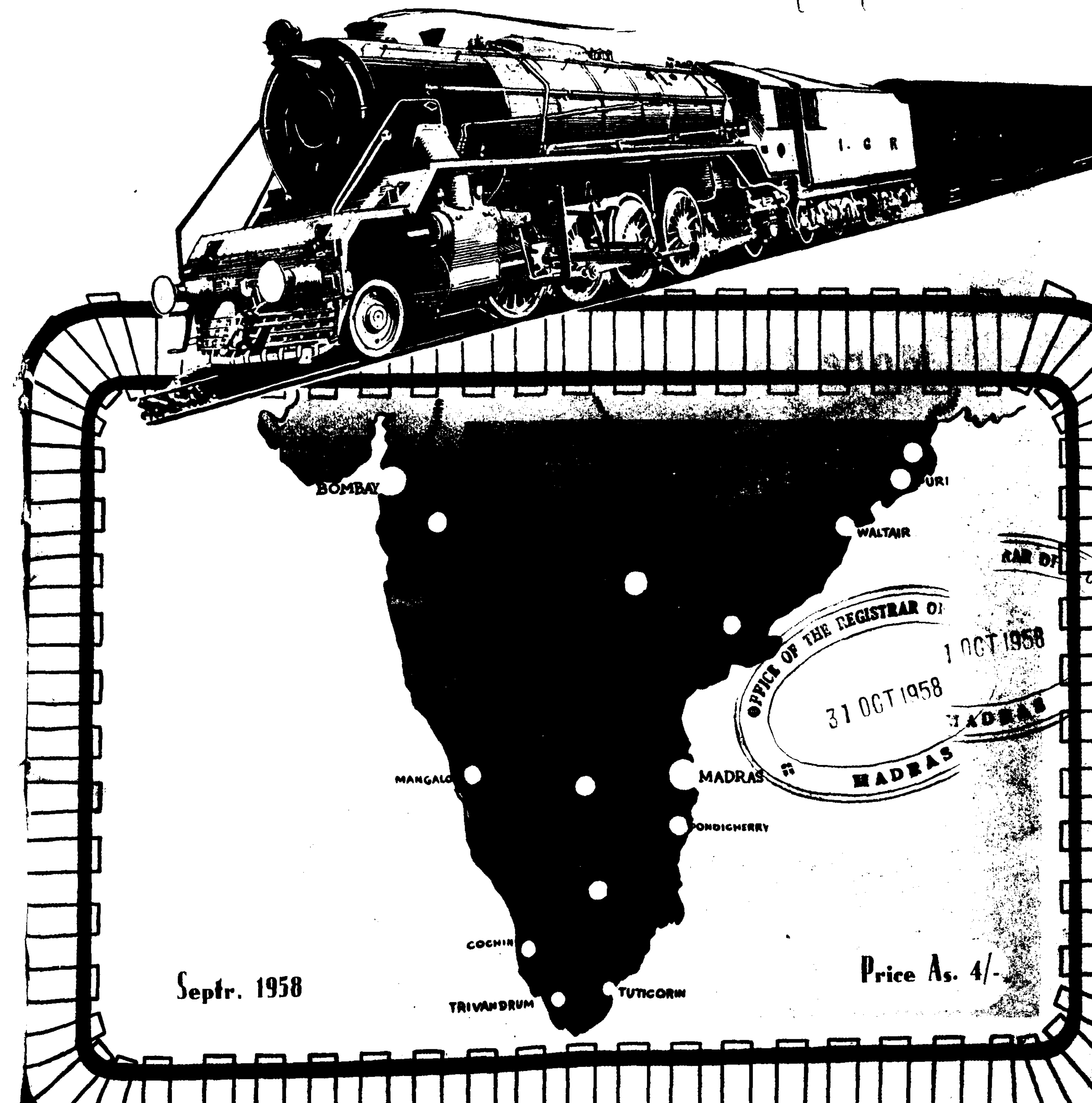
SOUTHERN RAILWAYS Magazine



Septr. 1958

Price As. 4/-

Brazil Modernizing Ports with Diesel Locomotives

BRAZIL, which has made great strides in bringing modern motive power to her railroads, is now modernizing the operation of her ports with new diesel-electric locomotives.

The country recently placed an order for fifteen 45-ton and two 65-ton diesel-electrics with the International General Electric Company (U. S. A.) in New York.

The locomotives will be manufactured by G-E's locomotive & Car Equipment Department in Erie, Pennsylvania. General Electric, S. A, of Rio de Janeiro, assisted the port authorities in determining their requirements, Globe Press Service reports.

The order was placed by Brazil's National Development Bank for the Port Administration of Rio and the Minister of Transportation and Public Works in the National Department of Ports, Rivers and Canals.

The locomotives will be used for switching freight cars delivered to the various ports by the Brazilian railroads. The purchase of these new locomotives is expected to greatly facilitate the exportation of Brazilian goods as well as the distribution of imported products.

Coincidentally, the order for the new equipment was placed during the 150th anniversary year of the opening of Brazil's ports. Until 1808, the country's commerce was restricted to Portugal. But in that year, Brazil was established as an empire, ruled by Don Joao VI, who opened ports to all international trade. A commemorative stamp was issued by Brazil early this year in honor of the former emperor.

The ports of Porto Alegre, Itajai, Laguna, Imbituba and Paranagua will each receive two 45-ton G-E locomotives in the new equipment order. Fortaleza, Natal, Recife, Maceio and Sao Francisco do Sul will get one each. The two 65-ton units will be used in the port of Rio de Janeiro.

Twenty-one other G-E locomotives are already in use in the ports of Rio, Santos and Paranagua.

The equipment purchases are part of an over-all plan by Brazil to modernize her system of transferring goods from the interior to seaports.

Extensive modernization has already been accomplished on five major railroads which purchased 88 main-line diesel-electric locomotives from G-E. These purchases were made in 1957 and are in addition to the more than 300 G-E locomotives already operating in Brazil.

The Switch from steam to diesel-electric power has helped Brazil save millions of Cruzeiros each year in coal imports.

(Continued from page 1)

Today, from that crude beginning, New York's subway system has grown to become the largest in the world. If its routes were laid out straight, they would be long enough to run a single track from Buenos Aires, Argentina, to Santiago, Chile—a distance of over 700 miles.

Over these routes run 6,500 electrified cars, which carry an average of 6-million passengers per day—or, approximately three-quarters of the city's total population of 8-million.

By the year, the number of passengers amounts to 1,400,000,000. More than 35,000 transit workers are required to maintain the system.

Big? It certainly is.

Big enough? Apparently some people in authority don't think so, for the system keeps expanding in length and equipment.

Subway routes run under the Hudson River to neighboring New Jersey, and recently, the Transit Authority placed an order for more cars and other equipment.

Some 250 cars were placed in service last year. They have the latest propulsion equipment, built by the Locomotive and Car Equipment Department of General Electric (U. S. A.) at a cost of more than $ 7,800,000. Each car has a package of four G-E traction motors and G-E control equipment.

Reliable control equipment is an absolute necessity on the subway. Trains operate at speeds of upto 50 mph. and must be able to deaccelerate rapidly. "Dynamic" braking is another feature of the new equipment.

The new cars hold a maximum of 200 persons each, 44 of them sitting. They can be operated in trains of up to 11 units from a single control station.

This order was the fourth major addition of equipment in recent years to the rapidly-expanding subway system. In 1954, 200 cars were purchased. In 1955, an additional 400 were bought and early in 1956, the system added 250 more cars.

What's going to be new in subways in the future? According to planners at General Electric, most heavily-populated cities are in great need of some form of rapid transit system and all will eventually have one.

The system would use self-propelled cars, would be modern, easy and economical to operate and would run either under the ground, as the subways, or above the ground along center malls or wide boulevards leading into the cities. Commuters coming in from the suburbs would have their choice of trains as they arrive, one after another, in ten or fifteen minute intervals.

Transportation planners do not want any repetition of the 1864 criticism that compared riders of public transportation to "sardines in a box".

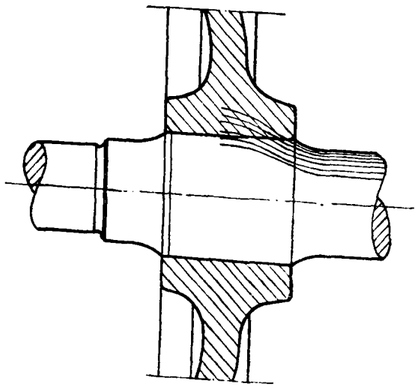


Fig. 14

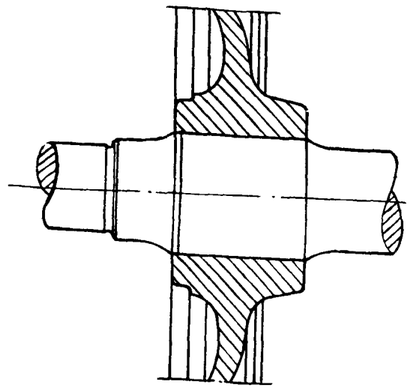


Fig. 15

and very appreciably reduce the tensile endurance limits. The methods of corrosion prevention will depend upon the use and function of the various components. The surface preservation is, therefore, of much importance in the case of the light-weight coaches, and the painting technique developed in the Integral Coach Factory, specially of Bitumen coating of the inside of the coach-shell needs to be particularly mentioned. The following table shows the result of atmospheric corrosion tests :—

	Loss in weight by corrosion
Mild steel	100
Copper bearing steels	78
High tensile steels—specially Corten	23
Stainless steel	Nil

DESIGN OF THE BOGIE

The bogie fitted to Integral Coaches is shown i Fig. 16. The riding comfort of a coach depend nearly exclusively on a good bogie construction The bogie is the part which is most liable to wear anc tear and therefore needs maintenance attention a regular intervals. Its behaviour in actual servic contributes towards the efficiency factor of a coach The weight of the bogie has been reduced by 26.5% in comparison with the I. R. S. bogie. This has beer achieved specially by resorting to a reliable welded construction throughout the bogie frame and the bogie bolster. As already mentioned the unsprung weights have been reduced to the minimum and the wheel sets have been considerably lightened. A smaller wheel of 3′ diameter against 3′—7″ on the conventional I. R. S. wheels has been adopted because the axle load has been reduced by nearly 2 tons and therefore not much disadvantage will accrue due to the lesser diameter of wheels. The reduction in unsprung weights results in less wear and tear of the permanent way, wheels and other parts of the coach in general. Shocks from rail-joints transferred to the coach body which cannot be absolutely eliminated, can be reduced appreciably. The unsprung weights in the Perambur bogie have been reduced by 18.8% compared to the I. R. S. bogie.

The other feature of the bogie design is that the usual conception of axle boxes being guided in horncheeks has been eliminated. In this case the axle box is guided by two guides welded on the bogie frame which are working in an oil bath sealed against dust and water, thereby resulting practically in no wear and tear. They are further so constructed that they also act as shock absorbers for the axle box helical springs controlling the deflection of springs, similar to the shock absorber, arrangement in an automobile. This arrangement also eliminates the play between the axle box and the guide and ensures a better riding quality of the coach. (Fig. 17).

SPRINGING

Besides the axle box springs which are arranged on each side of the axle box, the bogie has also two laminated springs arranged longitudinally, on which the bogie bolster is directly supported. By arranging the laminated springs longitudinally on the bogie, long springs could be applied which results in softer action of the spring.

Further, the spring, leaves have a channel profile.

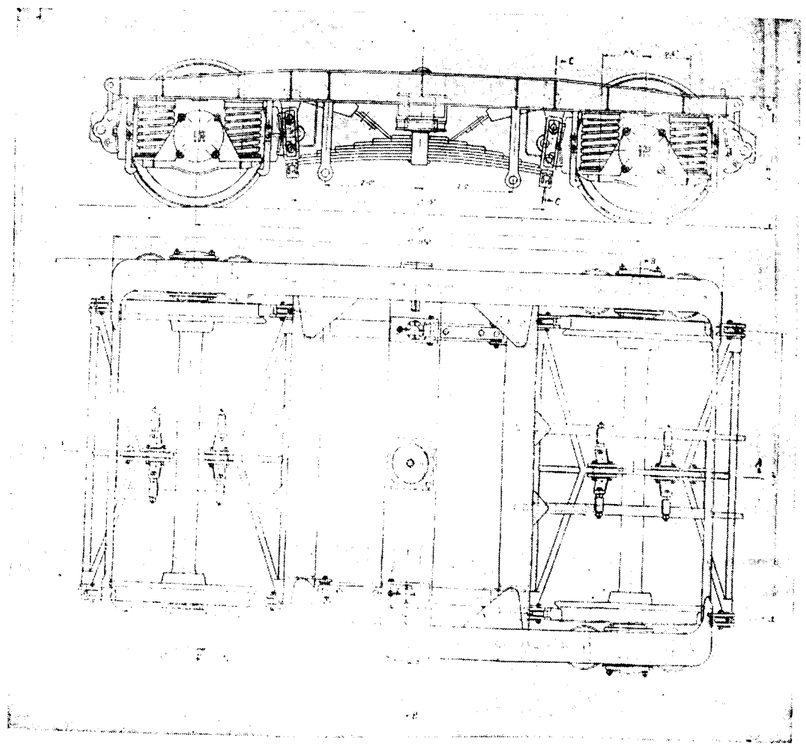


Fig. 16

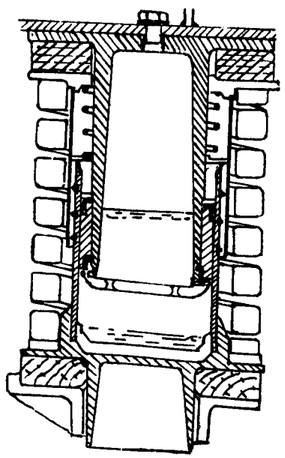


Fig. 17
Cross Section of Damper.

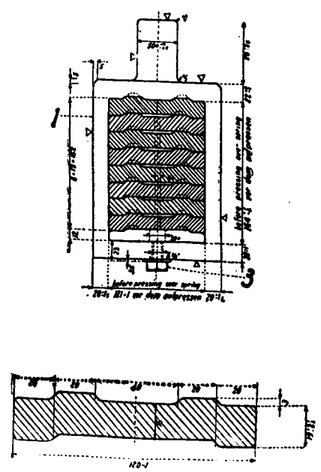


Fig. 18

(Fig. 18). This special profile provides the spring with a cavity throughout the whole length of the plates, after they have been assembled. These cavities provide an ideal means of permanent lubrication as they are capable of storing a considerable amount of lubricant. This results in an improvement of its shock absorbing capacity of the spring, enabling a softer cushioning of the coach—so important for comfortable travelling. Furthermore, it has to be mentioned that the spring leaves, before being assembled, are passed through what is called an "overstraining process" which makes it possible to load the spring to a greater extent without its showing any permanent deformation. The stresses, calculated in accordance with the usually known bending formula, are much higher than the yield point or even the tensible strength of the steel.

BOLSTER SPRING SUSPENSION

The bolster springs are suspended by swivelling hangers and these take up the lateral shocks as well as the side swinging of the running gear. These movements will therefore be not transferred to the coach body.

These swivelling hangers are suspended from the longitudinal members of the bogie frame in opposite angles in relation to the vertical. By this arrangement the bogie bolster and, consequently, the coach body are being centred into the longitudinal centre line of the bogie frame. The lateral swinging, transmitted from the running gear to the coach body when the coach runs over joints, crossings, etc., is reduced or even eliminated as a result of the restoring force developed. Experience has shown, that an angle of inclination, of about 7° for the hangers, gives the best results.

The bogie bolster is connected by means of two anchor links in the longitudinal direction to the bogie frame. These anchor links are an improvement over the present sliding plate guides located between the cross-member of the bogie frame and the bogie bolster. The anchor links are also much less susceptible to wear and tear and have the great advantage that an absolute-play-free-connection between the body bolster and bogie frame could be achieved which eliminates additional jerking while the coach is running.

BOGIE FRAME

The bogie frame is of a competely welded construction, welded together of a mild steel flats and plates, some of which are formed in press brakes to the required profiles. The design of the bogie is adapted to the special requirements of modern welding technique. Further, the design has been evolved after very accurate stress calculations and eliminates all pockets and corners, thus reducing the possibility of corrosion and ensuring accessibility for proper inspection.

Special attention has been given to the design of the connections between the longitudinal and the cross-members of the bogie frame, so that there is uniform stress distribution to the greatest possible extent.

BRAKE GEAR

With the usually known brake system in which the brake cylinder is fixed to the underframe, the braking force coming from the brake cylinder acts directly on the bogie frame, thereby subjecting the centre pivot to an additional stress. The braking arrangement on the Perambur bogie, however, is in such a way that this additional stress does not act at the centre pivot. This has been achieved by fixing respective reaction points for the brake rigging on the underframe. This results in a remarkable relief of force on the centre pivot, taking into consideration that the pull on the brake rod amounts to about 4.54 tons. The centre pivot is therefore subjected to less wear and tear and the free play of the bogie is unaffected during the braking period.

The brake block is designed in two parts consisting of the brakeshoe and the brake shoe-holder. Therefore, when worn out, the relatively cheap "wearing part" (brakeshoe) is replaced instead of the whole brake block.

OUTSTANDING FEATURES OF THE BOGIE

The outstanding features of the Perambur bogie can be summarised as follows :—

(1) The total weight of the bogie has been reduced by 26.5% as against the I. R. S. bogies.

(2) The unsprung weight has been reduced by 18.5% as compared to the conventional I. R. S. bogies resulting in much lesser wear and tear of the track and coaching stock.

(3) The wear and tear of the axle box guides has been completely eliminated.

(4) The movements of the axle box helical springs are controlled by built-in shock absorbers.

(5) The centre pivot is completely released of any additional reaction stresses from the brake gear.

(6) The conventional rubbing blocks for the bogie bolsters have been replaced by the anchor link arrangements which eliminates the jerky movements of the bolster.

The design of the light-weight coach having been discussed it will be interesting to know the production methods and organisation employed for manufacturing the light-weight coaches at Perambur. The design of the shell having been standardised for the Broad Gauge, and the requirements of the Indian Railways for such shells being in the region of 1,000 a year, it was possible to standardise methods of production on the same lines as in the case of an automobile. The organisation has therefore been streamlined and mass production methods have been introduced.

PRODUCTION METHODS ADOPTED IN I. C. F.

The so-called "Jobbing Layout" was chosen for the production of several details and sub-assemblies. 2,800 doors and 14,700 windows are required per year for the 350 body shells to be produced and, therefore, for the window and door shops it was decided to manufacture them in special departments according to the assembly line layout. Here the single machine tools and jigs are arranged directly according to the requirements of the flow of production, that is, where the layout places a machine along the line of the produced part. In the Main Assembly Shop, very detailed studies have been made and 11 stands have been provided in sequence for the main assembly. In the first stand the roof is assembled from sub-assemblies and components received from the sheet metal shop; in the second stand the roof so assembled is finalised for the main installation; in the third stand the underframe is similarly assembled from sub-assemblies and details received from the other manufacturing shops; the fourth stand provides facilities to finalise the underframe to be ready for assembly; the fifth stand is the main installation where underframe, sidewalls, end-walls and roofs are assembled together to form the shell; on the sixth and seventh stands the body shell is straightened after the welding of the minor details is completed and inspected prior to going through the painting process. In addition to these 7 stands, 4 other stands have been provided for the storing of the details and sub-assemblies required for the major assemblies. This belt must move every $4\frac{1}{2}$ days, and as 6 such belts are functioning the outturn is $6 \div 4\frac{1}{2} = 1.3$ coaches per day per single shift. Similarly for bogies, a belt has been installed incorporating various stands for the manufacture of the bogie-frame and the final assembly. Annexure I gives the details of this belt, from which it will be noted that for each stand the parts the jigs, and the material to be used have been finalised. Time studies are now being conducted to finalise the number and the categories of men required for these different stands. In the manufacturing shops also extensive use of jigs and fixtures has been adopted and for the manufacture of 1,029 components and sub-assemblies, 1,009 jigs and fixtures have already been designed and further 200 jigs and fixtures are in the process of being designed and manufactured. Gradually every component, detail and sub-assembly will be manufactured using jigs and fixtures, in order to ensure interchangeability and good quality of work. Figs. 19, 20 and 21.

Fig. 19. Roof jig.

Fig. 20. Underframe jig.

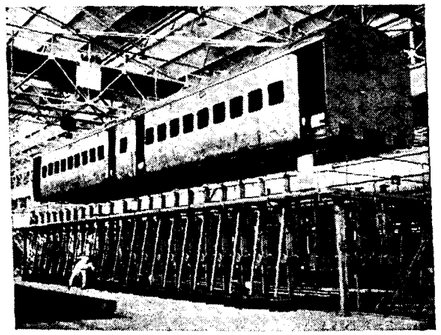


Fig. 21. Main Assembly jig.

Naturally in a mass production shop, quality control is very important. This is being introduced and inspection is arranged after every operation, in order to ensure an uninterrupted flow of correct parts on to the main assembly lines.

A Static Bogie Testing machine has been installed at the despatch end of the bogie assembly belt for testing all bogies after they have been assembled, to ensure trouble free service under actual running condition. A similar machine in each Railway Workshop will greatly help in the proper inspection of repaired bogie trucks. The static bogie testing plant is of 30 tons capacity and the equipment consists of a hydraulic ram through which the required load is applied on to the bogie and the Pendulum Dynamometer for reading and adjusting the load. The hydraulic ram (or pressure unit) is fixed to the horizontal beam of the testing frame and is balanced by suitable weights. The bogie truck to be tested is placed in position under the testing frame. By the manipulation of the control valve of the Pendulum Dynamometer, the required load is applied in a vertical direction on the centre pivot of the bogie bolster of the bogie truck. A load of 12.5/14.6 tons is applied to test the bogie under Tare load. The free working of the springs, shock absorbing arrangement and the bolster suspension, etc., are first checked up by the application and release of 20 tons load and the following measurements are taken under tare load conditions :—

(*a*) Height of centre pivot from rail level.

(*b*) Height of bogie side frame from rail level.

(*c*) Clearance between axle box housing and bogie frame.

(*d*) Clearance between bolster and bogie frame.

(*e*) Bolster spring camber under tare load.

A Dynamic Bogie Testing Machine has been ordered, so that bogie trucks can be subjected to dynamic loads by means of a pulsator arrangement. This machine which will be installed in the course of the next few months will enable a certain percentage of the bogies being subjected to all the rigours of working conditions encountered in service.

CONTROLS INTRODUCED

For efficient running of the factory it is necessary to provide for suitable managerial control so that the Administration can be sure of the implementation of its policy. With that object, the following controls have been introduced.

PRODUCTION CONTROL

A Production Planning and Control Department has been installed in order to ensure the full mobilisation of the man power and the machinery capacity. A master list of parts has been drawn up after dividing the coach into various sub-groups and indicating the details and sub-assemblies required under each sub-group. Certain commercial items and specialised parts such as castings, etc., are purchased. The raw material requirements have been standardised with particular reference to the indigenous capacity to manufacture the quality required.

The factory has been divided into Shops, Sections, and Load Centres, each Load Centre consisting of machines of similar manufacturing capacity. The capacity of each Load Centre is analysed in terms of the planned hours, and by a proper system of scheduling and machine loading, the load on the various Load Centres is evenly balanced in the production cycle. Overall schedules have been drawn up by the Production Planning Department for the complete production cycle from the commencement of indenting for raw materials right up to the completion of the coach. Detailed schedules have been drawn up for each batch order indicating the dates of commencement and completion of individual operations involved in the manufacture.

As a result of detailed operation studies, master operation plans have been drawn up for each part of the coach indicating the raw material required, the sequence of operations, the Load Centres to be used for each operation, special tools, jigs and fixtures to be used, and the setting up and operating times for each operation. The preliminary work study has been completed for most of the operations, and time study has now been taken up by a special section organised for the purpose. Timings are fixed by actual study of the operations as also by building up elemental time standards from standard data.

The issue of work orders is controlled by the despatching section of the Production Control Section which utilises an Ormig, reproducing machine for the preparation of the material requisitions and the production documents such as job cards and route cards. The work orders are received by the Shop Progress Offices who further process the work orders as per the schedule. Progressing of jobs is done by a central Follow-up section of the Production Control and the Shop Progress Sections. These sections ensure that schedules are adhered to by following up and smoothening difficulties duly anticipating delays in order to take preventive action before there is an obstruction to the flow of production. The fixation of target dates by the system of scheduling adopted enables delayed items being pinpointed and progressed from day to day. Delayed items are currently indicated on dispographs.

An efficient system of storage has been introduced, which ensures that materials are in readiness for assembly at the proper time and proper place, and by proper scheduling all the confusion that arises out of a hand to mouth system has been avoided. Material salvaging is done by a special section.

The efficiency of load centres is computed by means of mechanical tabulation by Hollerith machines which also furnish particulars of idle time and other statistics for production control. The Production Planning and Control Department has been given due importance to enable it to run rather as the brain trust of the workshops where all the thinking is done and a day to day picture of the entire factory is presented by this department by suitable charts for the benefit of the Works Managers and the Administration.

COST CONTROL

The importance of cost control in the efficient functioning of the shops cannot be over-emphasised. After all, it is the cost which gives the true index of efficiency of the entire organisation. A proper cost accounting system has been introduced, so that material and labour costs of the sub-groups of the coach are obtainable for each batch of coaches manufactured. Variations in costs of batches are analysed to highlight to the Administration and the Works Managers, inefficient working if any, so as to enable them to take remedial action. Overheads, idle time, etc., are also fully analysed to enable proper exercise of control by the officers concerned.

BUDGETARY CONTROL

Budgetary control is currently maintained. The yearly budget for the factory is prepared for the different departments and shops in conformity with the Accounts Code and the actual expenditure against the budget provided for is watched by the Administration and the Works Managers to ensure that the anticipated trend is maintained.

STATISTICAL CONTROL

For the purposes of managerial control, statistics of performance of each section and shop and of the whole I. C. F. are maintained, mechanical tabulation being adopted in most cases.

ORGANISATION

Naturally the organisation of a mass-production unit has to be radically different from that of a jobbing repair shop. A mass production unit, even though Government-owned, has to compete in the market on a commercial basis and therefore the organisation must be fully alive to the developments, market conditions, etc., and at the same time exercise proper control on the activities of the factory to minimise wastage in material, labour and overheads. There must, therefore, be clear demarcation between the persons laying down the policy and the persons who have to execute it. There must be adequate time available for everyone to plan and improve the methods.

The present organisation of the Integral Coach Factory, where the Chief Administrative Officer has the Finance, Stores and Mechanical Departments under his unified control is very satisfactory and enables good co-ordination to be maintained and prompt action to be taken in case of an emergency. Perhaps this could be improved upon if only it was possible for the Chief Administrative Officer to procure material directly instead of through the central organisation.

GENERAL REMARKS ON MATERIALS REQUIRED FOR LIGHT-WEIGHT COACHES

It has already been explained that the light-weight design has proceeded from the static to the dynamic conception and therefore it is necessary to consider all designs from the dynamic point of view, *i. e.*, ability to do work and not to deal with forces as in the case of static considerations. The I. C. F. has come in for some criticism because of its reluctance to depart from the methods adopted, but it is hoped that from what has been explained and in view of the fact that in the light-weight coaches the weight of every component has been cut down to the bare minimum to obtain higher outputs, performance and speeds, it would not be advisable to depart from tried-out materials and methods, unless very thorough trials are conducted. Further it has also been explained that the prevention of corrosion is of particular importance with light-weight vehicles as it can result in rapid destruction of the thin walled members and can very appreciably reduce the tensile endurance limits. It is on account of these reasons that it is absolutely necessary to use good quality of steel which will be guaranteed for weldability and will not be liable for corrosion. The steel is, being imported for the time being but it is hoped that Rourkela would be able to meet the requirements of the Coach Factory.

The Administration is fully alive to the necessity for encouraging indigenous products and every effort is being made to do so by giving technical advice to the various Indian firms. It is, however, a matter of time when these things would develop to the strict specifications and inspections exercised in the I. C. F. and during the period of development there is no other recourse but to import some of these materials from abroad. What has been achieved already in this direction is noteworthy. In the first batch of coaches the cost of imported material was Rs. 34,895 per coach as against Rs. 14,955 worth of indigenous material. In the last batch the imported content of the coach was only Rs. 24,925. This will clearly indicate the rapid progress that is being made in this direction.

PERFORMANCE

It would possibly be in the fitness of things to mention here the performance of I. C. F. since it went into production on the 2nd of October, 1955. On that auspicious day, Mahatma Gandhi's birthday, our Prime Minister, Shri Jawaharlal Nehru inaugurated the production in the shops, when the assembly of coaches, from knocked-down components received from our technical collaborators in Switzerland was started. Since then, there has been steady

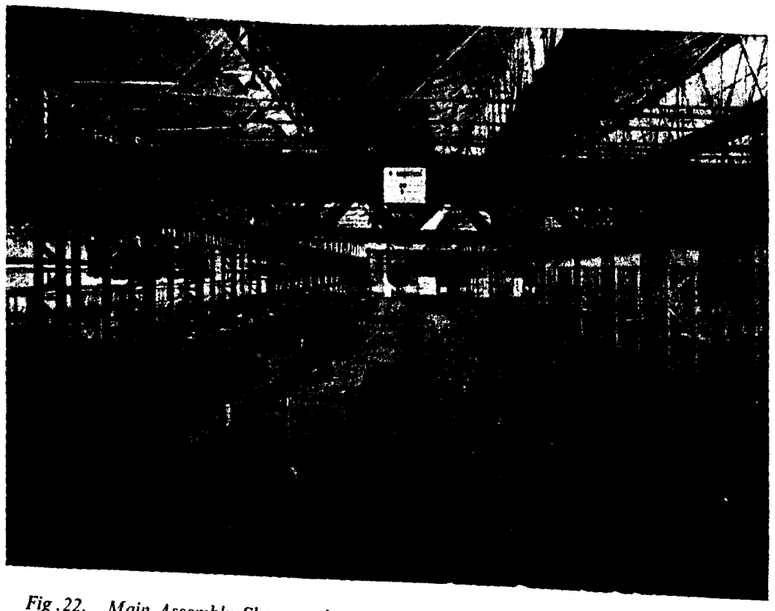


Fig. 22. Main Assembly Shop at the time of Inauguration of Production (Oct. 1955)

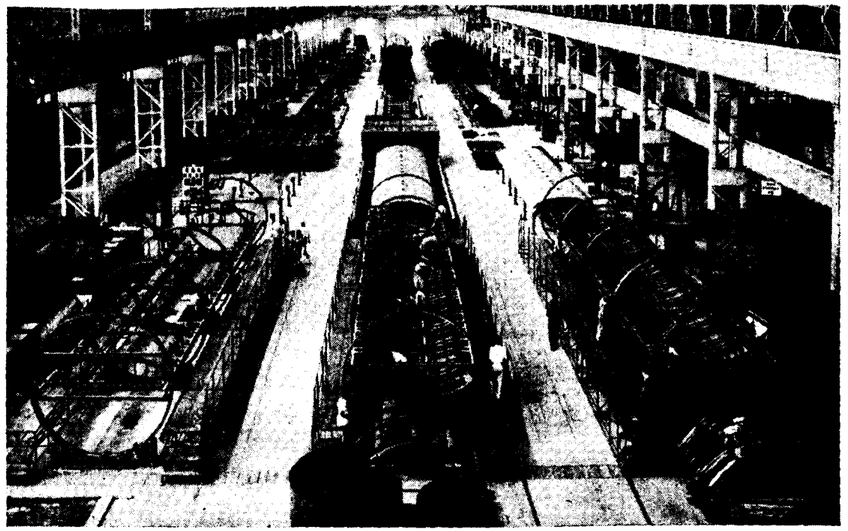


Fig. 23. Main Assembly Shop as it is now (Feb. 1957)

progress and now all the six Assembly Lines have been fully established and are in production. (Figs. 22-23). In February 1958 itself the full production target of 30 shells a month was achieved, instead of in 1960—61, laid down in the Technical Aid Agreement. Achieving this two years in advance of the scheduled date speaks for itself of the performance of the Indian personnel at all levels.

It might perhaps be also interesting to mention that the I. C. F. is now producing allmost all the components, sub-assemblies and assemblies for which it was planned. As already mentioned, most of the imports consist of raw materials, specially steel. The latest batch cost reports show that the cost of the shell has come down to about Rs. 1 lakh, which is cheaper even than the Schlieren ex-Works price of Rs. 1,02,000, exclusive of vacuum brake fitting, limpet asbestos spray and exterior painting which amount to Rs. 5,750. The landed cost of a similar coach is Rs. 1,87,000. With greater efforts and with the overheads distributed over larger number of coaches, this price is bound to come down further.

IMPORTANCE OF MAINTENANCE ON THE RAILWAYS

The light-weight coaches in India bring a new era of passenger comfort to the Indian Railways. It is, however, very necessary that these coaches are maintained with the same care as one would give to his motor car and the public also co-operate in maintaining them to the high standards. It is only then that it would be possible to get the best out of these coaches.

Annexure I

BOGIE FRAME TO DRAWING NO. T—0—3—001/00 MANUFACTURING SECTION

In the Bogie Frame Manufacturing Section, each belt consists of 15 stages and the sequence of operations is as under :

1. Detail for Bogie Frame.
2. Bogie Assembly Jig.
3. Space for Stacking.
4. Bogie Assembly Jig.
5. Space for Stacking.
6. Welding on Trolley (Left).
7. Welding on Trolley (Right).
8. Welding.
9. Straightening.
10. Welding.
11. Setting.
12. Welding.
13. Straightening.
14. Finishing.
15. Inspection.

DETAILS FOR STAND No. 4

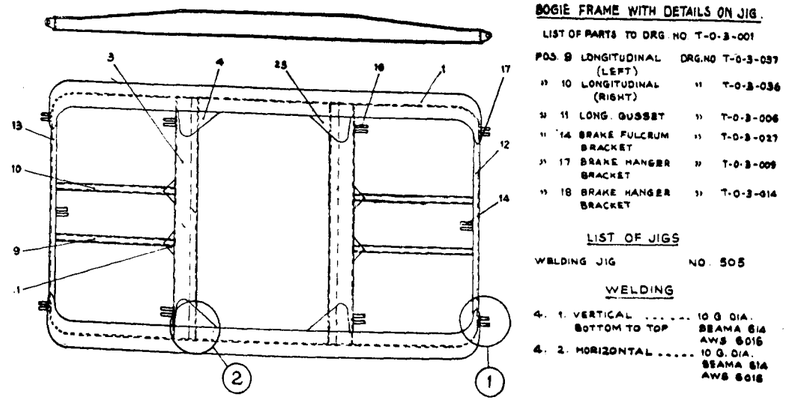


Fig. 24

For each stand the parts to be used, the jigs to be used and the material to be used have all been finalised. For example, Figure 24 illustrates the above particulars required for stand No. 4.

At the stage, the following further data are given :

(*a*) *Welding position*—Horizontal, turn to horizontal, vertical, bottom to top etc.

(*b*) *Welding direction*—This is shown on a separate sheet by the photographs with arrow marks.

(*c*) *Size of Electrodes*—The diameter of the required electrodes is given in gauges.

(*d*) The specification of the electrodes is given in two standards, *viz.*, BEAMA (The British Electrical and Allied Manufacturing Association) and AWS (The American Welding Society).

(Continued from page 16)

About 80 factories in the Netherlands regularly receive important orders for the construction of railway material and equipment. The Netherlands Railways have also co-operated in ensuring that products of foreign industries can be manufactured in the Netherlands under licence. For instance, the N. V. Spoorweg Sein-industrie at Bussum is making signalling equipment of an American type and the N. V. Werkspoor and the N. V. Heemaf have received orders for building locomotives of American design.

The Netherlands Railways are accounting for a considerable portion of industrial transport. For instance, the transport of crude oil from the oilfield in the North-East of the Netherlands to the refinery near Rotterdam is effected entirely by rail. Furthermore, a substantial part of the transport of coal from the mines in the South of the Netherlands and the transport of ores, fertilizers, building materials and agricultural produce is handled by the railways.

The Growth of the Railways in the Netherlands

ON the 20th September, 1839, the first railway in the Netherlands was opened between Amsterdam and Haarlem. The concession for this line, which was extended to Rotterdam in 1847, was held by the Hollandsche Ijzeren Spoorweg Maatschappij, called H. S. M. for short, which was founded in 1837. Soon after the opening of the first railway in the Netherlands a second railway company was established, the Nederlandsche Rhijinspoorweg Maatschappij, or the N. R. S. It owed its existence to the wish of King William I to have a railway constructed from Amsterdam via Utrecht to Arnhem. This line was completed in 1845. Subsequently, a whole series of concessions for constructing railways was granted, but owing to lack of capital the concessions were never taken up, with the exception of a concession for a line Utrecht—Zwolle —Kampen, which was constructed by a new company, the Nederlandsche Centraal Spoorwegmaat-schappiji, or the N. C. S. Since a cohesive system of railways was of the greatest importance for the Netherlands, after a great deal of controversy in 1863 a law was enacted which provided for the construction of railway lines by the State. For the operation of this State network the Maatschappij tot Exploitatie van Staatsspoorwegen, called the S. S., was formed. Many difficulties had to be surmounted in the construction of this State railway system, which comprised the main arteries of railway traffic, but gradually a cohesive railway system did at least emerge. The operation of this network, however, left much to be desired. There were too many large and small railway concerns and there was unhealthy competition. Tne Government studied various proposals for putting an end to this conflict of interests and in 1890 it concluded contracts with the H. S. M. and the S. S. The main lines were divided between these two undertakings, the N. R. S. being closed down. The lines were henceforth to be operated by the H. S. M. and S. S. "on terms which were as identical as possible on the basis of concentration and competition, employing in ample measure the common use of lines, stations and commercial establishments", as the history books put it. For 27 years this agreement continued to control the Netherlands Railways, until in 1917 an amalgamation of interests came about between the H. S. M. and the S. S. The need for this had already been felt for some time; in the war years 1914—1916 it began to be felt far more intensely. In 1916 the two companies requested the Government's approval of an amalgamation of interests and it took effect on the 1st January, 1917. It was a community of assets and liabilities, but not of capital or of reserves. This was accompanied by the winding up of the Nederlandsche Centraal Spoorwegmaatschappij and the Noordbrabantsch-Duitsche Spoorwegmaatschappij, so that by then all the railways in the Netherlands, with the exception of the local railways of Zealand—Flanders, became the property of the combined S. S. and H. S. M., under one name, viz. the Nederlandsche Spoorwegen or Netherlands Railways.

In the years after World War I the cooperating companies laboured under a great increase in operating costs, as a result of the rise in prices and the rate of interest. In connection with this difficult financial situation, in 1920 agreements were made between the railway companies and the State, under which the State granted a guaranteed dividend to the shareholders and in return therefore acquired the majority of the shares. Although in the years 1924 to 1930 the annual deficits did not recur, owing to an improvement in economic conditions, the financial position of the companies was still uncertain, in consequence of the inadequate depreciation policy which had been pursued for years. Arrears in this respect were estimated at 229 million guilders in 1928. This over-capitalization in the years after 1929, when, owing to the development of transport, the value of railway assets fell, constituted a serious obstacle in the competitive struggle with road transport, which was repidly developing. The economic depression which commenced in 1929 did not improve matters. This was the reason why a reorganization was carried out, the object of which was to establish the basis for a new and more economical structure of the business. In this reorganization, which was brought about in 1937, it was decided to liquidate the H. S. M. and the S. S. and to found the N. V. Nederlandsche Spoorwegen with effect from 1st January, 1938. Although the shares are held by the State, the Netherlands Railways are a concern which has the nature of a private limited liability company. This gives the Netherlands Railways a special position in the ranks of railway companies, as in many European countries the railways are a State concern. The economic position of the railways in the Netherlands is favourable; since 1941 the annual accounts have closed with a profit balance.

Year	Total receipts.	Profit balance
1946	fls. 262.9 mill.	fls. 7.9 mill.
1947	„ 285.5 „	„ 8.9 „
1948	„ 289.0 „	„ 0.0 „
1949	„ 285.7 „	„ 0.9 „
1950	„ 317.2 „	„ 1.4 „
1951	„ 331.9 „	„ 0.1 „
1952	„ 354.0 „	„ 5.5 „

DESTRUCTION DURING THE WAR

Before World War II the Netherlands had the best operated railway in Europe. Electrification was in progress. Of the then total network of 3,300 kilometres, in 1940 535 kilometres, or more than 16%, was electrified. On the main lines to the South, East and North the service was maintained with diesel-electric train units. The Netherlands Railways, however, came out of the last war very severely ravaged. If in May 1940 war damage was confined to rendering bridges useless and to considerable damage incurred by actual combat, inter alia in Rotterdam, all this was a nothing to the tremendous havoc caused to the railways by the occupying forces during the strike which commenced on 17th September, 1944, by order of the Netherlands Government in London. When liberation came on 5th May, 1945, the railways were confronted with a completely disrupted organization, mainly due to this senseless destruction. A few examples will serve to illustrate this clearly: of the 876 steam locomotives present on 17th September, 1944, only 126 were still available in May 1945; of the 1,499 steam-drawn passenger coaches only 146 were still usable; of the 28,861 goods trucks, only 445 were left; all electric and diesel-electric trains, totalling 950 coaches, had been destroyed or removed.

The track itself was also severely damaged. Only 18% of the pre-war net was still usable. During the occupation 116,000 tons of steel and 1,585,000 sleepers were removed. Immediately after the liberation the work of repair was tackled with the primary objective of obtaining a usable and cohesive network of railways. By the end of 1947 the most important work of repair had been completed by means of provisional measures.

For the period 1948—1952, inclusive, a programme was drawn up and put into operation for the definitive reconstruction of the most urgent facilities. From 1953 to 1958, inclusive, such work will have to be done as is essential to obtain a completely restored railway system. This definitive reconstruction will be accompanied by a modernization which will be most apparent in the form of traction, electric and diesel-electric, and from the signalling system. This modernization will bring about a rationalization of the organization, in that material available, consisting of a smaller number of units, will be able to attain greater transport achievements. The modernization of the signalling system will increase the capacity of the track and the stations. Although it has been possible so far to carry out only part of the work of repair and renewal, the Netherlands Railways, by making the maximum use of their restricted facilities, have already succeeded in attaining achievements in transport which quantitatively are considerably in excess of the pre-war figures.

THE NETHERLANDS RAILWAYS AND INDUSTRIALIZATION

In a densely populated country such as the Netherlands—and the population is still growing—industrialization is an imperative need. Efforts must be directed at providing employment in industry for ever-increasing sections of the population, as the other sectors of economic activity cannot or can only partly absorb the increase. An important contribution towards the realization of industrialization is being made by the transport undertakings and particularly those which have a national character. This is thus a task for the Netherlands Railways. This task is a very extensive one and comprises both passenger and goods transport, for industry is in equally great need of a properly functioning apparatus for goods transport, as sound facilities for passenger transport. The former is important for a smooth supply of goods and a smooth despatch of products, the second is important for attracting workers to new industrial areas. A substantial contribution towards the creation of good transport facilities is being made by the electrification and diesel-electrification of the railways. In addition, the Netherlands Railways are stimulating the development of national industry by the many orders which they have placed with industry since the end of the war. The materials for post-war rehabilitation were largely supplied by Netherlands factories and in the process some industries have delivered products which could formerly only be procured in foreign countries. The repair of the essential facilities has not brought to an end industrial activity on behalf of the Railways.

(Continued on page 14)

HERBERT LATHE DESIGN

Some features of Herbert Capstan and Turret Lathe design which contribute to high-quality, accuracy, durability and trouble-free operation

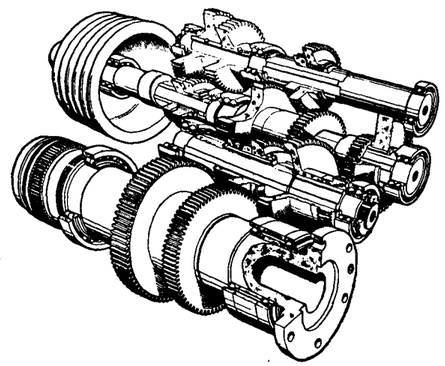
The line drawing below shows the headstock gearing of the Herbert No. 9C/30 Combination Turret Lathe, which has a maximum swing of 30".

Wall thickness and bore diameter of the spindle are $1\frac{5}{8}$" and $4\frac{1}{2}$" respectively, proportions which, with the general design, provide for maximum rigidity and eliminate chatter when machining heavy work at high speeds.

Quiet running, dependent on minimum shaft deflection under load, is ensured by large diameter shafts and the minimum distance between bearings. Where this distance is excessive relative to the shaft diameter, intermediate bearings are fitted. Shafts are also kept as stiff as possible, the method, where applicable, of clamping the keyed gears and bearings against a shoulder by means of retaining split rings or circlips being conducive to this design.

All high-stress gearing on Herbert Lathes is profile ground, an operation which, when producing cluster gears, necessitates the gears being ground separately and then clamped together.

One method of holding the cluster-type sliding gears together is with a hooked key. This positive method is preferred to the radial grub screw which tends to be thrown out of its seating by the centrifugal and vibrational forces developed by high speed shafts of this kind. The hooked-key method also permits the use of hardened and ground shafts.



Two other features of design in this Headstock are the use of sliding gears on splined shafts, in preference to using sliding keys and all shafts are mounted on ball bearings. The main spindle is mounted on ball and roller bearings; front bearings are of the angular-contact, double-purpose type to take thrust in both directions.

The power-operated Preoptive Headstock is exclusive to Herbert Lathe design and is now fitted to two sizes of each of the ranges of Capstan, Combination Turret and Hexagon Turret Lathes. This headstock with either a two-speed motor or a single-speed motor with double clutch drive, provides sixteen speeds and transmits ample power throughout the range. This headstock eliminates idle time due to speed changing and provides simplicity of operation, long life, quiet running, freedom from vibration and transmission of maximum power to the main spindle flange.

The accompanying illustration of the shaft and gearing arrangement of the Preoptive Headstock on a Herbert No. 5 Senior Capstan Lathe, shows that the high efficiency originates from a multi-vee rope drive. The efficiency is maintained through shafts and gears made from alloy steel and mounted on ball bearings. The hardened and ground gears are mounted close to the bearings to minimise shaft deflection.

The final drive is to a main spindle which is mounted on a roller bearing at the rear end and two large opposed angular contact ball bearings, which take thrust in both directions, at the front end. These bearings are specially made to precision tolerances and supplied in sets. Each bearing is guaranteed to be within .0001" in the bore and outside diameter relative to each other.

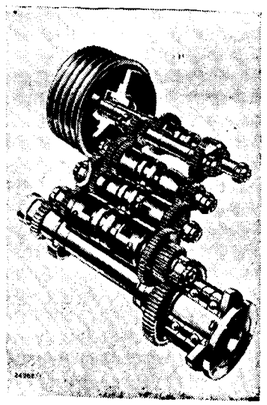
Instantaneous change of speed, under cut if desired, is made possible by the elimination of sliding gears, the actual change being made by the power operation of highly-efficient multi-disc friction clutches which are of Herbert design and manufacture.

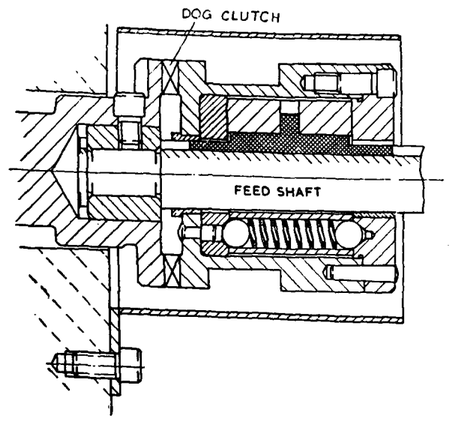
These Herbert clutches have been specially developed to deal with high-load conditions in restricted spaces. The clutch diameters have been kept small to permit adjacent shafts to be spaced closely together so reducing gear peripheral speeds and consequently gear noise.

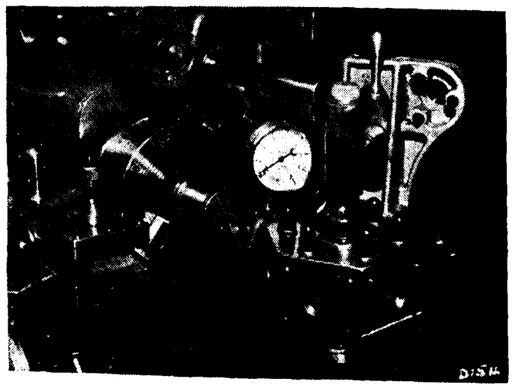
The use of multiple plates running in oil gives smoothness of action combined with the ability to accelerate and sustain heavy torque loads.

Very high speeds are possible with these clutches as they are in perfect balance and not affected by centrifugal force.

Light pressure is sufficient to operate them, therefore very little end thrust is placed on the clutch







shaft during engagement. Driving pressure is self-contained within the clutch and does not put any end load on the shaft.

Maintenance and adjustment is simple.

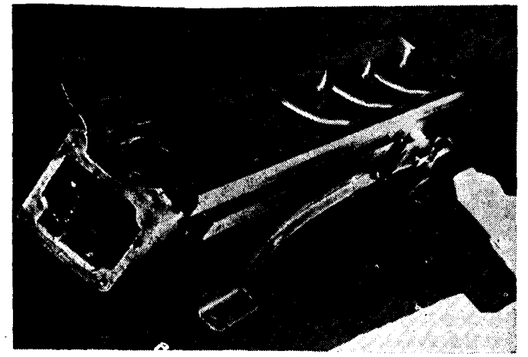
A constant-torque ball slipping clutch is fitted to the feed drive shafts on all the larger Herbert Lathes. This clutch limits, to a predetermined load, the torque transmitted and so protects the machine in the event of the operator permitting the saddle to run into an obstruction.

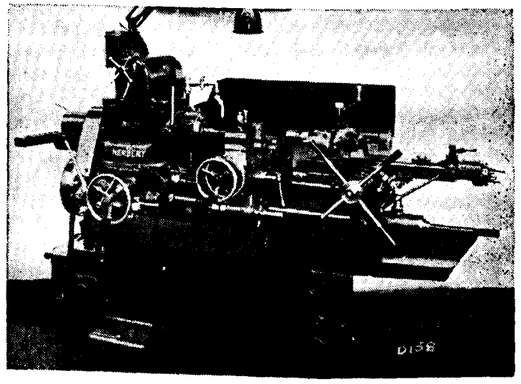
The testing of the predetermined load is shown above. A hydraulic gauge is mounted in the turret and the feed is engaged to bring the gauge into contact with the steel block gripped in the chuck. The clutch, in this test on a Herbert No. 4 Senior Preoptive Lathe, slips at $1\frac{1}{4}$ tons. On a Herbert No. 9B Combination Turret Lathe the load is 3 tons.

The dog clutch shown in the general arrangement drawing is that disengaged by the Chiprupter, a device which breaks into short lengths the long continuous turnings produced by Chipstream Box-tools. The Chiprupter control lever actuates a glut which momentarily breaks the drive.

Although accuracy is an essential feature in the construction of all machine tools, the ability to maintain this accuracy throughout a considerable period of use under workshop conditions, is of equal importance. Thus rigidity, to avoid vibration, and durability, to resist wear, are of major importance.

Rigidity is chiefly a matter of design and, once inherent, does not vary with varying conditions, foundations on the larger machines being considered as an integral part of the machine structure. Durability, however, is never absolute because wear is always present where sliding members are involved and is progressive. Thus the machine-tool maker must combat wear by means of hardened and protected surfaces and efficient lubrication systems.



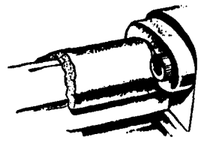


HERBERT No. 2D CAPSTAN LATHE

This is a $1\frac{1}{2}$" bar or 9" swing capacity lathe, ideal for batch production methods requiring frequent changes of set-up. Sixteen speeds, 50 to 2,550 r. p. m.; eight speeds, forward or reverse, obtained instantly without stopping the spindle.

This lathe is easy to set and simple to operate. It is capable of precision production on materials ranging from non-ferrous metals to stainless steel and its general design permits close limits to be held and maintained throughout a production run.

The machine illustrated has a long bed which increases the distance from the spindle to capstan from $18\frac{3}{4}$" (standard machine) to $26\frac{3}{4}$" and is fitted with an automatic traversing saddle. Accurate control of the transverse movement of the cross slide is provided by a large micrometer dial. This control is provided on the standard machine but an alternative fitting is the patent duo-rate cross slide which provides a fast approach and fine machining feeds.

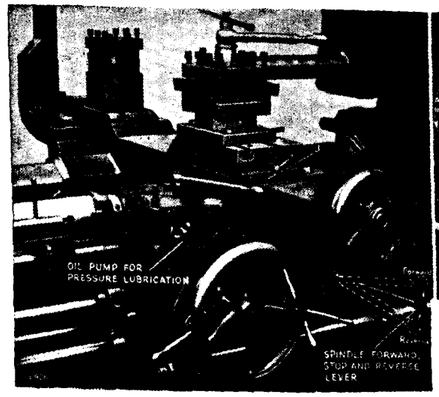


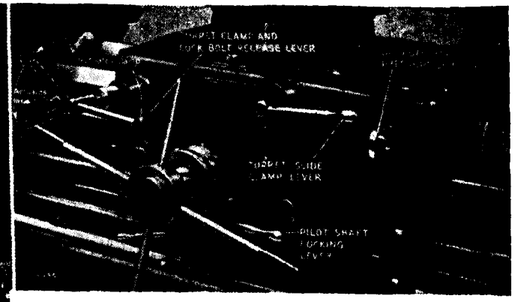
The quality of wear resistance or durability of sliding surfaces is assisted in Herbert Lathes by the Flamard process which considerably increases the wear-resisting qualities of cast-iron, without detracting from its other excellent properties. This hardening process is applied to bedways and other slides, to the mating surfaces of the turret and top slide and to spindle flanges. Wear has been practically eliminated by this process, for a check-up on a Herbert Lathe with "Flamard" bed after fourteen years continual use, confirmed that the alignments were still within the original limits.

The above illustrations show the bed for the Herbert No. 7 Preoptive Combination Turret Lathe, the protection of the asymmetric bedways by a cover attached to, and moving with, the saddle at the headstock end and the depth of hardness on the bearing surfaces of the bedways.

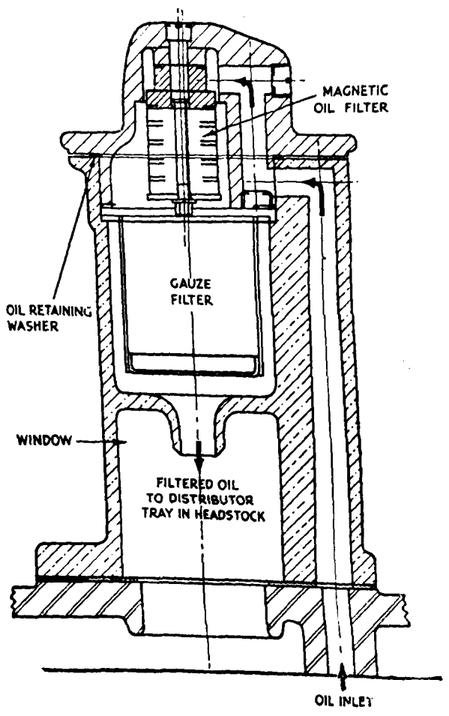
Haphazard methods and sole dependence on the machine operator for proper and adequate lubrication have been replaced by automatic continuous lubrication to important mechanisms. The operator is now responsible only for either topping-up oil reservoirs or operating an oil pump once every four hours.

An important unit in the automatic lubrication system to the headstocks of Herbert Capstan, Turret and Auto-Lathes is the indicator, which serves the dual purpose of filtering the oil, through gauze and magnetic filters and providing a visual indication that the pump is working. In this system an oil pump forces the oil to the indicator and so to a distribution tray from which it cascades over the gears, clutches and bearings. Oil is also fed through the shafts and ejected through various orifices by centrifugal force to ensure further distribution of oil to the different moving parts.





The above illustrations of the saddle and turret slide aprons on a Herbert No. 12B Combination Turret Lathe show some basic features of lathe design common, where applicable and necessary, to most types and sizes of Herbert Lathes.



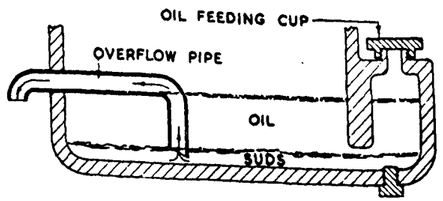
These features include :—

(*a*) Adequate protection of sliding surfaces such as the cross slide and mating slides of the saddle and turret slide with the bedways, to prevent ingress of fine chips between the mating surfaces.

(*b*) Wipers are fitted at the right-hand side of the saddle and both sides of the turret slide mating with the bedways. Bed covers are attached to the left-hand side of the saddle. The bottom slide on the saddle has been extended on the No. 12B (see left-hand illustration) to ensure full support to the cross slide at its extreme rear position and to avoid the wiper J extending beyond the end of the bottom slide.

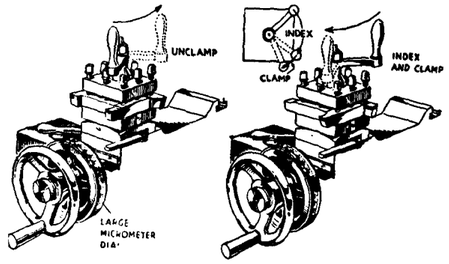
(*c*) Each apron has an oil reservoir for splash lubrication of the apron mechanisms. The overflow pipe for each reservoir also assists in draining any soluble-oil coolant which may penetrate into the aprons. The coolant, after a period of idle time, will separate from the oil and sink to the bottom of the sumps; the overflow is arranged so that when new oil is poured into the reservoir the coolant is forced out through the overflow pipe (*see below*).

(*d*) Longitudinal feeds of saddle and capstan or turret slide are accurately controlled by



"barrel-type" trip or dead stops. The fitting of barrel stops on the capstan slide has numerous advantages. They are more precise (being in-line with the thrust of the tools), contact with the trip stops is totally enclosed (chips cannot be trapped between the contact faces, neither can the operator's fingers) and are easy to set.

(*e*) The turret slide clamp lever locks the slide to the bed. Under extremely severe cutting conditions such as using a revolving centre in the turret, the clamping of the pilot-wheel shaft to its supporting boss, is advisable due to the high ratio of gearing in the turret slide apron.

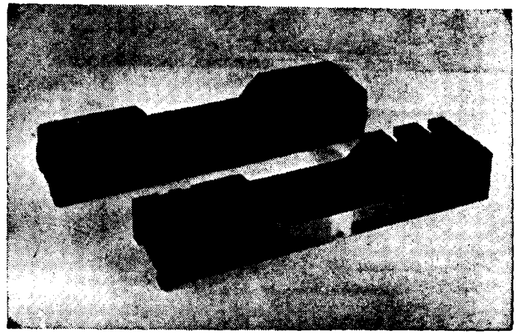


The average machine-tool is occupied in cutting for a surprisingly short period of a working shift consequently anything which reduces non-cutting times increases the productive capacity of the machine. Herbert designs ensure that controls are readily to hand and are instinctive, operation is easy and precise, without mental or muscular fatigue. It is surprising how the shape of a knob will affect production on a fast-cycle, manually-operated machine.

A standard feature of Herbert Lathes is the quick-acting square turret, illustrated above. One forward and reverse movement unclamps, indexes and clamps the turret. Cross-slides are fitted with a large micrometer dial. The dial has widely spaced, easily-read .001" graduations on a surface of satin finish chrome plating. The graduated ring is adjustable on the periphery of the dial disc so that it can be set to zero at any position of the cross slide.

Accurate indicators are fitted to this dial, also to the capstan slide pilot wheel to assist in repetition machining to close limits. The indicators on the dial avoid dependence on the operator's memory whilst those on the pilot wheel eliminate independent measuring of lengths machined in the work. The dial and indicators also simplify setting the machine trip and dead stops.

The tool clamp screws on the cross-slide tool posts have ground threads. After years of continual use, little damage is caused to screw threads and tapped holes in the toolposts. Their replacement is necessitated only by burred heads (caused by using incorrect spanners) and stepped contact clamping faces (caused by clamping on the edges or steps of tools).



All cross slides on Herbert Lathes (except the Nos. 0 and 1 Capstan Lathes, which are of cast-iron) are machined from forgings, approximately 212 Brinell, to ensure maximum strength and rigidity. One forging from each batch is laboratory-tested, a procedure followed with all deliveries of raw materials to our works.

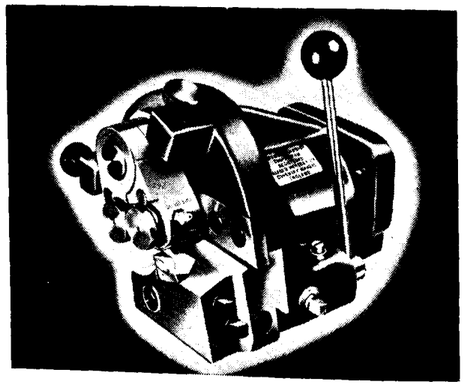
Efficient production is as much dependent on the tooling as on the machine—Herbert tooling is designed to ensure the maximum productivity.

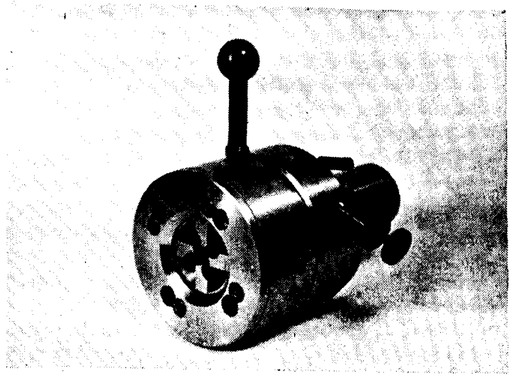
Tools can be set, clamped and used to take full advantage of the power available at the spindle.

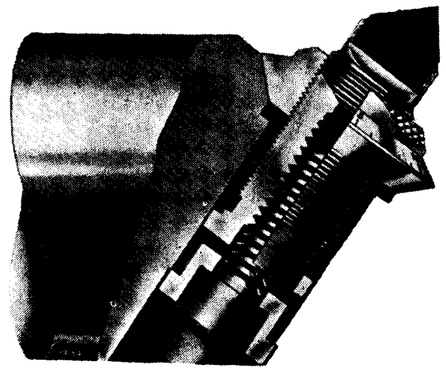
Standard outfits of tools for barwork or chuckwork are available for each size of machine and will deal efficiently with all normal work. Coventry Dieheads and genuine Coventry Dies will cut good threads at high rates of production in any material which can be threaded. Ardoloy, Chipsteam and Microbore tools are highly developed to meet modern production requirements.

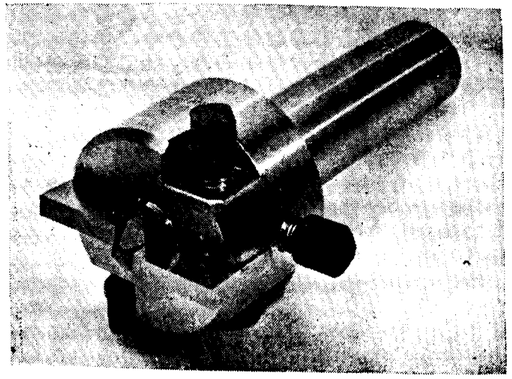
Many other features contribute towards general durability of Herbert Lathes; for example :—

(*a*) Where desirable, knee and combination toolholders are made of light metal, as









strong as, but 60% lighter than similar sizes of cast-iron holders. Thus in addition to reducing operational fatigue, wear on the capstan indexing and locating mechanism is minimised due to the reduction in weight, inertia and momentum.

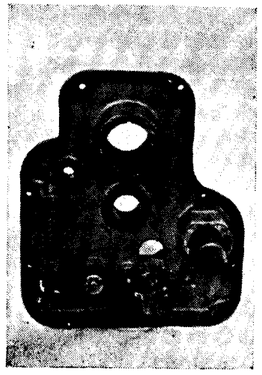
(*b*) Interlocks prevent the simultaneous engagement of two speeds or feeds, or prevent gear changing until the clutch drive is disengaged.

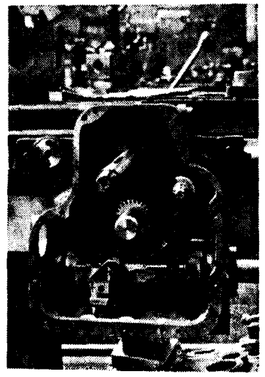
(*c*) Combination Turret Lathes are fitted with a frictionless rotating turret which can be easily rotated by hand in either direction, irrespective of the weight or unbalanced mounting of the tools. (On unclamping the turret, a thrust race is held firmly against the underface of the turret.)

A single oil pump on the saddle and turret slide aprons on a Herbert 12B Combination Turret Lathe, lubricates the slides and gib strips mating with the bedways. Oil grooves zig-zagged to the full length and width of the slides and gib strips ensure distribution over the full contact area. Other moving parts such as the front and rear cross slide stop-bar bearings, rotating barrel stops and cross slide handwheel (saddle), turret locking, stop bar indexing and turret slide clamping mechanisms (turret) are also lubricated by these systems.

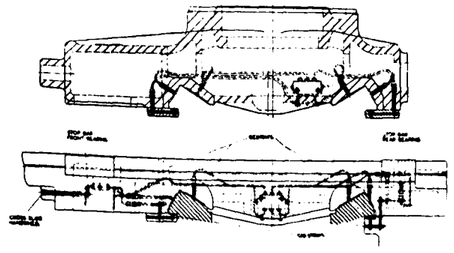
One stroke of the oil pump every four hours is sufficient.

This efficient single-shot lubrication system is also standard on the Herbert No. 5 Senior Preoptive Capstan Lathe and is a feature of design which has achieved a greater significance by the evolution of new machining techniques which today subject the machines to far more exacting conditions than those previously experienced. This method of pressure lubrication has been developed on most Herbert





This illustration shows the front cover removed from the Capstan Slide apron on a Herbert No. 4 Senior Capstan Lathe. Automatic feed is engaged by moving a small lever 45°, to rotate the detent pin "g" which, when the cover is fitted, is in the centre of the glut G to lift the worm box and thus mesh the worm and wormwheel. The drive is mechanically held by the retaining latch B, as shown at "b". Another lever on the saddle apron, through the pin "d", moves the cluster gear carrier D longitudinally along the splined feed shaft to bring either the fine or coarse feed spur gears into mesh. (Coarse feed is obtained when gears E and F are meshed.



Lathes to an ultimate which, with the Herbert system of Headstock lubrication, is conducive to prolonged life of the machine and accuracy of its products.

The power feed to the capstan slide is from the feed shaft through the spur gearing, worm and wormwheel and through gearing to the top pinion shaft which meshes with the rack bolted to the under-side of the capstan slide. After the completion of the forward stroke of the capstan slide, the feed is automatically tripped by an adjustable stop in the rotating barrel at the end of the top slide, which contacts a trip lever which rotates shaft A to press the plunger "a". The downward movement of this plunger rotates the trip plate under the retaining latch B to permit the worm box to drop and thus bring the worm out of mesh with the wormwheel. Rapid disengagement of the drive is ensured by the spring S.

This simple and very effective method of tripping feeds, generally known as the drop-out worm, is extensively used, not only in the Capstan Slide apron, but in saddle and turret slide aprons on Herbert Capstan and Combination Turret Lathes fitted with power feed. In these aprons the worm boxes are mounted on ball bearings and the worm shaft in the worm box is provided with ball thrust bearings.

Ball-bearing mounts considerably reduce loads and, consequently, the rate of wear and power losses, but the extreme importance in fitting them to apron worm boxes is that they minimise friction, a desirable factor to ensure an efficient, rapid automatic reverse feed disengagement. Immediately a forward power feed is tripped, the drive tends to throw out the worm whereas on a reverse feed, the frictional tendency is for the worm to remain in engagement with the wormwheel.

On Herbert Lathes fitted with quick-power traverse an interlock is incorporated into the turret slide drive mechanism to disengage the pilot wheel automatically when either the power feed or quick-power traverse is selected. This is a safety precaution primarily to safeguard against injury due to a rapidly rotating pilot wheel when the quick-power traverse is operative. An oil dashpot is also fitted into the quick-power traverse selection mechanism to ensure that the pilot wheel clutch remains disengaged until the turret slide is stationary.

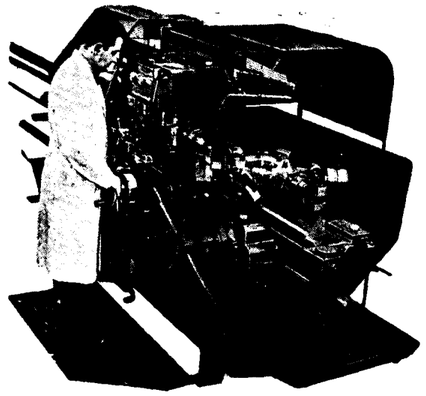
All essential features are incorporated to safeguard the operator against lack of vigilance or the unforseen. Particular attention is drawn to :—

(*a*) Complete enclosure of tools and work during operation. The front guard is provided with a window to give full view of the work when in position.

(*b*) Protection of rotating shafts slides and covered bedways.

(*c*) Chip deflectors on Chipstream Boxtools, a safety precaution which, with the Chiprupter, avoids injury from the long coiled turnings produced.

Notice also the compactness of design and that



all operating controls are within easy reach of the operator.

The Herbert No. 5 Senior Preoptive, shown above, is a masterpiece of Capstan Lathe design. It incorporates all the basic and proved features of Herbert designs and numerous new developments to meet specific requirements of users. These include:—

(*a*) Automatic sliding and surfacing saddle with or without chasing and taper-turning attachments. The taper-turning attachment is supplied complete with a special square turret and is mounted on the cross slide in place of the standard turret, a development which simplifies setting and operation.

(*b*) Cross and longitudinal feeds to the saddle are independently reversible to the longitudinal feed of the capstan slide. Thus either of the cross slide tools can feed transversely towards the work at the same time as the capstan tools feed towards the headstock.

(*c*) Automatic trip to chasing mechanism, when fitted.

(*d*) Automatic clamping of hollow turret. The hollow construction permits bars to be passed through, when required.

(*e*) Leader control to capstan slide if required. Of extreme advantage in precision cutting of threads requiring a number of cuts, when using a diehead or collapsing tap.

Equally important and well-known Herbert features are a diagonally-braced bed, large chip clearance, transverse adjustment of square turret and longitudinal adjustment to rear toolpost.

FURTHER DEVELOPMENT IN LD STEEL-MAKING PROCESS

A delegation of British specialists of the metallurgical sector has arrived in Austria to conduct negotiations on the granting of a licence for the industrial use in Britain of the Austrian LD steel-making process. The Austrian partners in these negotiations are the Austrian Alpine Montan Steel Corporation and the United Austrian Iron and Steel Works (VOEST).

Particular consideration in respect of British requirements will be given to a licensing of the recent further development of the LD-process, permitting the utilization of high-phosphorous-content pig iron for the production of top-grade steel. Other negotiations of the granting of foreign licences on the LD-process are under way with Portugal, Rumania, Hungary and Rhodesia.

*** *** ***

QUICK METHOD OF EVALUATING ORES

The U. S. Bureau of Mines has developed a simple and accurate method for using X-ray equipment to analyse certain earth ores, metals, and compounds which are of growing military and industrial importance. The new technique makes it possible to analyse 40 samples in a single day. By contrast only about a dozen samples could be analysed in a week by methods formerly used.

The basis of the new technique, known as X-ray emission spectroscopy, is that every element has a characteristic, simple X-ray line spectrum. High energy X-rays cause the atoms of the sample to become excited and re-emit fluorescent X-rays, which are characteristic of the elements in the sample.

In the Bureau's method, these rays strike a special crystal, which reflects the characteristic line spectra of the various elements at different angles as its race is rotated. Use of instruments of automation in the method virtually eliminates the chance of human error, and so within limits provides an accurate method for determining the purity and for making quantitative analyses of rare earth preparations. One of its advantages is the ease with which technicians can be trained to prepare samples and operate the X-ray machine.

SOUTHERN RAILWAYS MAGAZINE Regd. No. M. 5551 Vol. X No.3 September 1958

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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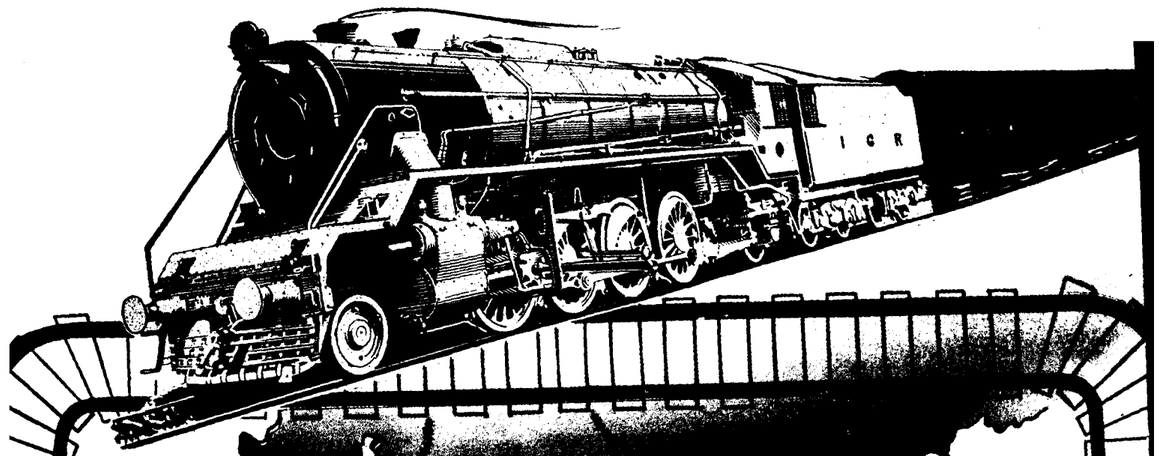
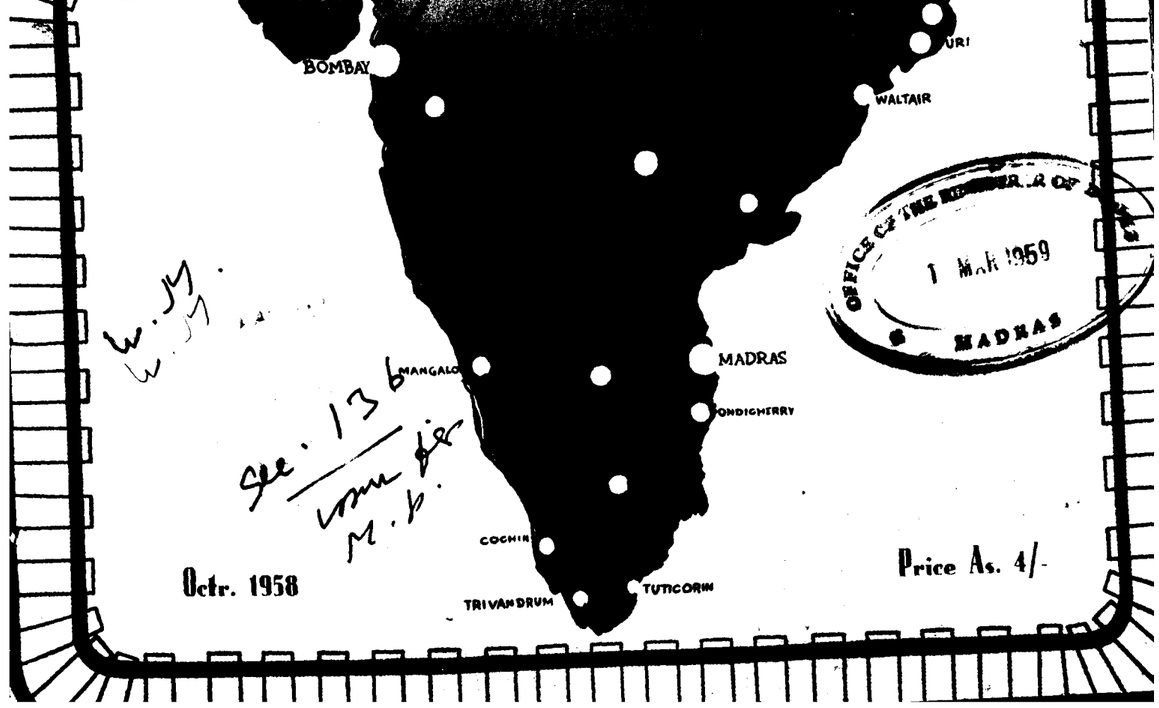
ENGINEERING SUPPLEMEN

SOUTHERN RAILWAYS *Magazine*





Octr. 1958

Price As. 4/-

Southern Railways Magazine

MACHINE SHOP & ENGINEERING SUPPLEMENT

CONTENTS

A few Automatic Railway Wheelset Reprofiling Mounted Wheel Lathe with Built-in Hydraulic Copying — Hydrauto'matic Tour Sculfort

ONE of the major problems of Railway Engineers has always been wheel turning. The floor space required for wheelsets lined up waiting to be accommodated in the wheel lathes, and the slow throughput of the conventional type of wheel lathes, has led to more and more space being used to install more wheel lathes to keep the wheelsets moving through shops at a rate to match the movement of other components.

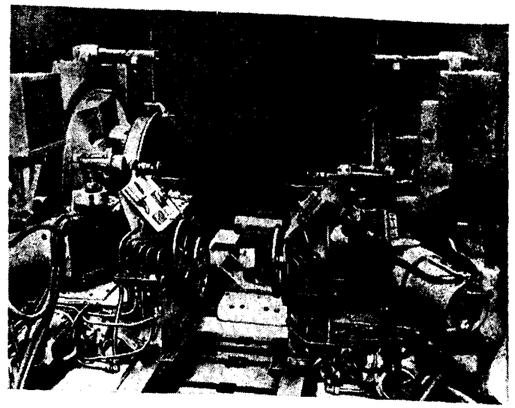
With the almost incredible increases (a) in freight and passenger traffic on Railways, and (b) in speed which requires more and more precision, the Mechanical Engineers are faced with the problem of maintaining the maximum rolling stock available for duty, which means that the time taken for repairs must be drastically reduced.

Sculfort-Fockedey, Vautier & Co., Maubeuge, France, who have more than seventy years experience in the manufacture of Wheel Lathes, have developed five years ago, a High Speed Wheel reprofiling Lathe with the sole purpose of reducing the floor-to-floor time for simultaneously re-turning new and worn wheelsets mounted on their axles.

Together with the results accruing from the continuous operation of their equipment in the leading Railway shops the world over, they have made a detailed study of hydraulic and electric equipment, so as to reduce non-machining times to a minimum and speed up machining to reduce the effective cutting time.

The Sculfort Hydrauto' matic Wheel Lathe is a self-contained machine including all necessary auxiliaries and provision has been made for synchronization of the various operational sequences. As a result of such distinct individuality it can be installed in a special small shed in the middle of the wagon wheelset park, and is also capable of quickly reprofiling the wheelsets of an electric locomotive, which must not be long out of running, due to its high capital cost.

The most important saving in time has been obtained by eliminating the conventional overhead crane which cannot give fast centering, as the balancing of the axle requires manual control for height and longitudinal adjustment, and is not always

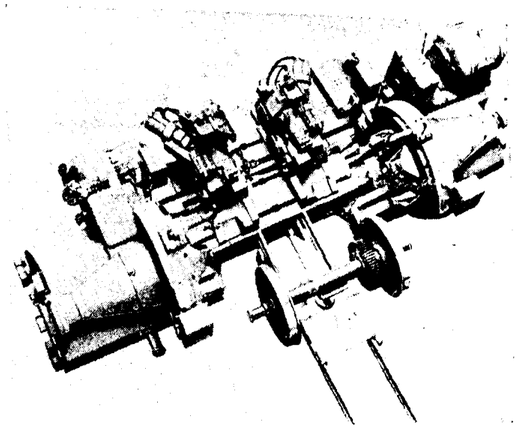


available when required. This crane has a high initial cost.

The Sculfort Hydrauto'matic Wheel Lathe is completely open at the rear, thus permitting the simple installation of a traversing, lifting and centering device.

The cuttings fall straight down into the foundations of the machine where they are easily removed by means of two steel containers.

The lifting and centering device, arranged in the central part of the lathe, consists of a carriage which



moves on a narrow gauge tract containing a hydraulic cylinder, the top of which can rotate 180°. With push button and end of travel control switches, this device picks up the wheelset, according to shop disposition, (a) on the tracks parallel to the machine axis and from a turn table or, (b) from the track at right angles to the machine axis i. e., parallel to the narrow gauge track upon which the lifting device runs, the wheelset in both cases having been previously rolled to the rear of the machine from the park outside.

On the lifting device the wheelset is brought to the machine, raised automatically to centre height and set in position to be received between centres.

This device ensures constant correct positioning of the axle ; eliminating any longitudinal adjustments of the toolposts and permits the loading of axles fitted with brake drums, dynamo pulleys etc.

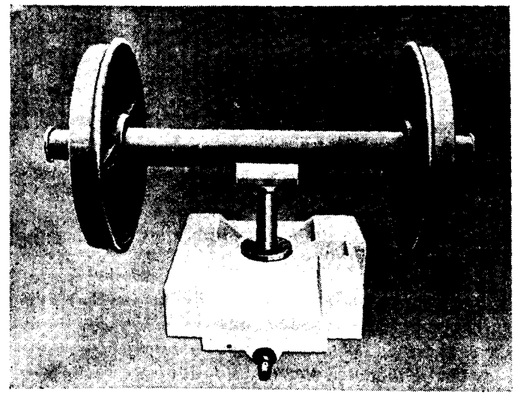
When necessary, the lifting device can incorporate a large table, also hydraulically traversed, so that wheelsets can be picked up on the treads, in order to avoid dismantling any unit, for example an electric motor on electric locomotive wheelsets, which prevents the use of the normal elevating unit, which lifts at the middle of the axle. This lifting device can handle loads in excess of 6 tons, which is normally the total weight of an electric locomotive wheelset complete with motor.

When required, or when the general disposition of the workshop necessitates, the traverse of the lifting unit, can be eliminated, and the lifting and centering device attached to the bed of the machine, thus enabling the wheelset to be rolled to the machine centre, where it is automatically raised to the exact centre height.

The approach travel motion of the two headstocks then commences and two sleeves take up the axle and, against spring pressure retract, ensuring perfectly correct alignment of the axle, until the headstocks are in the working position.

Between each of the four drivers, the faceplates are recessed so as to enable the operator to watch the constant and correct centering of the axle.

It should be noted that *no collets* are required, since the axle centre is used as a reference for the spring loaded centre in the faceplate. The axle centre being also the principal reference for other operations on wheelsets, such as journal returning and burnishing.



Both headstocks are driven by a separate motor operating through a common shaft. The traverse of the two headstocks along the bed is controlled by end of travel limit switches which ensures that the wheelset is positioned correctly in relation to the toolposts, which are set only once, in relation to the gauge of wheelsets.

The locks for the two headstocks are interconnected with the travel and immediately the correct working position along the bed has been reached, the actuation of the hydraulic locks of front and rear bolts on each headstock, commences after the headstocks are locked in position, the drivers are automatically tightened by push button control.

Each face plate incorporates four drivers suitable for all diameters of wheelsets. Axles fitted with roller bearing boxes up to 23″×23″, can be accommodated in the clear space between the drivers.

On request, the four drivers can be arranged so that they can be quickly adjusted in pairs to facilitate the handling of wheelsets of widely different tread diameters.

These drivers are individual hydraulic units, and the driving dogs have easily replaceable teeth in the end of a hydraulic piston. The approach of the dog is simultaneous, the pressure being automatically adjusted by means of an equalising valve. This eliminates distortion of the wheel rim during machining. The steady and powerful grip is also constantly maintained during cutting.

The drivers are designed for (a) lateral action, i. e.,

the contact takes place on the external side of the rim, or, (b) for radius action, i. e., the contact takes place on the external underside of the rim, when the external faces have to be machined. Specially designed drivers are also available for special work, when required.

This method of gripping and driving the wheel sets contributes to a reduction of non-machining time as much as the features above mentioned, as also does, the central control station, at which only one operator stands.

Since the operational sequences on the Sculfort lathe follow each other quickly, all pushbutton controls—levers and hand wheels—loading and unloading unit—traverse motion and locking of headstocks—tightening of drivers—speed and feed control—rapid traverse of slides and depth of cut control etc., etc., have been centrally positioned at the front of machine and between the two toolposts. From this vantage point the operator controls the machine without having to walk to various positions, as is the case with conventional wheel lathes, with two front and two rear toolposts. Since the principal motions of the machine are hydraulic and electrically operated by push buttons, almost negligible physical effort is required by the operator, which is an aid to high production.

Due to the extreme flexibility of the hydraulic equipment it is possible at any time, during the actual machining operation, from the central control panel and from the left and right auxiliary panels, to adapt the machine to the cutting conditions dictated by the particular wheelset being reprofiled.

Since the operator always stands at a position on the transverse axis of the machine, and between the two toolposts, the top of bed of the machine is at ground level, he is able to synchronise one operation with another. For example, after completion of machining, the two headstocks are traversed outwards from the axle, before they reach their limit stops the operator can set in motion the wheelset carriage which transports the wheelset to the rear of the machine. This arrangement enables handling, setting and non-machining times to be reduced to the minimum.

The Sculfort Wheel Lathe has been designed to meet the large scale production requirements of modern railway systems without specially skilled operators. As a result of a rationalization of the machining process and well tested technique, together with a sound basic design, unequalled machining times can be easily attained.

The two toolposts designed for using solid carbide pastilles consist of a heavy base fitted on the bed for positioning according to wheel diameters. A cross slide is provided which incorporates all the feed arrangements. The upper slide comprises a hydraulic copying device, this consists of sensing unit equipped with a tracer contacting a template, the pressure being less than 1 lb. The copying slide motions are controlled by a hydraulic cylinder of 5 tons capacity. High speed traverse and return motions are controlled by lever. The copying slide operates at a fixed inclination to the work, eliminating any undesirable stress, enabling almost the whole of the effective profile to be machined at one pass, that is to say, outer chamfer, slopes on tread, the flange over its maximum diameter, and also a portion down the external faces. (see fig. 1)

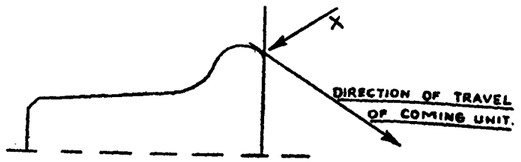


FIG. 1

After machining the inside face, the very small portion of the flange shown at X in fig. 1. is blended by a Carbide radius tool. The only manual adjustment here is the setting of the depth of cut after positioning the copying slide at the start. When necessary two passes, or a roughing and finishing cut, will be done in the same way.

The rationalization of the machining process ensures economical re-profiling of wheels. The wide variation in the amount of wear of wheels has led Railway Engineers to study profiles limits, and to establish a range of profiles for each amount of wear, so as to obtain maximum life from a wheelset. (see fig. 2)

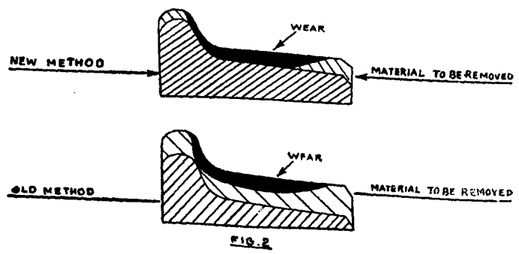


FIG. 2

Using a Tungsten Carbide Pastille, (the cost of which is very cheap), it is possible to cut through the

different hardnesses of the tread which can vary from 75—80 Kg/m^2 up to 200 Kg/m.^{2}, and so give the wheel a new profile without removal of any more material than is essential.

Depending on the amount of wear on a tread and the frequency of reprofiling, 5-6-7-8-9 or more, reprofilings may be carried out on a wheelset before replacing the tyre. Modern Railways all over the world now have a tendency to reprofile more often and to remove less material.

This economic necessity has induced the designers to incorporate, in the hydraulic copying device, a template carrier drum into which are fitted a number of templates equal to the tyre profiles to be machined.

Profile template changing requires only a fraction of a second, as the Barrel carrier can be revolved so as to introduce any one of a number of templates to the tracer.

The old system of profiling by cams requires skilled attention and the cams are prone to wear. Furthermore, a correct ratio between cam and tool size must always be maintained to ensure a true profile. The cost of one profile cam is approximately Rs. 2,500/-, and the cost of one Sculfort template only Rs. 150/-. The template length is about 6" but can be longer if required, and is 3/16" thick.

The Tungsten Carbide pastilles measuring 28 mm × 28 mm × 14 mm thick, are fixed in toolholders of the clamp type and are not brazed to a mild steel shank. The pastille has negative rake cutting angles ground on each of eight radiused corner cutting edges. A new cutting edge can be presented to the work by merely unclamping the pastille and rotating it to a new corner.

Mushroom or Button type tools used on conventional type machines can only be used in two or three positions due to the comparatively large area of the button which is engaged in cutting. Button tools require larger horsepower for equivalent metal removal rates and take longer to change as it is necessary to undo the holding screw. Regrinding is also expensive and more complicated than with the flat Sculfort type square pastille. To ensure rapid break up of chips a flat carbide chip breaker having dimensions 18 mm × 18 mm × 8 mm thick is clamped on top of the pastille. The radius cutting edge of the Sculfort type pastille gives a far superior surface finish to the wheel than can be obtained with the old fashioned H. S. S. or Carbide Button tool.

Under normal working conditions, it is possible to machine about 30 pairs of wheels with one set of pastilles, that is two pastilles, one in each tool holder before regrinding.

If care is taken to change the cutting edge before excessive wear or cratering takes place, several hundred pairs of wheels can be machined in the useful total life of a set of pastilles. When the pastille has been reduced by numerous regrinding to a minimum thickness, below which it is unsuitable for wheel turning, the pastille can be brazed to a mild steel shank and used as a conventional carbide tool on standard machining operations. The pastille can also be used as a chipbreaker on the wheel lathe. The negative rake ground on to the cutting edges of the Pastille enables the very hardest spots and sand inclusions to be machined with ease at high speed. (See fig. 2.)

An additional feature of the Sculfort machine enables the cutting speed to be reduced instantaneously (by finger tip push button control on the main panel, or the left or right auxiliary panels) should an exceptionally brake hardened or skid spot be encountered. Normal full speed can be regained in the same way. Also by rotating a simple graduated hydraulic control valve dial the rate of feed can be infinitely varied at any time during the profiling, for instance at the base of the flange where the depth of cut increases quickly. This ensures even wear at the pastille cutting edge and prevents excessive power consumption.

The feeds to each toolpost are entirely independent and the toolposts can operate at different feeds to suit cutting condition on the individual wheel. Feeds are infinitely variable up to 65 mm./min. and are applied smoothly. NOT by ratchet or pick feed mechanism, the links of which wear quickly.

Each toolpost can accommodate an extra pastille so that two tools can be engaged in machining at one time. The purpose of the second tool being to remove excess material from the top of the flange at the same time as the other tool is doing normal machining on the tread.

The Sculfort Wheel Lathe is powered with a 75 H.P. two speed motor (a four speed motor can be supplied if required). This motor is for the main drive only and other motors are incorporated for the auxiliary motions. The power available is in excess of the amount which any type of tooling at present available, can absorb.

Sixteen spindle speeds are provided through reduction gearing, and range from 3.4 to 30 r. p. m. and are arranged in arithmetical progression so that the difference between speeds is small. The speed range offered gives peripheral cutting speeds from 40—300 ft. per minute. These speeds cover the requirements for cutting with either Tungsten Carbide of High speed Steel, if necessary.

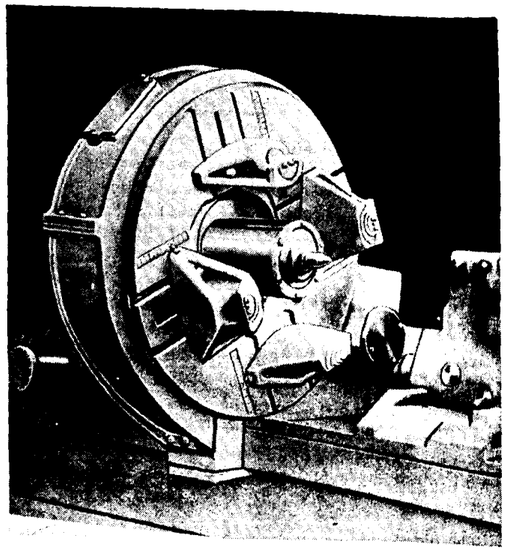
A modern high speed heavy duty wheel lathe must offer many up-to-date features, together with ample power and rigidity. The Sculfort Wheel Lathe incorporates these essentials. The machine weighs 40 tons—front spindle bearings are 16½" diameter—simple maintenance—pressure lubrication—safety devices for hydraulic and electric controls and measuring equipment etc., are all embodied.

The machine is extremely well proportioned, and has been designed in such a manner that once the main bed is levelled and grouted in, it need not be disturbed, even if the bedways require re-scraping after some years use, since they are made detachable and independently adjustable, although firmly fixed to the main bed.

The headstock bearing surfaces are provided with easily replaceable bronze friction plates ensuring long life in service. This principle is also adapted for the tool holder slides.

Pressure librication is provided to the most important points of bed—headstock—toolpost and slides etc., using adequately protected pumps and piping systems. All outlets are equipped with individual flow rate regulating and control devices. The headstock gears are splash lubricated.

Since many of the functions of the machine are actuated electrically and/or hydraulically in automatic sequence, very special attention has been paid to safety and protective devices. To mention a few—traverse limit switches—safety valves—manometers on hydraulic systems—warning indicator lamps on pushbutton control units, and finally, mounted on the main control cabinet, together with normal protective features, is an audible warning mechanism.



To ensure accurate dimensional production, measuring devices using micrometer screws, are fitted on tool slides and on the headstocks to enable simple, accurate and rapid measuring of wheel diameters.

In conclusion, the many special features incorporated in the Sculfort Lathe permit the reprofiling of wheelsets in less than ten minutes per set, floor to floor time. This figure is not as a result of a special effort on selected wheelsets, but is a normal production timing. A cutting speed of 65 metres per minute, a feed rate of 2.4 m/m per rev. and a depth of cut 3 to 5 mm.

Conventional wheel lathes utilize cutting speeds and feeds which are only half those used on Sculfort machines.

Designed as it is to meet the growing need of intensified output, the Sculfort Wheel Lathe is capable of revolutionizing the whole concept of Railway Wheel and tyre reconditioning, and slashing reprofiling costs by as much as 80% due to vastly increased out turn.

INDIA MAY ATTAIN SELF-SUFFICIENCY IN 10 YEARS

The U.S. State Department's top economic expert has told Congress that India might approach self-sufficiency in another ten years according to testimony published in Washington. Mr. C. Douglas Dillon, the Deputy Under-Secretary of State for Economic Affairs also said he thought there was 'a very reasonable chance' that Indian currency would be a relatively hard currency within ten to 15 years. Mr. Dillon testified at a hearing conducted by a House of Representatives Sub-committee on the U.S. Foreign Air Programme for 1958-59.

Leading Advertising Agency Changes its Name

KEYMERS BECOMES THE INDIAN DIVISION OF BOMAS LTD.

The Indian Branches of the well-known advertising agency D. J. Keymer & Co. Ltd. will, from 3—11—58, be known as the Indian Division of BOMAS LTD. This change reflects the decision taken earlier in the year by the U. K. parent organization, S. H. Benson Ltd., to form a separate company to develop further its overseas business. The initials BOMAS stand for Benson's Overseas Marketing and Advertising Service.

Announcing this development at a staff reception at Bombay on 3—11—58, Mr. R. F. Hardcastle—Director of BOMAS in India—said that "International advertising today knows no frontiers. We must speak with the same voice, in many different languages, to make known the goods and services which modern industry offers to the world. It is the progressive business-man who today thinks and acts in truly international terms."

A long tradition

D. J. Keymer & Co. Ltd. was formed well over a hundred years ago, in 1844, although it was not until the late 1920's that it entered the advertising field in this country. Together with other companies, expansion was held in check during the war years and the difficult trading period which followed, but since that time there has been a steady development of Keymer business in India. The company acts as advertising consultants to a large number of major national advertisers in this country, and Mr. Hardcastle said that "the considerable amount of goodwill which we have been fortunate enough to build for the name 'Keymer' in the past, will stand BOMAS in good stead during the years to come."

He went on to say that the Keymer operation in London will concentrate its development purely in the home market under the name of Keymer Advertising Ltd. "The change of our name in India", he added, "does not affect in any way the basic pattern of administration in this country. Our staff and our standards of service remain the same. The new title will, however, enable the Indian Branches of D. J. Keymer & Co. Ltd. and the Indian Market Research Service to take their place as an important part of a new international marketing and advertising operation."

BOMAS in Italy

While the staff reception was in progress, news was received from London that Bensons have acquired a 'substantial' interest in an Italian advertising agency operating from Milan. A new company has been formed—Radar Pubblicita S. p. A.—and the London interests will be in the hands of BOMAS LTD. It was stated that "news of BOMAS developments in other overseas markets will be announced in the near future."

THE ALL-INDIA SIGNAL & TELECOMMUNICATIONS SCHOOL PASSES OUT ITS FIRST BATCH OF TRAINEES

A colourful function was held at the All-India Signal & Tele-Communication School, Secunderabad, on 19—8—58 to mark the conclusion of training of the first batch of trainees at this institution. Shri B. Arora, General Manager, Central Railway, presided over the function. Shri S. A. Srinivasan, Principal of the School, in welcoming the General Manager and requesting him to preside over the function and give away the prizes and certificates of merit to the successful trainees, referred to the circumstances leading to the establishment of this institution for the training of the Signalling staff for the various Railways.

In his address Shri Arora referred to the considerable importance now attached to the proper training of Signal & Tele-Communications staff and hoped that with the intensive training that they have received at this institution they would go forth into the field and give a good account of themselves and maintain the high traditions which the Department expects of them.

A programme of variety entertainment followed in which trainees and guest artists participated. The evening's programme was rounded off with a delightful dinner at the School Hostel.

WATER COOLERS AT RAILWAY STATIONS

Water coolers to provide cool drinking water to passengers are proposed to be provided at 48 more railway stations in different parts of the country during the current financial year.

Last year, such coolers were provided at 34 stations. The stations at which water coolers are now being provided are:

Eastern Railway: Burdwan, Kiul and Jhajha; Northern Railway: Shahjahanpur, Hardoi, Khaksar, Hardwar, Dehra Dun, Etawah, Shikohabad, Hapur, Hathras Jn., Mainpuri, Churu, Moha, Tehsil, Delhi, Kishanganj, Jind Kurukshetra, Saharanpur, Ambala Cantt. and Sonepat.

North-Eastern Railway: Farrukhabad; North-East Frontier Railway: Amingaon, Gauhati, Pandu, Alipurdaur Jn., Bongaigaon, Lumdig, Dibrugarh, Siliguri Jn. and Tinsukia.

Southern Railway: Bezwada, Nellore, Tenali Gudiwada, Adoni, Dharmavaram, Dronachallam, Bagalkot, Gadag, Mayavaram, Dindigul, Tinnevelly Jn., Cannanore, Calicut, Olavakkot Jn., Arsikere and Hindupur.

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RS. 5 CRORE OUTLAY PROVIDED FOR TELECOMMUNICATIONS AND SIGNALLING

An outlay of slightly over Rs. 5 crores has been provided for the improvement of signalling and telecommunications on the Indian Railways during the current financial year.

Among the important new works to be started will be the provision of the modern route relay interlocking of the latest control switch or push button pattern at the Howrah terminal yard on the Eastern Railway. The project is likely to cost Rs. 25 lakhs.

It is proposed to introduce a "very high frequency" multi-channel communication scheme on the South-Eastern Railway. Centralised traffic control system, the most modern form of railway signalling which is widely in use in the U.S.A. and other Western countries, will be introduced on the Kathihar-Baranni section of the North-East Frontier Railway. This would help considerably in enhancing line capacity on this section.

Several schemes for improving signalling on the Southern Railway have also been included in the current year's programme.

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SPECIFICATIONS FOR HEAT DUTY FIRECLAY REFRACTORIES

Fireclay refractories intended for general purposes have been classified into high heat duty and moderate heat duty refractories, the latter being subdivided into two groups, namely Group 'A' and Group 'B' on the basis of certain well-established properties.

An Indian Standard Specification for Moderate Heat Duty Fireclay Refractories, Group 'A' (IS: 6—1958) has just been issued by the Indian Standards Institution. The standard covers the requirements for moderate heat duty fireclay refractories, Group 'A' for general purposes. It relates only to burnt fireclay refractory bricks and their shapes. This standard was first issued as a tentative standard as IS: 6—1949, and then further revised in 1953. As a result of the experience gained during these years, the Institution has decided to issue the same as a firm standard.

The Institution has issued another Indian Standard Specification for High Heat Duty Fireclay Refractories (IS: 8—1950) which covers the requirements for high heat duty fireclay refractories for general purposes. It relates only to burnt fireclay refractory bricks and their shapes. The second standard was also issued as a tentative standard in 1949, and again revised in 1953. As a result of the experience, the Institution has issued the same now as a firm standard.

Copies of the standards, published in English and priced at Rs. 1.50 and 1.00 each respectively, can be had from the offices of Indian Standards Institution, New Delhi, Bombay, Calcutta and Madras.

SPECIFICATION FOR RECTANGULAR PRESSED STEEL TANKS

The Indian Standards Institution has issued an Indian Standard Specification for Rectangular Pressed Steel Tanks (IS: 804—1958). Pressed mild steel tanks have come into use to a large extent because of their ease in erection, facility in transport, standard construction, ease in dismantling and re-erection.

The specification lays down the requirements for the materials, fabrication, erection and supply of rectangular pressed steel tanks used for the storage of cold and hot water and certain other liquids and chemicals, under pressure not greater than the static head corresponding to the depth of the tank. This specification does not cover the requirements of tanks subjected to earth or other external pressure other than wind pressure and of those used to store liquids having temperature higher than 100°C.

Copies of the standard, published in English and priced at Rs. 2.00, can be had from the offices of the Indian Standards Institution, New Delhi, Bombay, Calcutta and Madras.

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HORIZONTAL CENTRIFUGAL PUMPS FOR CLEAR, COLD, FRESH WATER

The Indian Standards Institution has drafted an Indian Standard Specification for Horizontal Centrifugal Pumps for Clear Cold, Fresh Water [Doc: EDC 35 (447)], which covers the minimum requirements for horizontal centrifugal pumps for clear, cold fresh water.

The object of the specification is to provide guidance to both manufacturers and users of horizontal centrifugal pumps for clear, cold, fresh water. The specification covers only the minimum essential details for goods quality horizontal centrifugal pumps The standard while defining the classes and types of pumps, their standard units, explains the terminology and nomenclature used in the standard, and prescribes general and specific requirements for such pumps.

Copies of the draft standard are being circulated freely, so as to elicite comments by 1st January 1958. Copies can be had from offices of the Indian Standards Institution, located at, New Delhi, Bombay, Calcutta and Madras.

* * *

INTERNAL COMBUSTION ENGINES

The Indian Standards Institution has issued the following four draft Indian Standards, relating to Internal Combustion Engines, for comments from interested persons, before *5 December 1958*:

1. Code for Rating Test of Constant Speed Internal Combustion Engines [Doc: EDC 14 (396)], which applies to the following types used for marine, auxiliary, stationary and industrial purposes:
   (a) Gas engines
   (b) Oil engines
      (i) Diesel (compression ignition), air injection
      (ii) Diesel (compression ignition), airless injection
      (iii) Surface ignition type, and
   (c) Carburettor type engines.

2. Code for Rating Test of Variable Speed Internal Combustion Engines [Doc: EDC 14 (392)]. This standard code applies to the following used for automotive purposes:
   (a) gas engines;
   (b) diesel (compression ignition), airless injection and
   (c) carburettor type engines.

3. Code for Type Testing of Constant Speed Internal Combustion Engines [Doc: EDC 14 (442)]. This standard applies to the following, used for marine, auxiliary, stationary and industrial purposes:
   (a) Gas Engines,
   (b) Oil Engines,
      (i) Diesel (Compression Ignition) air injection
      (ii) Diesel (Compression Ignition), airless injection
      (iii) Surface Ignition Type,
   (c) Carburettor Type Engines.

4. Code for Type Testing of Variable Speed Internal Combustion Engines [Doc: EDC 14 (441)], which applies to the following used for automotive purposes:
   (a) Gas Engines
   (b) Diesel (Compression Ignition), airless injection, and
   (c) Carburettor type Engines.

Copies of the draft standards, can be had, free on request from the offices Indian Standards Institution, New Delhi, Bombay Calcutta and Madras.

Track Weight and Truck Type Considerations in Switching from Steam to Diesel Operation

*By G. T. Bevan**

ONE of the more important questions being asked by countries now undergoing the transition from steam to diesel or diesel-electric power is "how will it affect rail weight and axle loading?"

These countries naturally expect dieselization of their railroads to result in increased hauling capacity and greater locomotive utilization, along with reduced locomotive maintenance.

But if their railroads become over-conservative in their specifications, they might fail to obtain all the advantages for which they are about to invest large sums of money.

This is particularly true in deciding whether to buy locomotives with A1A, B_O—B_O or C_O—C_O trucks and whether certain sections of line will have to be reconverted for heavier rail.

In general, the application of steam locomotives was dictated by certain track conditions. The counterweights on steam locomotive driving wheels produced a pounding effect (dynamic augment) which set up associated stress that had a detrimental effect on both rail and ties. Definite ratios of axle loadings to rail weights that compensated for this offset were established.

Diesel-electric locomotives do not have dynamic augment and, consequently do not produce the high track stresses encountered with steam locomotives. Therefore the rigid restrictions which applied to steamer axle-loading need not be followed.

However, when diesel-electrics entered the scene, these same rations were strictly adhered to—until motive power utilization became severely handicapped. Light rail sections were considered to be unsuitable for the conventional "heavy weight" (or all weight on drivers) of the B_O—B_O truck main line diesel-electrics. The demand for lighter axle loadings brought forth the A1A type truck. While this apparently solved the problem it had one great disadvantage. Compared to a locomotive of similar horsepower and total weight with B_O—B_O type trucks, the locomotive with A1A—A1A trucks has only two-thirds of its weight available for traction. This imposes a severe restriction on the tonnage it can handle and makes it undesirable for main line service.

Typical examples of what happens when A1A trucks are applied to locomotives of 900 and 1200 horsepower are shown in Tables I and II. In the case of the 900-hp. locomotive, approximately 58% more tonnage can be hauled up a 2% grade when C_O—C_O trucks are used.

The Missouri-Kansas-Texas Railway in the United States was one of the first to realize these handicaps. According to a report by the Railway Sub-Committee of the Inland Transportation Commission prepared for the Economic Commission for Asia and the Far East, this railroad at first requested a 1600-hp. locomotive designed to weigh 70 tons for branch line service. It was soon discovered, however, that greater utilization could be realized by operating existing main line 1600-hp, 120-ton B_O—B_O units over lines laid with 26 kg. rail. Several highly successful demonstrations proved that old axle load limitations for steamers could be increased 15—20% for diesels without any detrimental effects.

The maintenance of Way Department of another large United States railroad made a detailed study of track stresses in various rail sections under both steamer and diesel operation. The following conclusions were reached:

1. Rail weights could be reduced 18 to 20% when diesels were applied with the same axle loadings as with steamers. The report shows rail weighing 64 kg. per meter required for a "heavy" Santa Fe type steamer (2—10—2) could be reduced to 53 kg. per meter for diesels of the same axle loading.
2. Maximum tie plate loads resulting from locomotive operation could be reduced 47% by substituting diesels for steamers with the same axle loading.

* Application Engineer, (Locomotive & Car Equipment Dept., General Electric Company, U.S.A.)

3. Maximum resulting ballast pressures could also be reduced 47% by substituting diesels for steamers with the same axle loading.

However, certain other restrictions, such as older bridges and trestles, originally designed in the days of smaller steam locomotives, occasionally limited the application of new and higher capacity diesel-electrics.

Where light rail sections (25—30 kg. per meter) are used, track usually is laid with low-grade ballast, and cross tie spacing is greater than for well-ballasted main line service. Consequently speed restrictions are imposed, irrespective of the type of motive power used. This makes it possible to operate the B_O—B_O type locomotive with its higher axle-loading.

A survey of the application of standard 1500—1600—1800 HP. all-purpose road-switcher locomotives in the U. S. A. (Table III), shows that only a fraction of one per cent of those sold from 1946.

THIRD TRACK WEIGHT AND TRUCK TYPE XXX 1946

Through 1956 were of the A1A truck design. The only exception is in high-speed passenger service, where trains are operated at 128 to 160 kilometers per hour. Here the A1A design has proved quite popular. In this case, however, emphasis is on speed and these locomotives usually have higher horsepower capacity than is needed for branch line service.

An example of present thinking on U. S. railroads is found in the case of the dozen 1600-hp. road-switchers purchased by an Eastern railway in 1950 with A1A—A1A trucks, see Table III. The Operating Department of this railway found itself severely handicapped with a "light weight on drivers" locomotive. After experience with A1A trucks it realized the handicaps this design imposed on tonnage hauling capacity and these units were rebuilt with B_O—B_O trucks in 1952. Several other U. S. railroads have since rebuilt locomotives of the A1A—A1A design in B_O—B_O or C_O—C_O types. The Milwaukee and Union Pacific are two notable examples.

Many years experience on the U. S. and other countries that have already passed through most or all of the period of transition from steam to diesel shows that a large majority of the lines laid with light rail sections can be operated very successfully with locomotives having either C_O—C_O or B_O—B_O trucks.

Table IV illustrates the advantages of using a C_O—C_O truck in preference to an A1A truck on two sizes of a well-known line of locomotives manufactured specifically for export. Approximately fifty percent more tractive effort is available at 20% adhesion for both locomotives with all-driving axles as compared to locomotives with two dead axles.

In concluding this comparison, it is worthwhile to point out that before a locomotive with an A1A—A1A truck design is specified, a very careful engineering study should be made to insure that its application is economically justified. In this manner, costly results of misapplication, as illustrated by past cases where this design was initially used, can be avoided.

TABLE I
900 HP LOCOMOTIVE
COMPARISON OF HAULING ABILITY
A1A—A1A VS C_O—C_O TRUCKS

	A1A—A1A	C_O—C_O	% Difference
Total Weight of Locomotive (Metric Tons)	77	77	—
Total Weight on Drivers	51	77	50%
Number of Axles	6	6	—
Number of Traction Motors	4	6	50%
Tractive Effort Continuous Rating (kg.)	15,422	19,777	28%
20% Adhesion Tractive Effort (kg.)	10,300	15,400	50%
Trailing Tons on 2% Grade at 20% Adhesion Tractive Effort	330	522	58%
Number of Cars (20 Metric Tons)	17	26	53%
Train Speed on 2% Grade (KPH)	20	13	35%
Speed of Train with 330 Trailing Tons with C_O-C_O Type Trucks (KPH)	—	20	—
% Adhesion if Locomotive with A1A Trucks Hauled 522 Tons or 26 Cars up 2% Grade	30%	—	—

TABLE II

1200 HP LOCOMOTIVE COMPARISON OF HAULING ABILITY
A1A—A1A VS C_O—C_O TRUCKS

	A1A—A1A	C_O—C_O	% Difference
Total Weight of Locomotive (Metric Tons)	79	79	—
Total Weight on Drivers	53	79	50%
Number of Axles	6	6	—
Number of Traction Motors	4	6	50%
Tractive Effort Continuous Rating (kg.)	15,422	19,777	28%
20% Adhesion Tractive Effort (kg)	10,600	15,800	50%
Trailing Tons on 1% Grade at 20% Adhesion Tractive Effort	770	1,196	55%
Number of Cars (36 Metric Tons)	21	33	57%
Train Speed on 1% Grade (KPH)	26	17	35%
Speed of Train with 770 Trailing Tons with C_O-C_O Type Trucks (KPH)	—	26	—
% Adhesion if Locomotive with A1A Truck Hauled 1196 Tons on 1% Grade	30%	—	—

TABLE III

USA MARKET
1000 HP—1500 HP—1600 HP TYPE*

	A1A-A1A Trucks Road Switchers	Total Number Ordered Road Switchers
1946	24	55
1947	10	233
1948	3	255
1949	4	260
** 1950	12	1289
1951	0	1105
1952	0	861
1953	0	1122
1954	0	621
1955	2	1071
1956	0	965
	55	7837

Percent 0.7%

* Number Locomotive Units Sold with A1A-A1A Trucks for Local Branch Line Service in U. S. A.

** The Trucks on these 12 Locomotives were changed to the B_O—B_O Design in 1952.

TABLE IV

COMPARISON - WEIGHT, TRACTIVE EFFORT & ADHESION OF SELECTED MANUFACTURED TYPES OF LOCOMOTIVES
C_O-C_O VS A1A-A1A

Model	Truck Type	KG Axle Wgt.	KG Total Wgt.	% Wgt. on Drives to Total Wgt.	Con't T.E. (KG)	T.E. (KG) at 20% ADH	% T.E. Used at 20% ADH	% of Additional T.E. of Type A over Type B
(A) 900 HP	A1A-A1A	12,300	73,900	66.7%	12,750	9,850	77%	—
(B) ,,	C_O-C_O	12,852	77,112	100.0%	19,777	15,500	79%	58% *
(A) 1200 HP	A1A-A1A	12,150	78,900	66.7%	12,750	10,500	82.5%	—
(B) ,,	C_O-C_O	13,300	79,500	100.0%	19,777	15,900	81.0%	51% *

* at 20% Adhesion

RAILWAYS TO INTRODUCE EIGHT-WHEELER WAGONS?

A move is afoot, according to a newspaper report, to introduce eight-wheeler goods wagons on the Indian Railways in an effort to increase track capacity.

Foreign countries with long distances like United States, Canada, USSR and China have already switched over to eight-wheeler wagons, which carry more than twice that of the conventional four-wheelers existing on Indian Railways.

CENTRE-BUFFER COUPLER

To speed up operation and avoiding collisions the introduction of Centre Buffer Coupler, which is already in use in Russia, China, the USA and other countries, is being considered. The advantage of this coupler is that it is automatic and wagons when shunted—against each other link up automatically. The centre buffer coupler can also stand greater strain, facilitating the haulage of heavier and longer freight trains.

Other improvements thought of, include the installation of the electrical hump for the process of breaking up and remarshalling and mechanical loading.

*** *** ***

INCREASING SCOPE OF RUBBER RAIL PADS

The Annual Report of the Natural Rubber Development Board, just published, highlights the laying of rubber rail pads " in very large numbers " carried out in various parts of the Commonwealth during 1957.

The Report continues : " In South Africa, following a successful trial. 400,000 rubber pads were ordered for use with concrete sleepers. In Australia, New South Wales Railways are using regular supplies of pads and intend gradually to introduce these to the majority of the track which they control, whilst the Queensland Railways are to commence experiments with rubber pads in connection with their electrification scheme. Following close liaison with New Zealand Railways there seems every prospect of large-scale use in that country."

In the more general engineering field the Board's policy has been " to stimulate new developments in conjunction with the British Rubber Producers' Research Association and to issue basic information to engineers on established uses where natural rubber is pre-eminent."

*** *** ***

LOCO COMPONENT WORKS NEAR BANARAS

The Indian Railway Locomotive Components Works at Manduadih, near Banaras, is being constructed at a cost of nearly Rs. 4.8 crores. Located on 350 acres of land including a staff colony near Manduadih, an important railway transhipment yard on the North-Eastern Railway, the workshop will be constructed entirely by Indian engineers. It will employ about 2,500 persons when in full production.

The workshop will manufacture parts for both Broad and Metre gauge locomotives. A training centre with the first batch of 80 trainees is expected to begin functioning within the next few months, and teaching staff for it is now being recruited. A major portion of the land required for the project has already been acquired.

High-Production Vertical Boring Mills in Railway Workshops

RETAINING RING ROLLING-IN MACHINE

AMONG the machine tools used in railway workshops, especially those for the overhaul of rolling stock (wheels and axles), the single and double-column vertical boring mills occupy a very important position. According to whether shrunk-on tyres or solid wheels are to be machined, the standard batch-built high-production vertical boring mills are equipped with suitable tooling and clamping fixtures, which can also be fitted later or replaced and which enable these universal machines to be utilized as special-purpose machines. When boring out tyres, for example, an operational cycle must be adopted corresponding to the variety of sizes encountered in these components in repair workshops and approximating as nearly as possible to an automatic cycle.

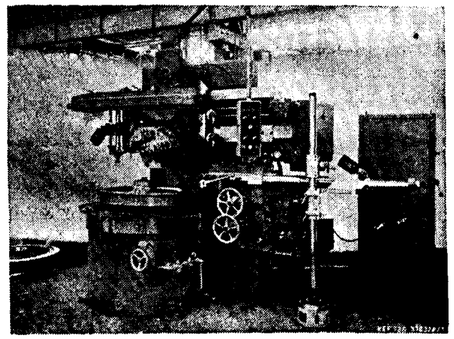


Fig. 1. Type KEF 125 Single-column Vertical Boring Mill for turning tyres and solid wheels.

The electro-magnetic clutches, which are used almost exclusively nowadays in high-production vertical boring mills for the control of the feeds, enable these machines to be equipped with tracer-controlled profiling attachments, which copy turn to a template and which are used especially for machining solid wheels. It is not only the profile of the actual running surface of the wheel which is copy turned in this way, but also in many cases the curve wheel body. The profiling attachment must therefore be fitted to both the railhead and the sidehead.

In the following paragraphs, we should like first of all to show the possibilities of application of universal vertical boring mills, our remarks being based on the assumption that these machines are of a design corresponding to the very latest workshop practices, especially as regards the efficiency of the drive and the simplicity of the centralised control, particularly in relation to feed changes.

Fig. 1 shows a type KEF single-column vertical boring mill, in which the rail elevation has been dispensed with, so as to achieve the maximum rigidity of the machine under the heaviest possible cuts.

When machining solid wheels as shown on an enlarged scale in Fig. 2, the sidehead copy turns the running surface to a template, while the five-station turret on the railhead machines the boss and, also

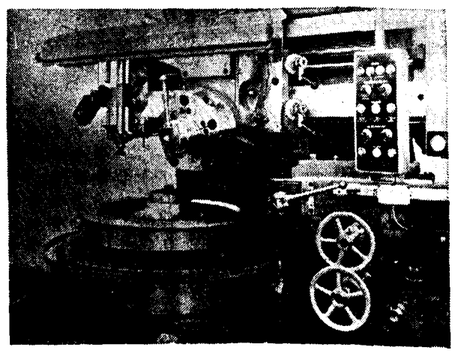


Fig. 2. Solid wheel being copy turned on a KEF 125 Single-column Vertical Boring Mill.

using the profiling attachment, turns the body of the wheel. As the boss of the wheel did not have to be bored on this machine, the wheel was held on a spigot inserted in the bore, but the machine can also be arranged to bore out tyres. For this purpose, the five-station turret on the railhead carries five tools for roughing and finishing the inside diameter of the tyre and for producing the retaining ring groove and the stop. In workshops without special wheel-set lathes, where the running face of tyres has to be profiled as well, the sidehead is utilised with the tracer controlled

HOW TO RESERVE ACCOMMODATION

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

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

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

Tickets will be issued only if accommodation is available.

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

Reservation fee is not refundable.

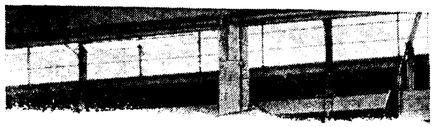
III Class seats are also reservable on Express and certain other important trains for long distance passengers from the train-starting stations on payment of a reservation fee of 4 Annas per seat.

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

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

(Inserted in the interests of Travelling Public)

profiling attachment as for the solid wheels and the side faces of the tyre are turned at the same time. The running surfaces are turned with button tools as in the wheel-set lathes.



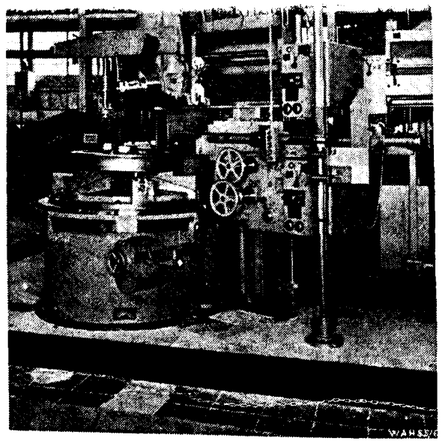


Fig. 3. Type KE 160 Single-column Vertical Boring Mill for solid wheels.

In its standard form, i. e. with elevating cross-rail this machine is intended chiefly for machining solid wheels and is equipped for machining the outside and the bore of the boss. As will be seen from the illustration, the component is held in a power-operated self-centring chuck, which can be placed on the standard table and can be supplied for operation by compressed air or oil.

The KZF double-column vertical boring mill brings a very great increase in production in the machining of solid wheels as shown in Fig. 4, the sidehead being used for profiling the running surface as in the previous cases, while the remaining turning operations, including turning the body of the wheel to a template, are divided up between the two railheads operating simultaneously. For this purpose, the railheads are provided with large faces with tee slots to take the heavy toolholders necessary for this operation. The indexing of the turret is thus eliminated. The

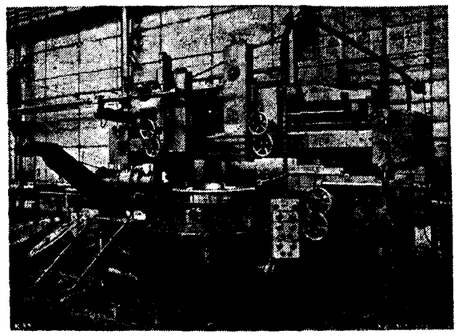


Fig. 4. Double-column Vertical Boring Mill for solid wheels.

production of the machine is increased still further by the simultaneous utilisation of several tools. These machines can also be equipped for machining tyres. Hydraulic or pneumatic chucks are preferable for clamping the components. The standard double-column vertical boring mills, type KZ, with elevating cross-rail can also be used for this work in a manner exactly similar to the single-column machines.

If large batches of tyres of the same dimensions are to be produced, as is usually the case with high production in the steel works, a special automatic tyre lathe is used. The two heads on the fixed cross rail, intended for boring on the right hand side and grooving on the left hand side, work automatically to an electro-magnetically controlled cycle. After centring, the component is automatically clamped either mechanically as in Fig. 5, or in a power chuck. Included in the operational cycle is a speed

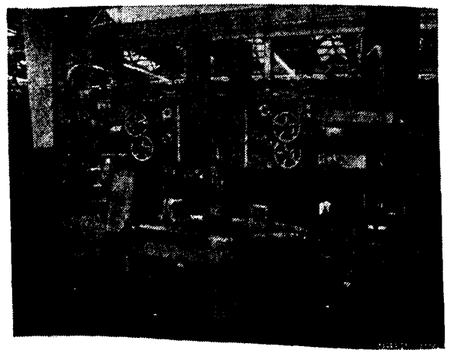


Fig. 5. Type RRK Automatic Tyre Lathe with mechanical work clamping fixture.

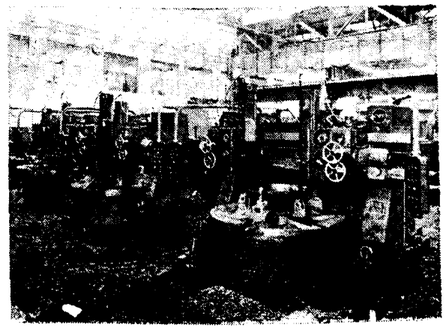


Fig. 5-a. A battery of RRK Automatic Tyre Lathes with air chucks.

change before the finishing operation commences, the table being brought up to the higher speed automatically. Further, a measuring device with a special fine measuring unit ensures that the pre-determined diameter is accurately adhered to. Gauges are used for setting the tools.

As the automatic functions can be cut out, these machines are very often used in railway repair workshops. When the tyres are sorted out and grouped in batches of the same size, a special tyre lathe reduces the machining time as compared to a universal machine, even when the automatic functions are cut out.

In all the above cases, a swivelling-arm crane is used alongside the machine to expedite insertion and removal of the components.

Retaining ring rolling-in machine Type XW.

This rolling-in machine is for beading-in retaining rings in railway wheels. The frame holding the two rolls is in the form of a casting. The shaft for the upper roller rotates in fixed bearings, the adjustment being effected hydraulically through the medium of the

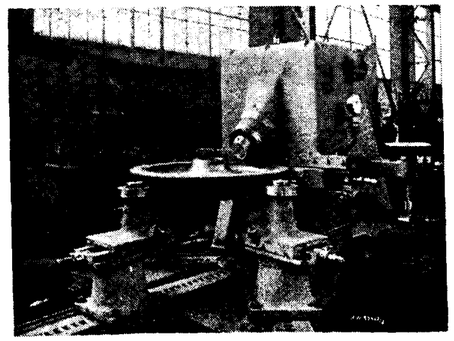


Fig. 6. Type XW Retaining Ring rolling-in Machine.

lower roller. The upper roller is conical and its centre line is at an angle to the plane of the wheel. The angle of inclination and the taper of the cone are so calculated that the contact surfaces of the tyre ring and the conical roller roll over each other correctly and without slip, this producing the best results. A special device is provided to compensate for the pressure differences caused by the varying heights of the unmachined tyres. The roller frame is connected to a base plate, which supports the holding blocks for the wheel or the wheel and axle assembly.

Finally, we should like to mention that the machining of cylinders and pistons can also be performed highly successfully on the single-column vertical boring mills, type EK and KE, described above. For this purpose, heads with square rams are used in place of the standard heads with five-station turrets. For the production of piston rings from tubular blanks, special parting-off tools for use in the sidehead have been developed.

The machines described above are from the production programme of Messrs. Schiess A. G., Dusseldorf, Germany.

STILL UNDER EXAMINATION

Shri Shah Nawaz Khan, Deputy Minister of Railways, told Shri Jhulan Sinha during Question Time in the Lok Sabha that the recommendation of the Reviewing Committee of Railway Accidents Enquiry Committee that " Judicial enquiries instead of enquiries by Government inspectorates should be held into major railway accident " was still under examination.

At present, the views of the Ministry of Communications on the matter were being awaited.

He said it had been finally decided that the Railway Inspectorate would continue to be under the Ministry of Transport and Communications.

A Short History of DAINICHI KINZOKU KOGYO CO.

Personal History of President S. Koyama,

Chairman of the Board of Committees of Osaka Prefecture Machinery Cost Appraisers,

Permanent Director of the Japan Machine Tool Builders' Association,

Chairman of the Board of Osaka Machine Consultation Club,

Chairman of the Board of Amagasaki Local Factory Association,

Directors of several other related Companies.

DESCRIPTION OF COMPANY'S PRODUCTION AND THE FEATURES

Since the establishment in 1931, the Company have been engaged in the production of the Universal Machine Tools. During the war, the entire production were supplied to the navy for the equipment of the naval vessels. In the post war years, they were supplied not only naval vessels but to practically all the new merchant ships, reconditioned ships and foreign ships built in Japan, also for the land uses in Power Houses, National Railways, Spinning Mills and other factories and machinery repairing shops. Some were exported to foreign countries.

The Company owns several patent rights, furthermore the Company received the subsidy from the Ministry of International Trade and Industry for the experimental construction of the universal machine tool to be equipped on board the vessels and travelling shop cars, etc., in 1953 and such machine was produced successfully in 1955.

Beside the production of Universal Machines, the Company is manufacturing the single unit Lathes and Shaping Machines which are drawing attention in the trade circle.

TYPES OF MACHINES PRODUCED

Universal Machine Tools—	DUM 1-GA, 2-GA, 3-GA, 4-GA-S, 2-GB, 3-GB,
Lathes—	DL-4′ 6′, 8′, 10′, 12′, DLS-6′, 8′, 10′, 12′, 14′, 16′, 18′, 20′, DLG-6′, 8′, 10′, 12′, 14′, 16′, 18′, 20′, DLS-6′, 8′, 10′, 12′, 14′, with Copying Attachment DLG-6′, 8′, 10′, 12′, 14′, with Copying Attachment.
Shaping Machines—	DSS-16″, 18″, 20″, 24″, DS-24″, 28″, 32″.

1. UNIVERSAL MACHINE TOOL

a) One Universal Machine has four machining functions—Lathe, Shaper, Drill and Milling, driven by one motor, the power transmitted to each function freely, with high precision, constructed rigidly, and simply to operate. Compared to the single unit machine tools, they are second to none in the precision and capacity.

b) Once the material is mounted on the work table, it can be machined without changing the mounting in drilling, milling and shaping.

c) Lathe bed has the gap so that large material can be machined. Both Inch and Metric screw threadings are possible.

d) Compared with single unit machines, 50% savings are possible in the installation floor space and weight.

e) The cost of the machine is 50% less than the single unit machines, 60% less in the erection expenses, 50% less in the maintenance expenses.

f) Two machining functions can be obtained at the same time, the Lathe and one of the three other functions.

g) There are several patented safety devices so as any novice can operate the machine safely.

h) Small types of Universal Machines are suitable to mount on the trucks or auto-tricycles as travelling repair cars, medium and large types are suitable not only for the repairing but also for the production purposes in various industries.

2. DS-24″ TYPE NEW HEAVY DUTY SHAPING MACHINE

a) Solid Top Ram for the heavy cutting—

In the conventional types, a long groove is bored in the back of ram which rendered it rather weak, but in this machine, in consideration of such vulnerability, a solid top ram with rib reinforcement is adopted.

b) Special stabilizing mode of Ram—

Different from the conventional types, a special construction is adopted so as the position setting screw can be tightened from outside, which eliminates the slipping of the ram when the load is applied.

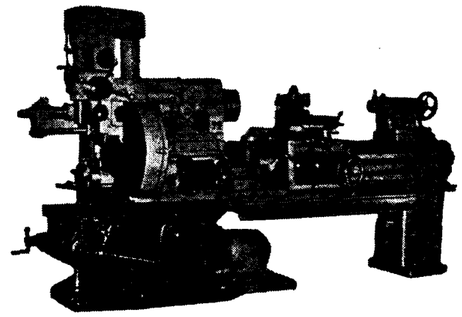
c) Anti-snaking motion of Ram—

In the conventional types, when the tool receives side pressure, it escaped toward the direction the pressure is applied, and when the side pressure is turned off, it returns to its original position, i. e. the snaking motion. To rectify such defect, there was no way but to tighten up the jigs on the sliding surface. Over tightening of the jigs made it heavier and caused the burning of the sliding surface.

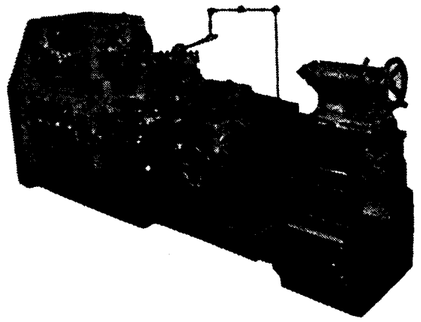
In this machine, in consideration of such defect, is equipped with a special anti-snaking motion system.

d) Longitudinal & Vertical Rapid Transverse System—

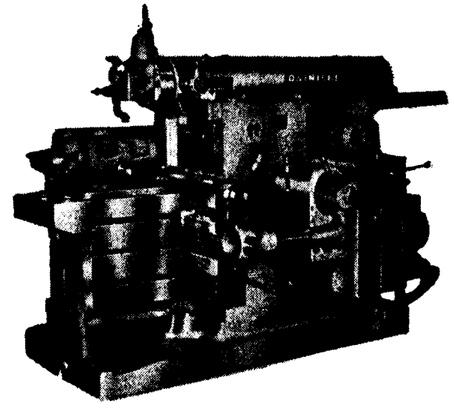
In the conventional types, the rapid feeding of the work table to the left and right was only possible, but in this machine rapid vertical feeding is also made possible.



DUM-3GA Type Universal Machine Tools.



DLG-8 Heavy Duty High Speed Lathe.



DS-24 New Heavy Duty Shaper.

e) Concentrate Clamping of Cross-rails—

Hitherto it was necessary to walk over to the both sides of the table to clamp the cross-rails to the column to tighten the nuts, however in this machine the nuts on the both sides are clamped at the same time.

f) Cutting Speed Change Handle—

Hitherto it was necessary to turn two handles alternatively to get the desired speed, but in this machine, the desired speed is obtained by turning one handle only.

g) Tool Self-lifter, Vertical Feed of Tool, Copying Attachment—

These attachments are quite necessary to advance the machining capacity. They are supplied on request of the purchasers.

3. LATHE

The Company is turning out Lathes with bed length of 4′ and upwards. The representative type is the DLG–8′ Model. Its bed and legs are cast en bloc to add the rigidity, the speed of the main spindle is changeable into 16 steps with maximum speed of 1,400 r. p. m. and constructed to equip the copying attachment if desired.

Head Office & Factory: No. 3, Hama-maruta, Amagasaki City, Japan (Telephones-Osaka (48) 6621, 6622, 9880)

Sales Office: No. 18, Masagocho, Kitaku, Osaka, Japan (Telephones—Osaka (34) 3018, 3019)

Tokyo Office: No. 498, Asagaya 4—Chome, Suginamiku, Tokyo, Japan. (Telephone Tokyo (39) 9923)

Leaf Springs for Automobile Suspension

The Indian Standards Institution has issued an Indian Standard Specification for General Requirements for Leaf Springs for Automobile Suspension (IS : 1135—1957), which covers general requirements for leaf springs for automobile suspension.

The standard has been prepared on the recommendation of the Tariff Commission which had conducted and enquiry into the Automobile Leaf Spring Industry in 1954.

The Standard prescribes general requirements for the chemical composition, leaf sections, leaf ends, centre bolts, centre holes and centre dimples, clips, surface finish and protective coatings, etc. for leaf springs and also lays down sampling methods and test for load rate.

Copies of standard published in English and priced at Rs. 2.*00* each, can be had from the offices of the Indian Standards Institution, at New Delhi, Bombay, Calcutta and Madras.

* * *

USE OF WAITING ROOMS BY WOMEN

Women passengers travelling third class are in future to be allowed to use waiting rooms which are at present meant exclusively for those travelling in higher classes.

According to a directive issued by the Railway Board, at stations which have only one waiting room for female passengers, third class female passengers will be allowed to share it with passengers travelling first and second. At stations where two waiting rooms are provided for ladies travelling by first and second classes respectively, the latter will be thrown open to third class female passengers also.

At places where the former inter class waiting rooms were converted for other use after the abolition of inter class, wherever possible, these will now be reopened for the use of third class female passengers.

MACHINE TOOLS

THE principal unit of Osaka Kiko's Inagawa Factory, the machine tool plant, was built in 1939 under the Machine Tool Manufacturing Enterprise Law. Its scale, equipment and lay-out make it one of the best machine tool plants in Japan. The company has so far turned out as many as 3,037 sets of machine tools including High Speed Precision Lathes, Milling Machines, Radial Drilling Machines, Horizontal Boring Machines, Honing Machines, Planers, etc. Since 1949 it has been making design innovations, and under Government subsidies, the company has succeeded in producing on an experimental basis Heavy Duty High Speed Milling Machines, Micro-Heavy Honing Machines. The company is now making every effort toward increasing and rationalizing production by centering it around these two type machines.

1. Heavy Duty High Speed Milling Machines

Osaka Kiko is at present turning out machines of the Vertical type No. 4 and No. 3. It is, however, planning to produce the Horizontal Type No. 4 and No. 3 as well. These tools are of the latest designs and in them are incorporated the following special features:

(a) Fitted for high precision work

(b) Rigidly built for heavy, high speed cutting

(c) Ease in operation insured by full use of hydraulic and electric controlling devices

(d) Efficient operation assured by conveniently located handles and push buttons

2. Production Milling Machines

Horizontal type No. 2 which is being produced currently has the following outstanding characteristics:

(a) The column may be moved vertically

(b) Fitted for mass production

(c) Easy conversion to vertical, universal, slotting, or drilling operation can be made by use of suitable attachments

(d) Easily operated

(e) Favourably priced in comparison with similar machines

3. Micro-Heavy Honing Machines

Osaka Kiko's experience of more than a decade plus the various improvements added to it make this machine the most advanced of its kind available in Japan. Some of its merits are:

(a) Capable of heavy duty
No grinding necessary
Capable of rough and fine honing

(b) Can perform fine finishing

(c) Partial honing possible

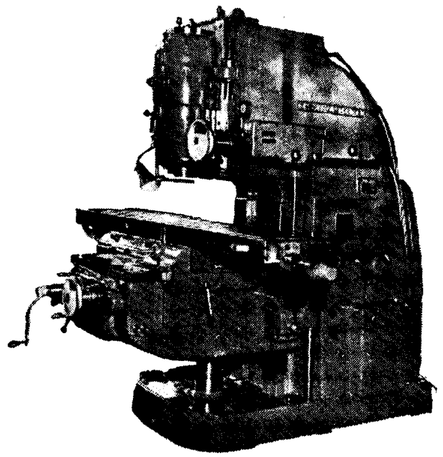
(d) Easy to operate as almost all operations are hydraulically or electrically controlled

(e) Can be handled automatically throughout operation as the machine has a boning tool equipped with an automatic sizing device, making for reduced number of operators

4. Diamond Lathes

In 1942 Osaka Kiko was awarded a prize at the first national testing and inspection for the specially high quality of its lathe. Its latest lathes are improved versions of the prize winning model. Special features are:

(a) High speed cutting, minute feed and fine finish



(b) Fine finish on light and non-ferrous metal can be achieved

(c) Rigidly built and vibration proof

5. Radial Drilling Machines

These machines embody improvements on the traditional radial drilling machines and the latest designs. Their prominent features are :

(a) Heavy cutting made possible by increased rigidity in column

(b) Increased spindle revolution, hydraulic control over changes in revolution and feeding speed and the pre-select system

(c) Equipped with a hydraulic pressure clamp

6. Other Special Machines

In addition to the above-mentioned machine tools, Osaka Kiko also manufactures machines for special purposes, such as Lathes for Diesel Engine Cylinders, Multi-Boring Machines, Crank Pin Lathes, Drill Way Cutting Machines and Rifling Machines for Gun and Cannon Barrels.

Plastics Converting Machines at "PLASTICS '59"

AT the present time, about one year before the opening of the international trade fair PLASTICS 59, Duesseldorf, 17—25 October, 1959, little can be said about the new development in plastics converting machinery which are to be shown. This article will therefore mainly deal with the significance of plastics converting machinery in the industry.

Taking into account that the turnover of the plastics converting industry in 1957 amounted to more than DM 1,580 million, the production of plastics converting machinery during the same year amounting to DM 100 million value, appears rather low, especially as 35 per cent of this total was exported. As the activities of the converting industry double or treble the value of the plastics, this means that during 1957 new investments in machinery amounting to only around DM 65 million made it possible to convert plastics worth about DM 600 or 700 million. From this total it may be gathered that the high quality of machinery already installed enabled manufacturers to use the same equipment to a large extent.

Moulding materials in particular are counted as belonging to the main body of plastics materials, and these are converted on mechanical and hydraulic presses. The machine construction used has been evolved many years ago and has experienced little change in its basic principles. However, these presses work in batches, i. e. not continuously. The development of high-speed fully automatic presses is not yet completed; machine constructions of this type up to now are only suitable for the manufacture of smaller articles. Further development in this sphere also concentrates on improved accessories; among these may be counted hydraulics as well as devices which ensure consistently accurate opening and closing of the presses.

The most important progress during recent years was certainly made with thermoplastic materials, that is materials which become soft again when heated (whereas the thermosetting moulding materials remain hard). These materials are converted to foils on calenders, made into articles of every type on injection moulding machines, and finally converted into profile ribbons, and also foils and sheets on extruders.

In 1957 the West German machinery industry produced presses to the value of DM 16 million, rolling units and calenders worth DM 22 million, injection moulding machines for DM 32 million, and extruders worth DM 20 million. Originally the rolling units and calenders were taken over from the rubber industry. These are constructions which have reached a fairly high stage of development. For the production of foils and plates the 4-roller unit is still the leading model. In the case of foil-drawing calenders on which soft PVC foils are being produced, the aim is to achieve increasingly greater widths, at the same time ensuring consistently even foil thickness. To achieve such high precision standards it has been necessary up to now to do without special surface effects in calender roller distance setting such a embossings or grainings. Separate devices have to be installed for this purpose after production.

An important type of machinery for converting thermoplastic materials are the extruders. They work quite continuously, with one, two or more extruder units built in. These extruders clearly show the close connection between machine and raw material development. Both high-tensile low-pressure polyethylene and hard PVC material cannot be converted on the normal type of extruder. Extruders with particularly long extruder units were constructed for this purpose, with a ventilation zone by means of a vacuum installed at the centre. Recently a high degree of automation has been reached with extruders; thus de-ærated extruders with wide slot nozzles have converted unbreakable Polystyrol into plates which are automatically cut to the required length. The injection head is an important part of the extruder, as the plastic product leaves the machine at this point. According to the respective shapes profiles of various kinds can be obtained or tubes up to 250 mm. in diameter, as well as foils or hollow pieces, such as bottles. This very components makes the extruder a machine of very wide application.

The development of injection moulding machines

is far from completed. Research here centres on obtaining higher and yet higher shot-weight, i. e. increasingly larger and heavier mouldings. Whereas ten years ago we had machines of only about 200 grammes shot weight in Germany, machines with about 4 kilos shot-weight are now on the market. But the development is not yet completed; it is expected that machines with up to 10 kilos shot weight will become possible Another line of research has made its mark during the last two years, since the so-called extruder injection moulding machines have appeared on the market. In these machines an extruder unit deals with the plasticizing of the material and then acts as a moulding plunger. As a result the material only has to remain in the injection moulding cylinder for a shorter period of time. The manufactured parts are therefere more consistently even and regular. At the 1958 Hanover fair four German and one English machine manufacturer showed extruder injection moulding machines of this type, so that quite a number of technical innovations can be expected in this field.

Certain difficulties were encountered in the manufacture of very deep bodies, insofar as these were to be produced on injection moulding machines. Some years ago the deep drawing process aroused attention, a process making use of thermoplastic sheets which were first heated to make them pliable and then vacuum formed. In the meantime machinery has been constructed for form areas 1×2 metres, heating the sheets from above and below and achieving drawing depths of almost ½ metre. But here too it was seen that technical progress can only be made in stages, and the vacuum moulding machines have not been able to oust the injection moulding machines. Prices for the sheet material and possible uses for the spoilage material played an important part here. Finally great experience is needed to heat the material in such a way that no irregularities arise in thickness after shaping. One interesting innovation has been to couple a deep drawing unit to the injection moulding machine immediately after production of the foil. Time and energy is thus saved for the cooling and re-heating of the material. Such installations are suitable for large-scale serial manufacture of plastic containers, etc.

Another noteworthy group of the plastics converting machinery are the crushers, cutting mills, mixers and kneaders (production value in 1957 about DM 13 million). Crushers are used in the production of plastics and also in plastics converting to crush the waste material. In addition to larger units, small cutting mills are used which are attached to the injection moulding machine so that smaller casting or moulding waste can be crushed immediately and added to the raw material again. This is important insofar as otherwise all waste has to be sorted out according to type of material and colour before transport or storage.

Finally, mention must be made of the machine type which was evolved particularly for converting plastics foils, but also for floor coverings and other roll materials; the welding plants and welding apparatus. The welding machines now work almost exclusively with high frequency. Larger units operate automatically, for instance with units for the making and sealing of filled foil bags. Operation of these units is based on the electrical properties of the materials to be sealed; for this reason it was necessary, for instance, to develop a special process for the welding of the polythene foils. As plastics are playing an increasingly important part in packaging, there is a wide range of application for welding machines and welding equipment.

The future of plastics will see numerous new developments, and closely linked to these improvements and inventions will be the further perfection and improvement of machinery for plastics converting.

RAIL WAGONS ORDERED

Orders have been placed on four Calcutta Railway wagon manufacturers for the supply of more than 10,000 wagons of different types to the Indian Railways. The orders have been placed against the 1958-59 rolling stock programme of the Ministry of Railways. A variety of wagons has been ordered, including some types which were in the past imported from foreign countries. All the wagons are intended for the Broad Gauge system. Although exact quotations remain to be finalised, the value of these orders is likely to run into several crores of rupees.

YOSHIDA'S DRILL

VARIOUS kinds of special plant-work, which was created by YOSHIDA MACHINE TOOL CO., LTD., established in 1919, have made the plant a special grade technical engineering industry throughout Japan. Yoshida's Drills are designed to give both precision and speed. Each product is the latest model machine and applicable to all requirements in drilling work, and is also designed with emphasis on rigidity, strength and accuracy.

YUD—540 Type

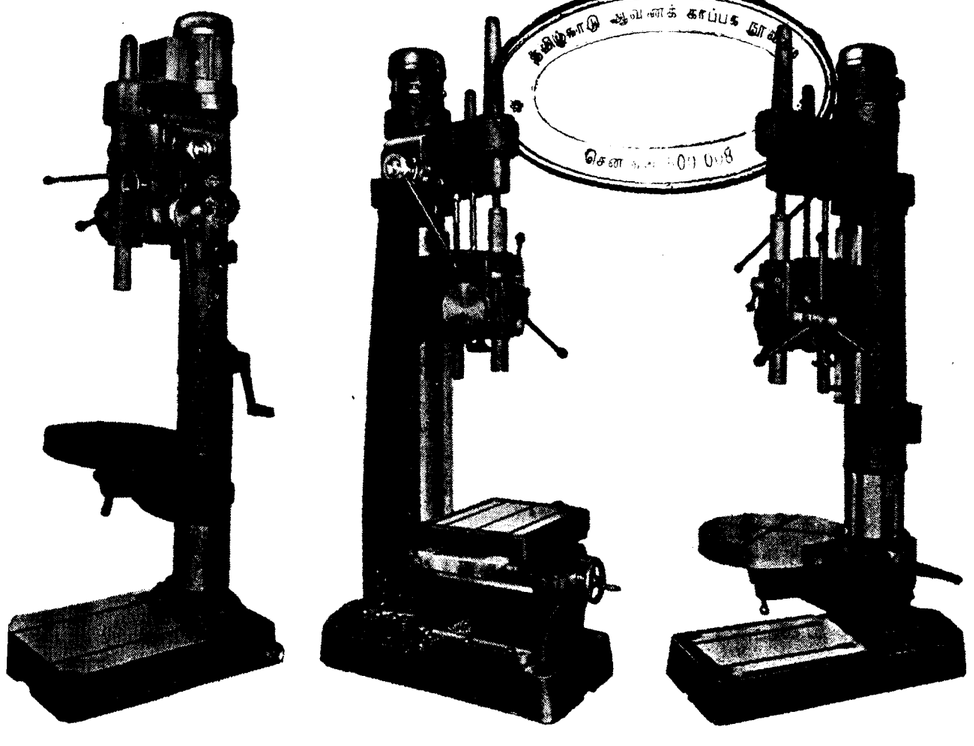
Swing	—	540 mm.
Drilling Cap.	—	40 mm.
Tapping Cap.	—	16 mm.
Spindle Speed	—	75-1,525 r. p. m.
Feed	—	0.1-0.2-0.3
Shipping Space Needed	—	62 cft.

YUD—640—B Type

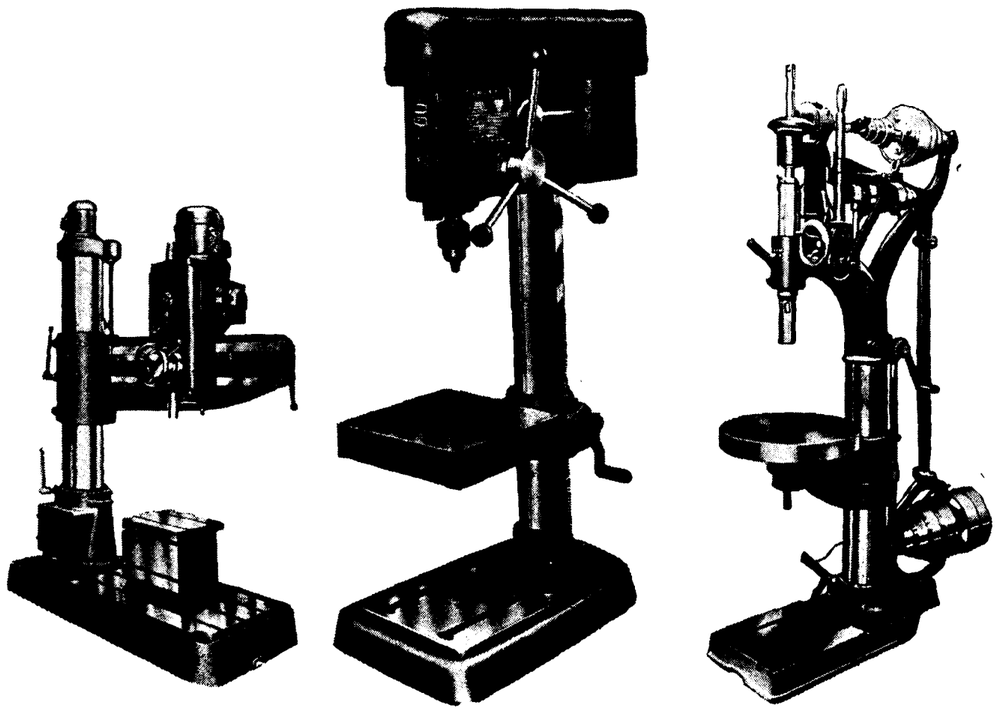
Swing	—	640 mm.
Drilling Cap.	—	50 mm.
Tapping Cap.	—	25 mm.
Spindle Speed	—	50-1000 r. p. m.
Feed	—	0.07-0.15-0.22-0.3
Shipping Space Needed	—	145 cft.

YUD—640—A Type

Swing	—	680 mm.
Drilling Cap.	—	50 mm.
Tapping Cap.	—	25 mm.
Spindle Speed	—	50-1000 r. p. m.
Feed	—	0.07-0.15-0.22-0.3
Shipping Space Needed	—	140 cft.



YUD-540 Type *YUD-640 B Type* *YUD-640 A Type*



YRD–1000 Type *YBD–360 Type* *YBD–420 Type* *YLD–560 Type*

YRD—1,000 Type

Swing	—	1,000 mm.
Drilling Cap.	—	40 mm.
Tapping Cap.	—	20 mm.
Spindle Speed	—	80–1,500 r. p. m.
Feed	—	0.1–0.17–0.22–0.3
Shipping Space Needed	—	240 cft.

YBD 360 Type

Swing	—	360 mm.
Drilling Cap.	—	12.7 mm.
Spindle Taper	—	J. No. 2½
Spindle Speed	—	600–3000 r. p. m.
Shipping Space Needed	—	10 cft.

YBD—420 A—Type

Swing	—	420 mm.
Drilling Cap.	—	13.5 mm.
Spindle Taper	—	J. No. 3
Spindle Speed	—	400–3000 r. p. m.
Shipping Space Needed	—	10 cft.

YLD—560 Type

Swing	—	560 mm.
Drilling Cap.	—	32 mm.
Spindle Taper	—	M. No. 24
Spindle Speed	—	22–416 r. p. m.
Feed	—	0.04–0.05–0.08
Shipping Space Needed	—	40 cft.

History & Growth of INDIAN MACHINE TOOL INDUSTRY

By S. M. Patil, *B.E., A.M.I.E., A.M.I. Prod. E.*
Deputy General Technical Manager, Hindustan Machine Tools (P) Ltd., Bangalore.

THE famous wartime call of Sir Winston Churchill "Give us the tools and we will finish the job" impresses vividly how the fate of even powerful nations essentially rests on their productive capacity during the period of national emergency. A nation without a virile Machine Tool Industry is placed at a grave disadvantage in regard to prosperity in peace time and safety during the war period. It is literally true that modern machines preserve liberty throughout the world.

India has suffered so much from the shortage of machine tools during the last wars that she cannot forget this bitter experience. If her industry is to be economic and is not to be suddenly paralysed due to curtailment of imports she must be prepared to meet whatever sacrifices may be involved for a successful and balanced development of the machine tool industry in the country.

Although machine tools were manufactured in India as early as 1899 and this continued throughout the early years of the Twentieth Century, the number of machine tool manufacturers was extremely small and the products manufactured very very poor in quality and standardisation. The post period of the first world war (1914—18) saw the real beginning of the Indian Machine Tool Industry when some three leading machine manufacturers took up to making of machine tools mainly simple type lathes, Drilling machines and Shapers. The second world war gave a very great impetus of this infant Industry and as the Indian industry geared itself in the manufacture of defence equipment, the demand for machine tools increased considerably. Although the situation as late as the close of 1939 was not so acute as imports of machine tools from UK and America still continued, however with the fall of France and Italy's entry into war, India was virtually cut off from the Allies. In 1943 when Japan declared war, India had been sealed off and was left to rely entirely on her own production. These exigencies of war compelled the British Government to harness the resources of the country and develop every possible Industry for the manufacture of Machine Tools in India for stimulating war efforts in order to transform this subcontinent, into a mighty arsenal of the Allies in the East! As a result of this, the Industry made a very good progress as will be seen from the fact that whereas in 1942 the total number of graded machine tools manufactured in India was only 273, in 1946, this number had increased to 4,121 valued slightly under £ 1 million.

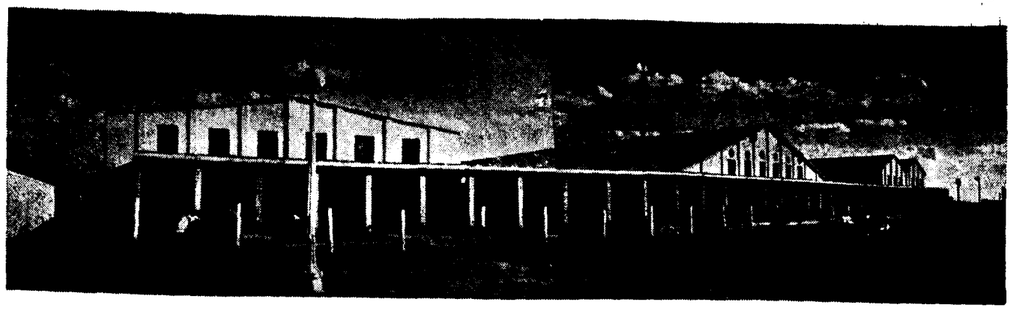
Although the Indian Machine Tool Industry made this remarkable progress in comparatively short period, subsequent developments in the postwar period however have been unfortunately of a retrograde character. This was mainly because the general organisation of the Industry was not specialised and firms which were originally engaged in the manufacture of other engineering items had been encouraged to take over the production of machine tools. Most of them either did not possess adequate equipment for producing high quality parts, or the requisite knowledge of technique of building precision machine tools. As a result, after the termination of the war, the Industry faced a virtual crisis. In 1949 sales of indigenous machine tools had already fallen and large stocks of unsold machine tools has been accumulating, with the result the output of machine tools in 1950 had been reduced to hardly £ 2,00,000/-. There was general prejudice amongst the consumers towards indigenous machine tools as the standards, design, quality and workmanship, service and performance of the Indian built machine tools were far too low in comparison with imported machine tools. In the struggle for survival in the postwar period of the 2nd World War many small scale machine tool manufacturers disappeared. The wartime number of 24 graded and 100 ungraded machine tool firms was reduced to 15 graded and bearly 30 ungraded machine tool binders after the independence and partition of the country.

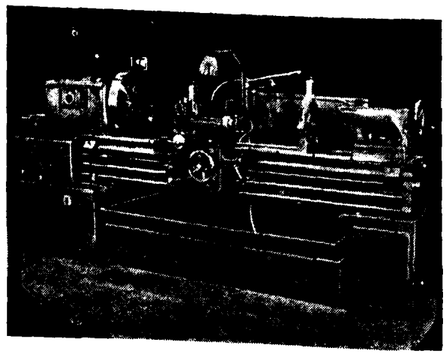
The dawn of independence saw the indigenous machine tool industry, built up during the war, virtually collapsing in the face of postwar competition and partition. Independent India therefore found it vital to re-establish the Industry on a more lasting foundation. As by its very nature, the machine tool industry does not hold out proposals of large and

quick returns and the capital required for establishing the Industry on sound basis being substantial, the country's Government found 'Private' capital unwilling to invest the large amounts required.

The Government therefore had to take the lead and in 1949 entered in to a Technical collaboration Agreement with Messrs. Oerlikon Machine Tool Works, Buehrle & Co., Zurich, Switzerland, to set up a machine tool manufacturing unit namely, Hindustan Machine Tools Factory in Jalahalli—Bangalore.

The Hindustan Machine Tools Project at Jalahalli commenced construction of the Factory in the latter half of 1953 as the interval between 1949 and 1953 was mainly devoted to the selection and securing of site planning of factory and recruitment and training of Supervisory and Managerial staff. The factory commenced production late in 1955 with 8½" centre lathe specifically designed by its technical consultants. The first series of these Lathes manufactured in the Factory came off the production line on 31st May 1956. Thereafter, the production had been gradually stepped up to about 25 per month by January 1957 and 36 per month by May 1957.

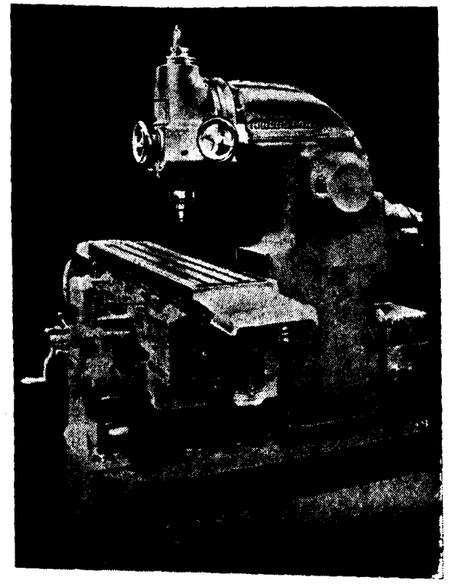


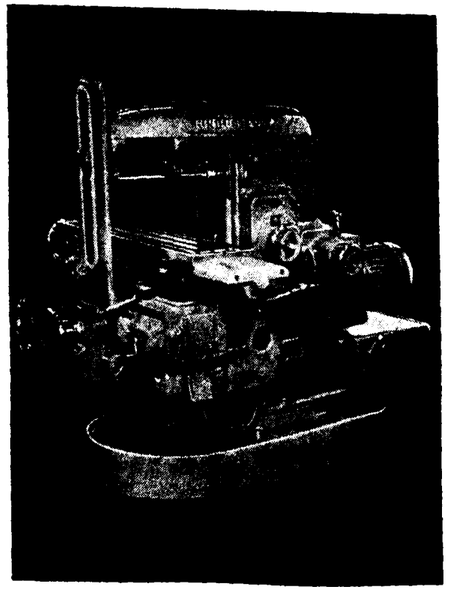


Although originally planned to work on a single shift basis and to reach a production of 400 machines per annum by 1960—61, the Hindustan Machine Tools revised its original plan, in view of the vast increase in the demand for machine tools in the country, and commenced introduction of multiple shift working. As a consequence, the production has been more than doubled and the Factory produced in 1957—58 300 lathes and 100 milling machines. The production target for this year (1958—59) is 600 machines of all types and sizes.

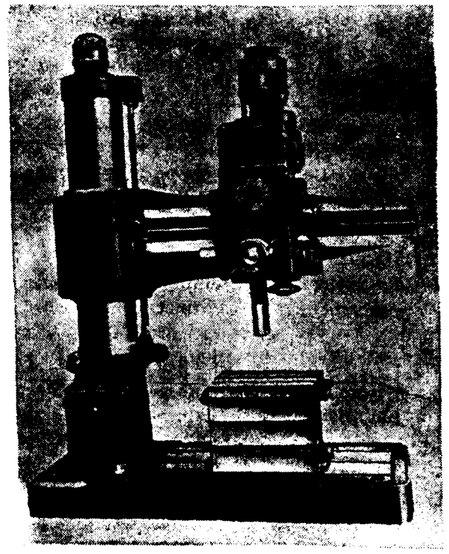
The twenty year contract concluded with M/s. Oerlikons and due to expire in 1974 was revised during the year 1956 whereby the capital and management participation of M/s. Oerlikons in the Hindustan Machine Tools Company was terminated. The Government of India thereafter took over the complete management of the Factory and bought over from Oerlikons their share capital in the Company. During the last one year rapid progress has also been made with the Indianisation of the Factory, the number of foreign technicians which stood at 85 in 1956 was reduced to 28 by June 1958.

A new limited technical collaboration Agreement with the well known firm of Fritx Werner in West Germany was entered into in early 1957 for the production of medium and heavy Milling Machines in six varieties (Viz: sizes 2 & 3 in Horizontal, Vertical and Universal types). The first series of 5 Milling machines produced in the Factory mainly assembled from components, same off the production lines in May 1957 and a total of 100 machines were produced by end of March 1958. About 300 machines are expected to be manufactured in 1958—59





In view of the very substantial capacity of Hindustan Machine Tool Factory the production programme was further increased and diversified and in June 1958 another technical collaboration Agreement with a reputed West German firm, Messrs. Hermann Kolb, Koeln, has been signed for the production of medium Heavy Radial Drills in 10 varieties (sizes upto 2" in solid steel in arm lengths 3'—6" to 6'—6"). The current manufacturing programme includes the assembly of 50 machines of these Radial Drills by end of March 1959.



The Hindustan Machine Tools Factory, which contributes presently 60% of the entire Indian production of machine tools, envisages further increase in output upto 800—1000 machines per annum by 1960—61, approximately 70% of the entire nations production of machine tools which is likely to be running at £ 4 million a year at the end of the 2nd plan period.

The country's Government have attached great importance to this vital industry and continuous efforts are being made to expand the production of machine tool Industry in both public and private sectors. The recommendations of the Government-set-up Machine Tool Committee, have been accepted by the Government and the development of the main categories of basic machine tools has been allotted to the following six principal manufacturers of graded machine tools in the country :

1. Copper Engineering Ltd., Satara Road.	Geared shapers upto and including 32" stroke (Gradual change over from cone-pulley to geared head)

2.	Hindustan Machine Tool (P) Ltd., Bangalore	Lathes 17″ Swing, present & allied models. Milling Machines (No. 2 & No. 3) Plain, Vertical, Universal and manufacturing (Heavy type) Grinding Machines, O. D., Universal & I. D. Radial Drilling Machines Lathes 20″ to 28″ Swing Production Jig Borers Lathe (other types) Capstans & Turrets
3.	Investa Machine Tools & Engineering Co. Ltd. Bombay	Drilling Machines Pillar 1¼″ to 2″. Drilling Machines column upto 3″. Drilling Machines Radial below 2″.
4.	Machine Tool Prototype Factory, Ambarnath	Lathes, Geared head 10″ Swing Lathes, Capstan ½″ Grinders, Surface 18″×24″ Grinders, Tools & Cutter Lathes, Capstan 1¼″
5.	Mysore Kirloskar Ltd, Harihar	Lathes 12″ to 28″ Swing Lathes—Capstan 1½″ Lathes—Capstan 2½″ Lathes—Turret 3½″
6.	Praga Tools Corp. Ltd. Secunderabad	Drilling Machines Bench Drilling Machines Pillar 1″ & 1½″ Milling Machines No. 1 Lathes, Bench.

Following the recommendations of the Machine Tool Committee, the Government have also set up a standing body viz. Machine Tool Development Council to foster, control and supervise the country's machine tool Industry and to recommend to the Government its needs and requirements, with regard to essential raw materials, technical aid, proper financing etc. and in general to champion the Industry's cause in every possible way for its stabilization and future expansion. A recognised association consisting of some 21 machine tool manufacturers belonging to both private and public sector constitute the Indian Machine Tool Manufacturers Association, who concurrently supplement and support the cause of its members and recommend steps to be taken to encourage machine tool manufacture in the country.

For the rapid industrialisation of the country a strong well-built machine tool Industry is a backbone. The development of the Industry should therefore be considered in its own right as a primary necessity for the nation, rather than a part of a general engineering development. Certainly, the country's industrial planners are alive to the situation and will certainly consider the needs of the Industry with all seriousness and give appropriate priority for it in the Third Five Year Plan of the country.

"I S I in the 'India 1958' Exhibition"

'India 1958', the industrial show window of India, has been organized as a national exhibition, the first time by the Union Government ever since the independence, to show to the delegates attending the Meetings of International Bank, International Monetary Fund, Rotary International, International Air Transport Association, etc. The industrial progress achieved by India in the last one decade or so. Quite naturally, to portray the part of standards movement in the industrial development and national economy of the country, the ISI has also participated in the exhibition. The exhibition, spread over an area of 120 acres, is by far the biggest ever attempt made by any organization in India, rather in Asia. The ISI Stall occupies an area of 1350 sq. ft. in M Pavillion (Octagonal Pavillion). The stall brings out the role of standards in the national economy and industrialization; traces the origin and growth of standards movement in India; and outlines the achievement of the ISI in the last one decade in various fields such as engineering, building, textile, chemical, agricultural & food, structural & metals, electro-technical products, etc.

Admittedly, while the aim of industrialization programme is directed towards the greater production and utilization of country's economic resources, it is vitally important that our products should have stable quality, competitive prices, and good performance, in the interest of home market, consumer satisfaction and foreign exports. This aspect has been brought out in the ISI STALL which depicts ISI's effort in ensuring the quality of goods for home consumption and export markets.

The main emphasis however, is an educating the home consumer, so as to win his confidence in indigenous products, as also to educate and guide him in the recognition and purchase of goods of quality. The stall also bring out the important role played by the ISI for the greater utilization of country's steel resources through its Steel Economy Programme which was launched at the instance of the Planning Commission

Polish Machine Tools for Railway Shops

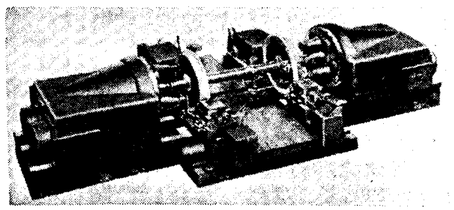
THE specialization of the Polish Engineering industry in the production of special purpose railway shop machine tools looks back to 60 years traditions. Already in 1905, 86 various machine tools models for machining such rolling stock as axles, treads, wheel bodies, wheel sets, buffers, springs, etc. have been produced. This range of machines was changed in the direction of more efficient design, ensuring best production output and exploitation as well, as simplifying servicing, as a result of increases in demands and tempo of railway building.

After the Second World War these traditions were taken up by the well known RAFAMET Works—heavy machine tool works in Kuznia Raciborska. Many years of production experience, co-operation with various scientific institutes and specialists employed in the railway industry, have permitted the manufacturer not only to adapt his products to meet the purchaser's demands but, moreover, to outline new directions in his specialised line of machines.

The RAFAMET machine tools form a collection permitting to produce new wheel sets as well as the repair of worn ones. This collection comprises the following machines :

The Wheel Lathes, type ITCH/A, ITCH, ITCT/A, and TLA 140 are destined for machining the profile of wheel sets for wagons and tenders (type ITCH and ITCH/A). The ITCH type equipped with single speed motor is designed for the production of new wheel sets only. The other models equipped with four-speed motors, thus enabling change of cutting speeds without stopping the machine are not only fit to perform all repair operations on wheel sets but simultaneously fully up to standard machining new wheel sets.

Semi-automatic Wheel Lathe type TLA 112 (see photograph) designed for machining wagon, tender, and electric rail cars wheel sets. It is a modern type adapted for machining both worn and new sets, and can be classed among the most modern wheel lathes. Infinitely variable main drive and D. C. drive of feeds, automatic fixing by means of hydroplastic clamps, automatic measuring with selection of economical cutting depth, and a wide range of

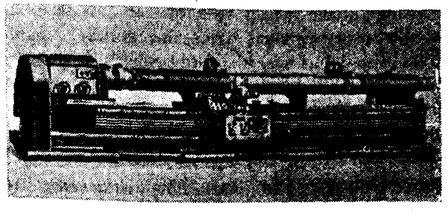


Semi-automatic wheel lathe **type TLA-112**

other new, most recent solutions of construction permit to obtain high output.

Semi-automatic wheel lathe type 3 TCH/A for machining treads, flanges and side surfaces of locomotive and tender wheel sets. The main drive is from a four-speed motor, enabling quick speed change. Simultaneous machining with all four slide-rests, electro-hydraulic preselection of feeds and speeds, and centralised control ensure high output and ready servicing. An attractive feature is the special device for turning and burnishing internal journals of wheel sets, this being of considerable importance for steam locomotive repair shops.

Universal Wheel Lathe type UUA 160 is designed for small railway repair shops, primarily is adapted for machining wagon, tender, electric rail car, diesel and steam locomotive wheel sets. It serves for machining of profiles, internal and external axle journals by turning and burnishing, and machining of wheel bodies and tyres. This combination of a standard production lathe and a turning and burnishing lathe ensures high output and versatility.

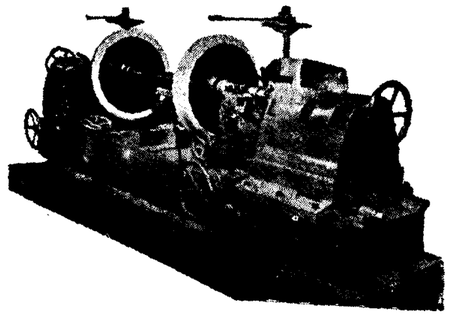


Axle turning lathe **type TOA-40**

Axle Turning Lathe type TOA 40 (see photograph) is designed for high capacity, Large scale series

production of wagon, tender and locomotive axles. The machine is built in two models, viz.: as a roughing lathe model TOA 40z, and as a finishing lathe model TOA 40w. Fully automatic machining cycle, and hydraulically controlled template slide rests afford speedy and precise machining. It may be also used as a standard lathe for any turning work.

Turning, Burnishing and Polishing Lathe type XBB 21 is a special lathe, designed for turning and burnishing or grinding internal and external journals, hub seats and collars of wagon, tender, electric rail car, diesel and steam locomotive wheel sets (in the latter case with the exception of driving wheel sets) of any design. The XBB 21 lathe is an entirely original design to appear for the first time on the world market.

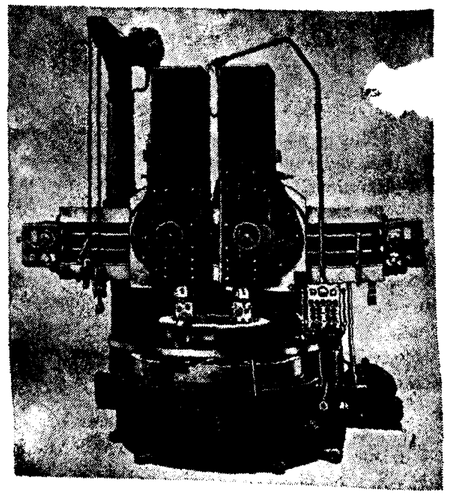


Turning and burnishing lathe **type TBG/U**

Turning and Burnishing Lathe type TBG/U (see photograph) is designed for turning and burnishing axle journals and hub seats of railway wagon and tender wheel sets.

Finishing of the wheel axle journals by burnishing has notable advantages over the grinding—method still in use. It has the advantage of providing, besides the required smoothness of the surface and the geometrical accuracy of the journal, also hardening of the journal surface by way of compression.

Universal triple-roller Burnishing Attachment type EBB 11, is designed for burnishing shafts and locomotive piston rods in a wide range of diameters. Owing to small dimensions, this attachment can be fitted on any universal turning lathe.



Vertical boring and turning mill **type KO-10A**

Vertical Turning and Boring Mill type KO 10/A, is designed for machining wagon and tender tyres. It finds wide application in railway stock production works and repair shops, more over, this mill can be used for various turning work as a universal boring mill in view of the possibility of taper turning and threading.

Vertical Turning and Boring Mills, type KLA are special lathes with an automatic work cycle, destined primarily for industrial works producing new wheel sets, and for big rolling stock repair shops as well. The models KLA 112 and KLA 170 are destined for reaming wagon, tender, electric and steam locomotive tyres within a range of sizes adequate to characteristics of each machine.

Vertical Boring and Turning Mill type KLB 120, is a semi-automatic four rest turning mill designed for machining wagon disc wheels and wheel bodies. By the electrical copying system the problem of machining all wheel surfaces has been solved ; simple and ready control, of table speeds by cam gear and fully automatized operation of the slide rests facilitate servicing of the machine, and do not call for highly skilled operators.

Universal Vertical Boring and Turning Mill type KLC 160, is destined for machining wagon, tender and

(Continued on page 33)

SWIFT Machine Tools for Railway Workshops

GEORGE Swift & Sons Limited, Halifax, England, make a large variety of machine tools which are used extensively for railway work and these comprise both lathes and planing machines, the latter being manufactured by their Associate Company, Swift-Summerskill Limited.

Fig. 1 shows a piston ring turning, boring and parting-off machine, for which many repeat orders have been obtained. The 'pots' from which the rings are manufactured are cast with a special vee base for gripping in the chuck, this being clearly shown on the illustration. The saddle comprises a long surface slide which carries a turning rest at the front, and parting-off slides at the back, the parting-off slides carrying multiple tools arranged on the angle so that the rings are parted off successively and not simultaneously.

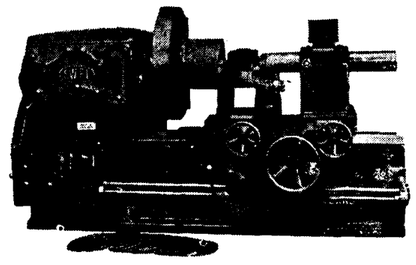


Fig. 1

At the right-hand end of the saddle is carried the boring bar holder, and this so arranged that the boring tool and the turning tool travel up simultaneously. This method allows of much higher cutting speeds with a far greater degree of concentricity of the finished product.

The specification of the machine is as follows, and the machine is generally as our list type 'C' herewith, so far as it applies, in particular the description of the headstock, feedbox and apron being identical.

"The piston ring lathe is arranged for producing piston rings from a pot casting up to a maximum diameter of 26".

"The saddle of the lathe carries two tools for simultaneous boring and turning, and the rear slide carries a series of parting-off tools for successively parting off the rings when the boring and turning

(Continued from page 32)

locomotive wheel bodies, tyres and disc wheels. This machine is equipped with a turret head with most up to date automatic clutch control for copying, taper turning and threading, also a special rest for the execution of the oblique grooves for retaining rings, and a boring head for burnishing hub holes are provided. The machine can be also used as a turning mill in mass manufacture.

Vertical Boring Mill type WLA 130, is used for finishing holes in wheel centres. A high degree of accuracy in operation is required as having a decisive influence on the secure joint between wheel and axle.

Special Press type MAB 40 is designed for static and dynamic test of springs used in railway rolling stock units.

A Set of Special Machine Tools type LO is designed for machining axle boxes with anti-friction bearings. This set, placed in line and connected with an adequate number of universal lathes is used for mass production of axle boxes cases.

Wide range of dimensions and versability of the above machine tools permit for selection of the most suitable machine for any specific production conditions.

The present tendencies in the design in special machine tools for Railway purposes pursue the same aims as the general machine tool industry, that is to say to, full automatization of production processes and simultaneously improvement of quality and accuracy of the finished article. This involves constant changes in the existing designs and their replacement by new ones; and the engineering department of the RAFAMET works is constantly busy to meet these requirements.

operations are completed. The machine is capable of dealing with pot castings up to 15" long.

"Automatic feeds are provided for both the boring and turning operations, and for the parting-off operation. 9 rates of feed are provided, the sliding feeds ranging from 10—300 c. p. i. and the parting-off feeds ranging from 30—900 c. p. i. The feeds are controlled by a single lever on the apron.

"The headstock has 18 speeds ranging from 4—230 r. p. m. All the gears are of alloy steel hardened and profile ground, and all the sliding gears are mounted on ground six spline shafts. All the gearing and bearings in the headstock are lubricated by means of a pump, the sump being contained in the bed. A double multiplate friction clutch, oil immersed, controls the starting and stopping and braking of the spindle. The headstock spindle mounts a 36" diameter 4-jaw independent chuck having special jaws to grip the pot casting.

"The machine is driven by a 20 H. P. squirrel cage motor through the medium of vee belts, and is controlled by push buttons mounted in a pocket at the front of the headstock.

"The bed is of the inverted vee type, 30" wide across the shears, and is carried directly on to the foundation. The weight of the machine is approximately 9.½ tons."

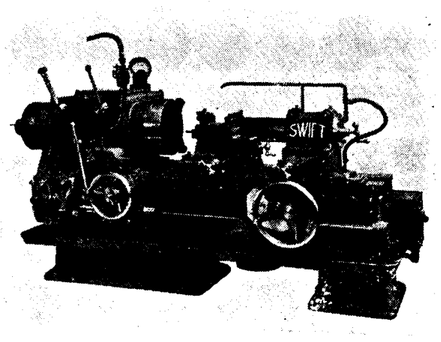


Fig. 2

Another machine for which repeat orders have been obtained is shown in Fig. 2. This is a somewhat similar machine to the above piston ring lathe, except that this above machine is for producing cylinder liners. Again, the liners are cast with a vee base for gripping, and the saddle consists of front turning slides, a massive boring bar holder for boring out the inside, and parting-off slides are situated at the rear of the bed.

The machine is arranged for the turning and boring to be done with the tools opposite to each other so as to permit both higher cutting speeds and greater accuracy in concentricity.

Both boring and turning tools are controlled by mechanical formers so as to give the shape required both internally and externally, and a single tool holder is fitted at the back for parting off the cylinder when finally completed. The specification of the machine is as follows:

"The piston valve liner boring, turning and facing machine is specially designed for simultaneously boring and turning piston valve liners, subsequently facing and parting-off. The saddle carries independent tools for the boring and turning operations which are performed simultaneously, each tool being controlled by a former plate to produce the special internal and external forms. At the rear of the saddle is mounted a slide with automatic in feed carrying three tools, one tool for grooving, another tool for facing the end of the liner, and the third tool for parting of the finished liner. The former plates are carried at the front of the machine, anchored to the bed and having endwise adjustment for setting purposes.

"The feed motions are controlled by a single lever on the apron and an automatic trip is provided for the saddle traverse. 9 rates of sliding feed are provided ranging from 24—480 c. p. i., and 9 rates of in feed ranging from 64—1280 c. p. i.

"The headstock has a range of speeds from 9—420 r. p. m., changes being by means of sliding gears which are mounted on ground six spline shafts. All the gears are of alloy steel case hardened and profile ground, and the starting and stopping of the machine is by means of a multi-plate friction clutch running in oil, a brake being provided for quickly bringing the spindle to rest. The drive to the headstock is from a 12. ½ H. P. squirrel cage motor and vee belts. The motor is controlled from push buttons mounted in a pocket on the front of the headstock.

"The headstock spindle is arranged with an American short taper nose and mounts a 16" diameter 4-jaw chuck.

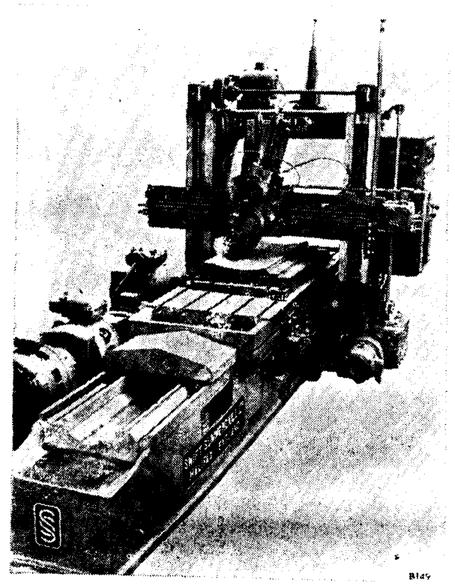


Fig. 3

"The machine is arranged to machine liners having a maximum diameter of 14" and a maximum length of 24". The weight of the machine is approximately 85 cwts."

Coming now to planing machines, these are built up to a maximum of 12' 0" in width, and if required can be fitted with special forming motions, grinding heads, milling heads, etc.

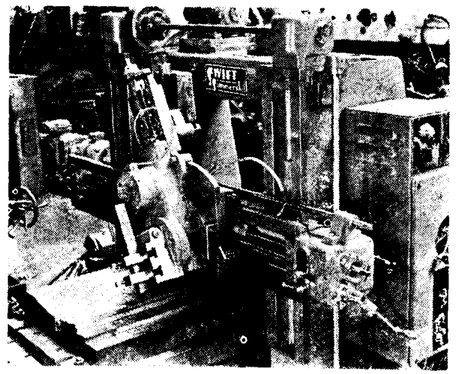


Fig. 3 shows a 36" wide machine fitted with a special radius forming motion, but the features enumerated above can be fitted on any size machine.

The machine is manufactured in both two-belt and all electric types, but the latter is far more versatile. Cutting speeds from 25 to 200 f. p. m. are obtained in small increments, and a range of feeds is provided in 80 steps varying from 005" to ½". A quick power traverse motion is obtained to everything to which the feed motion applies (on all electric machines).

On Swift-Summerskill machines the guide of the table is by means of a vee and a flat, pressure oiling is applied throughout, solenoid tool-lifting is fitted to the tool boxes (on all electric machines) and the elevating motion is by separate motor.

RAIL PROJECT FOR ELECTRIFICATION

The main line electrification project on the Eastern and South-eastern Railways has been placed under the direct charge of a General Manager and Chief Engineer.

The project envisages electrification of 1,350 route miles of track and is estimated to cost Rs. 84 crores.

Shri H. D. Awasty, now the Director of Civil Engineering, Railway Board, has been asked to take charge of this work as the General Manager and Chief Engineer, Railway Electrification, with headquarters in Calcutta.

Shri Awasty is a senior engineer with 27 years of railway service during which he has undertaken a number of important engineering assignments, including the Assam Rail Link project as the Deputy Chief Engineer. The project, it may be reminded, was completed in record time. The new Electrification Project Organisation will shoulder the responsibility of a large administration and maintain liaison with the Railways, State Governments, other outside organisations and the Central Ministries as well as get on with the design, planning of work, procurement of materials and execution of work in the field.

Role of Asquith Machine Tools in Railway Workshops

AN interesting Asquith machine recently supplied to speed production of rolling stock is the machine illustrated in Fig. 1 which was designed to deal with the drilling of railway wagon underframes. This Asquith machine consists of two Universal Radial Drilling Machines mounted on traverse beds to provide 14 ft. of horizontal movement. Each drilling unit has a main head which carries an offset spindle slide on slideways positioned down one side of the main head. Feed to the slide is either by power or hand and two rates of power feed are provided. The gearing in the head is arranged so that three speeds, suitable for the sizes of holes to be drilled are available.

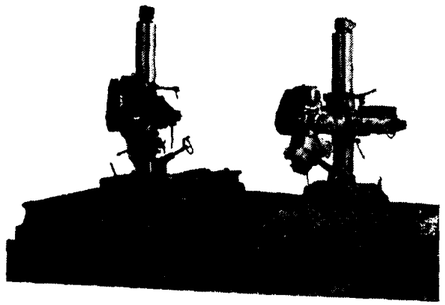


Fig. 1. Special Asquith Drilling Unit supplied to The Pressed Steel Company Limited for drilling railway wagon underframes.

The driving motor is mounted on an adjusting base which in turn is mounted on a plate spanning the arms of the machine at the drilling end. A counterbalance weight is mounted at the opposite end. Longitudinal traverse of the machine is by hand, a bracket being mounted on the traverse base so that the hand wheel for traversing is in a convenient position for the operator. The traverse base is locked to the bed by hand-operated locks.

This machine demonstrates the application of the basic standard Asquith portable universal radial drilling machine to special purposes for higher production, and the versatility of the standard machine can readily be appreciated and other similar operations visualised.

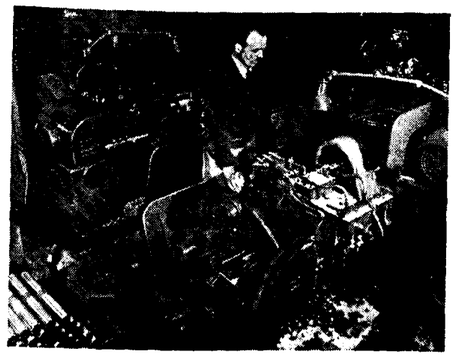


Fig. 2. Two Drummond "Maximinor" Automatic Multi-Tool Lathes installed at Metropolitan-Cammell Carriage and Wagon Co. Ltd., Saltley, Birmingham. The machine in the foreground is turning components in pairs seen in the left-hand bottom corner. The other Maximinor is turning pins.

Fig. 3. Swift 8V3 Lathe turning cast iron sleeves at Taylor and Challen Ltd., Birmingham.

Another type of machine which is accelerating production of rolling stock components is the Drummond "Maximinor" automatic Multi-tool Lathe shown in Fig. 2 applied to the turning of coupling pins and screws, and numerous similar components required in quantity can be considered for this type of machine. The 'Maximinor' operates on a completely automatic cycle. A lever is moved to clamp and unclamp the air-operated tailstock and hydraulic chuck for loading. One push button only is then pressed to commence the cycle of quick approach, feed into depth, longitudinal turning and quick return. The 'Maximinor' is the smallest Drummond automatic Multi-tool Lathe and there is a range of machines of this type in capacities up to 15 in. by 102 in. Standard and special equipment enable a wide variety of parts to be turned with a multiplicity of cutting tools operating simultaneously.

Swift lathes are also machine tools manufactured by a member company of the Asquith Machine Tool Corporation and many of these machines, which are of modern design capable of utilising carbide tools to full advantage, are raising output in railway workshops. A wide range of standard types is available in capacities up to 72 in. swing and bed length to suit requirements. The smallest machine in the range is the type 'A' lathe shown in Fig. 3.

ASIA USES MORE DIESEL LOCOS

A shift towards the use of diesel locomotives was a major development in rail transport in Asian countries during 1957, according to a United Nations' report.

This shift is attributed to the need to find alternative motive power where coal is deficient and also to speed up the railways.

The Federation of Malaya introduced diesel locomotives for the first time in 1957 and there was further expansion in other countries such as Burma, India, Indonesia, Pakistan and the Phillippines.

The report says that in some cases the introduction of diesel power has considerably improved the efficiency and financial position of the railways.

900 mm, long and a crane arm. After adjustment of some of the additional equipment the truck is well capable of service in a series of other operation centres.

Apart from the types already mentioned, the CKD works are preparing several new outstanding designs. Czechoslovak designers are making use here of the valuable experience gained during the manufacture and operation of the present types of trucks which are being further improved.

The Second Czechoslovak Engineering Exhibition in Brno proved again that the participation of Czechoslovakia in the technical development is not insignificant. Many visitors from abroad highly appreciated just those Czechoslovak products which will serve for internal transportation in factories.

In the first place it is the easily controlled type AT 1521 accumulator truck with infinitive variable speed which is mainly intended for the traction of whole series of trailers. In factories or works where for some reason no crane equipment is available, a special truck for the transportation of rods, bars and other materials is an indispensable help. It facilitates difficult work in connection with the clamping of heavy piece for machining into the lathe chucks and face plates. An essential improvement of the hard work of railwaymen is an accumulator tank-truck for the transportation of the water supply to passenger trains.

Czechoslovak designers, however, are not content with merely following the well worn path of the present design of this type of transportation. They have taken into account that not in every place where the Czechoslovak trucks may serve in the future, is there a sufficient supply of cheap electric power for the charging of accumulators. They are, therefore, preparing the production of the trucks driven by an efficient combustion engine. Thus the Czechoslovak industry will meet the requirements particularly of those countries where combustion motor fuels are very cheap and more easily available than electric power.

Among such countries there is, for instance, Brazil, which has recently become one of the most important buyers of Czechoslovak accumulator trucks. The well-known Vigorelli sewing machine factory is equipped exclusively with the flat and high-lift CKD Trucks for internal transportation inside their factory. Fully loaded trucks transporting materials and products from one production hall to another overcome here a considerable gradient without any difficulties. In the Kibon refrigerating plant in Rio de Janerio, after the first difficulties regarding the selection of an oil suitable for the hydraulic equipment, the AV 1522 high-lift trucks are now operating without any defects in surroundings with an ambient temperature of-36°C.

The foreign trade corporation of STROJEXPORT exports a considerable quantity of these trucks to the German People's Republic, Egypt, Syria, India, Vietnam, Holland, Bulgaria and Poland.

Strojexport has already concluded delivery contracts for the supply of several hundreds of these trucks to the German People's Republic where, apart from their current use, they will also serve for the mechanisation of building and construction works and in the manufacture of prefabricated panels and blocks.

AMENITIES FOR RAILWAY USERS

The newly formed North-East Frontier Railway is likely to spend as much as Rs. 30 lakhs during the current financial year on a wide variety of items calculated to improve amenities for railway users according to newspaper report.

The largest single item of slightly over Rs. 5 lakhs has been provided for augmenting the number of retiring rooms and waiting accommodation at stations, parcel offices, goods sheds, etc.

Arrangements for water supply at stations, parcel offices, goods sheds, etc., will cost another sum of nearly Rs. 5 lakhs.

A fairly heavy item of work relates to improvement in lighting and provision of fans on platforms and waiting halls and sheds, venders' stalls at stations, parcel offices, goods sheds, etc.

Among the other more important items of amenities envisaged are refreshment rooms and vendors' stalls, improved latrines, provision of new overbridges, better bathing facilities, etc.

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