be pursued during the years of development, was to render increased life to the forging dies.

It is a well known fact to smithy engineers that dissipation of Kinetic energy, produced on falling tup meeting the lower anvil, primarily affects the life of forging dies, because in case of conventional drop stamps, only one part of die is a moving factor. The dissipated Kinetic energy usually affects the lower stationary die in a similar manner as a chisel head gets deformed under the impacts of a hammer.

If it would be possible to move both the chisel and the hammer against each other at same speed, on their meeting the deformation of chisel head could be prevented to a considerable extent, just the same as the life of forging dies is prolonged when used on counter blow system.



To explain further the advantages of Double Acting Hammers over the Conventional Drop Stamps, I wish to outline briefly both the afore mentioned practices.

1. The conventional drap stamp hammers operate on a principle wherein the upper falling tup of a certain given weight is lifted to a certain height from where the same is dropped by gravity in order to obtain the required effect of blow.

The capacity of the drop stamp hammer, therefore, is derived from the weight of the falling tup multiplied by the height from which the tup is dropped. The following formula is generally applied :

Falling tup weight plus weight of top die multiplied by falling height—mkg (or ft./lbs.) less 10% frictional losses.

The above formula, however, covers the approximate theoretical capacity of the drop stamp forging equipment per each single blow only and since the output of the die forged components depends mainly on the frequency of the blows or the so-called effect of blow per second, actually a formula according to the following example should be considered.

Example : A conventional drop stamp of 7 cwts. has a falling weight of approximately 450 kgs. (comprising 350 kgs. of tup weight and 100 kgs. of top die weight). The dropping height is 1.5 metres (about 5′) and thus the effect of blow is :

450 kgs × 1.5 metres = 675 mkg, less 10% dropping frictional losses.

Total theoretical effect of blow is the equal to 615 mkg per each single blow. The maximum number of blows obtainable on a 7 cwts. drop stamp hammer is upto 40 per minute. Therefore, the maximum theoretical working effect of blow per second is equal to :—

$$\frac{40 \times 615 \text{ mkg}}{60} = 410 \text{ mkg (per second)}$$
OR 2972.5 ft./lbs. per second.

It must also be noted that from the above mentioned theoretical effect of blow per second, approximately 30 to 40% is absorbed by the stationary anvil and hammer foundation and, therefore, only 60 to 70% of the available theoretical effect of blow is actually transmitted into the workpiece.

2. The Beche double acting (counter-blow) method represents a system wherein both the lower and the upper tups are used as striking factors. They move coupled together and strike against each other in order to achieve the maximum effect of blow. The impact capacities of this type of hammers, i. e. the kinetic energy developed on the two tups meeting, range from 2000 mkg (14500 ft. lbs.) in the case of the smallest Beche double acting hammer and upto 1,25,000 mkg (9,06,250 ft./lbs.) in the case of the largest Beche double acting hammer so far built.

The lower and upper tups are driven against each other at the same speed, resulting in no losses on their meeting and the swage forging operation on the double acting hammers will, therefore, need essentially less mkg (ft./lbs.) striking power, and consequently, less number of blows than as required under the stationary anvil block type of hammers of similar mkg capacity.

The drive of Beche double acting hammers may be effected either by steam or by compressed air pre-heated to 160 deg. C. The velocity of the blows is controlled through a hand lever operated valve gear, thus enabling application of light touching or heavy racking blows, according to particular swaging work requirements.

Steam or compressed air, whichever is used as the driving factor, is conducted upon the top surface of upper tup piston for actuating the blow and under the same piston for separating the anvils.

When effecting the blow, the lower tup (anvil) is drawn upward against the upper tup by means of a double sided coupling and thus accomplishing the counter-blow. On the return stroke, the lower tup drops down by its own weight, assisting thereby the rising of the upper tup.

The tups of Beche double acting hammers, upto 30,000 mkg capacity, are coupled mechanically by means of steel bands passing over pulleys. The steel band coupling consists of 20 to 30 steel plate leaves, each about 1/32″ thick. Normally 3 to 4 of these leaves would be sufficient to operate the hammer but for safety's sake and also for long life of the coupling, a larger number of leaves is used. The design of the mechanical couplings is illustrated in fig. 1 of the attached bulletin.

Beche double acting hammers over 30,000 mkg are provided with hydraulically operated couplings. With this system, plungers leading from the left and right hand sides of the upper tup on downward movement are immersed into oil cylinders. The displaced oil is transferred to the plunger of the central cylinder and by driving the same, the bottom tup moves upwards against the upper tup to accomplish the counter-blow.

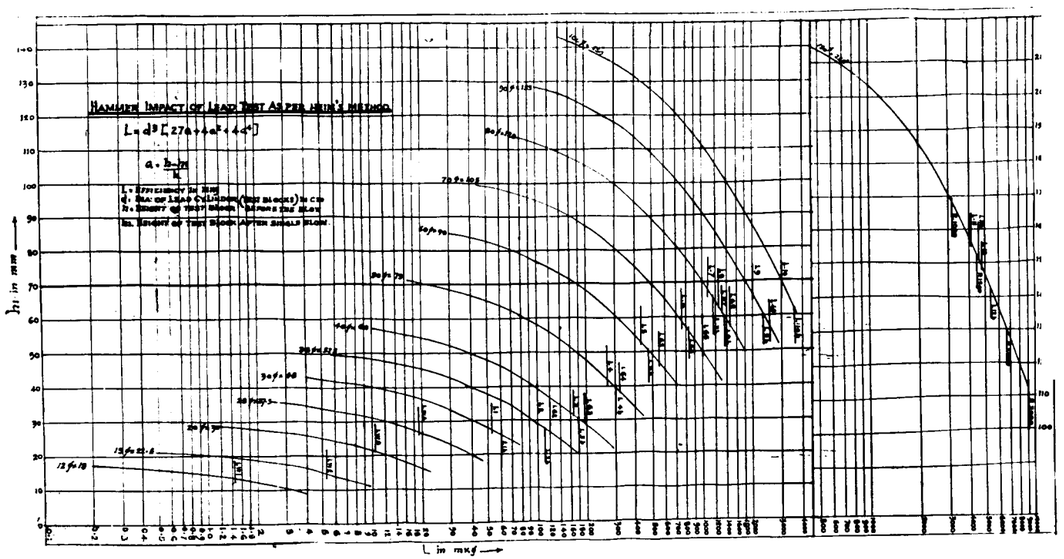
To economise on consumption of steam or compressed air, the Beche double acting swage hammers work on the expansion principle. By this method a saving of about 40% is possible as against the system of Full Pressure. During the forging operation, because of the counter-blow principle and the pressure factor, dies on Beche double acting swage hammers are under constant pressure and, therefore, re-coiling of the tups is completely eliminated.

Apart from better production output, the most outstanding of the many advantageous features of the Beche double acting hammers is the elimination of the heavy anvil block and the reduction, consequently, of the required foundation. Beche double acting hammers need only approximately one eighth of the size of foundation as may be required by a similar capacity drop stamp hammer.

The economical efficiency of Double Acting Method can best be proved by submitting the double acting hammers to Heim's Lead Cylinder Test, as utilized for measuring the capacity of Pneumatic hammers. The principle of this test is shown in the enclosed diagram.

Before concluding the paper, I would like to review the main features of the double acting principle.

(1) Possibility of installing double acting hammers on soil where otherwise conventional drop stamps could not be erected.
(2) Low cost of foundation
(3) High production output
(4) 4 to 5 times longer life of forging dies.



(5) Possibility to control the effect of blow at will, i. e. to apply light touching or heavy racking blows according to requirements.

(6) Economical consumption of compressed air or steam.

(7) Elimination of heavy anvil blocks.

Whilst the initial cost of a double acting swage forging hammer is slightly higher than that of a drop stamp, the small cost of foundation and the considerably higher production output that can be obtained on the double acting hammer, outweigh many times the small difference in the initial cost, between these two types of hammers.

ELECTRIC TRACTION EQUIPMENT FOR INDIA

£ 900,000 ORDER PLACED WITH U.K. FIRM

Two oversea orders, together worth about £ 8,000,000 for British electric rolling stock and equipment have been announced in London.

Electric traction equipment worth about £ 900,000 has been ordered from Associated Electrical Industries (India) by Jessop & Company, which is supplying 104 coaches for broad-gauge multiple-unit trains for the Calcutta suburban railway electrification scheme.

The new rolling stock will comprise 34 three-coach units, each consisting of two driving trailors with a motor coach in between. Two spare motor coaches have also been ordered.

The bulk of the electrical equipment will be made by Metropolitan-Vickers Electrical Company and its work at Sheffield and Trafford Park, Manchester. Approximately 10 per cent. will be manufactured in India.

The South African Railways and Harbours Admir tration has placed an order for 349 electrical railv coaches with Metropolitan-Cammel Carriage & Wa Company to the value of £ 7,200,000.

DREDGER FOR SERVICE ON THE HOOGHL

A £ 1,000,000 order for a dredger for Calcutta has b secured by a British firm. An announcement by company says that the order was obtained in the fac competition from European and Japanese shipyards.

The vessel has been ordered by the Calcutta I Commissioners and is intended for service on the R Hooghly.

A spokesman of the firm said that the contract w provide nearly two years' work for all trades in t shipyard.

EFFECTS OF U. K. RAIL STRIKE

By Paul Bareau *

DAMAGE TO ECONOMY NOT SERIOUS

NOW that the railway strike in Britain is over, the time has come to count the cost. It can already be claimed that the damage it has caused to the British economy has been much smaller than was at first feared.

When the locomotive drivers stopped work it was widely assumed that after a week or so a large part of British industry would grind to a stop. It was argued that difficulties in the movement of bulky material—like coal, iron ore, limestone and steel—would, in a matter of days, cause a general slow-down in the pace of British industry.

Because coal could not be shifted from the collieries these would, before long, have to curtail production; deprived of their coal and coke and iron ore, blast furnaces would have to be damped down; once short of its essential steel supplies, the shipbuilding and engineering industries would have curtail their production. So ran the argument. It can be said that those who reasoned thus were happily confounded in their gloomy prophecies.

It would be misleading to suggest the railway strike will have left no ripples on the British economy. Its impact was very much smaller than had been feared. Even in the matter of coal production and distribution, it was found that, somehow or other, the necessary transport could be found, and the coal industry hardly missed a beat during the two-and-a-half weeks of the strike. The steel industry may have lost about 150,000 tons of production—an almost negligible figure in relation to its total output.

The comparative invulnerability of the heavy industries to the engine drivers' strike was due, in part, to the excellent work put in by those railway workers who remained at work throughout the strike, and in part to the speed with which even the heaviest and bulkiest of traffic was shifted from rail to road transport. Even at the end of the strike, deliveries of coal throughout the country were about four-fifths of the normal, and the steel industry throughout this period worked at about 90 per cent. of its capacity.

QUICK ADAPTATION

This was but one aspect of the resilience that kept the British economy going with hardly a faltering step during the railway strike. Throughout trade and industry the same kind of adaptation was to be seen. Where workers had far to travel and normally depend on rail transport—as in the great urban agglomerations such as London—they somehow or other got to their offices and factories. Firms, large and small, organized coach transport for their workers. Thousands of old motor-cars were hauled out of their garages or dumps and put on the roads. The lorries did immense mileages and their drivers remained at the wheels for heroic periods.

Certain types of traffic which normally use the railways found more efficient and cheaper accommodation on the roads. A case in point is fish carrried from the ports to big centres of population where wholesalers may come to thank the railway strike for having introduced them to a more economical method of transport. That may represent a permanent loss to the British Transport Commission, but it is a net gain to the economy as a whole. The general attitude was, oddly perhaps, for from being deeply pessimistic. From one week to the next the usual comment was: "Of course things aren't too bad now. It's next week that the trouble will start."

Merchants went to great lengths to get goods sent abroad. Some woollen firms, for example, used air transport in order to honour export contracts and delivery dates. These are but a few of the examples of the methods that kept the economy going during this difficult period. Capacity for adaptation is a mark of the Britain and of the British economy. They have both shown ample and reassuring proof of it in the two-and-a-half weeks of the railway strike.

Some of the success achieved in maintaining production must, however, be attributed to the running down

* *Deputy Financial Editor of the "News Chronicle"; Assistant Editor of the "Economist"; and Associate Editor of the "Banker", London.*

of stocks of raw materials and semi-manufactured goods. Those stocks should soon be reconstituted, and with that the immediate effects of the strike on the economy will have been wiped out.

BALANCE OF PAYMENTS

The longer-term effects of stoppage on the railways should not be overlooked, but they are unlikely to be severe. The modest setback in the production of coal and steel will probably have to be made good by increased imports. To that extent balance-of-payments difficulties, which became apparent earlier this year and which seemed in recent weeks to be yielding to the credit policy measures taken in March, may again raise their heads.

The balance-of-payments position will be difficult to assess in the coming weeks, not so much because of the effects of the railway strike but because of the stevedores' dispute, which has hampered the movement of shipping into and out of British ports. As a result of this strike many British exports are piled up and awaiting shipment. Nevertheless, it is estimated that in recent weeks only one-third of the normal exports has not been moved out of ports. In only a few cases will delays involve cancellation of the orders in question.

Oversea trade returns for June will almost certainly reflect this slowing down of export shipment; but, all being well, the slack should be taken up by an acceleration of shipments in subsequent months.

Provided the resource which has stood Britain in such good stead in recent weeks of labour troubles and in absorbing the shock of transport strikes can be applied to a solution of the problems of making good the shortcoming in production and delays in deliveries, it may well be that by the end of the year no visible traces of these troubles will remain.

SRI LAL BAHADUR SHASTRI TOURS VINDHYA PRADESH

The Union Minister for Railways and Transport Sri Lal Bahadur Shastri, accompanied by the General Manager of the Central Railway Sri M. N. Chakravarti recently completed an extensive tour of Vindhya Pradesh. Our Railway Minister was accompanied by the Chief Minister of Vindhya Pradesh Sri Shamboo Nath Shukla, the Home Minister Sri Lala Ram Bajpai, the Minister for Industries Sri Dhan Bahadur Singh and the Minister for Public Works Sri Gopal Saran Singh.

Sri Lal Bahadur Shastri examined several proposals fo construction of new railway lines in Vindhya Pradesh including the link from Harpalpur to Satna-Rewa *vi* Khajuraho, an important place of historical interest. H went into the question of arrangements for improve wagon supply at Mau Ranipur and expeditious clearanc of betel leaves, grown extensively in Vindhya Pradesh from the rail heads of Harpalpur, Mahoba, etc. fo stations reached *via* Jhansi and Kanpur.

The Railway Minister also went into the question o opening of out-agencies *via* Harpalpur connectin Chhattarpur and Maharajpur with Harpalpur and Tikam garh with a suitable station. The Vindhya Prade Government has agreed to forward proposals in th regard to the Union Ministry.

CLEANLINESS LEADS TO HEALTH AND HAPPINESS

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

Cleanliness prevents disease; medicine only attempts to cure.

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

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

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