Machine Tools Souvenir

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MACHINE TOOLS SOUVENI

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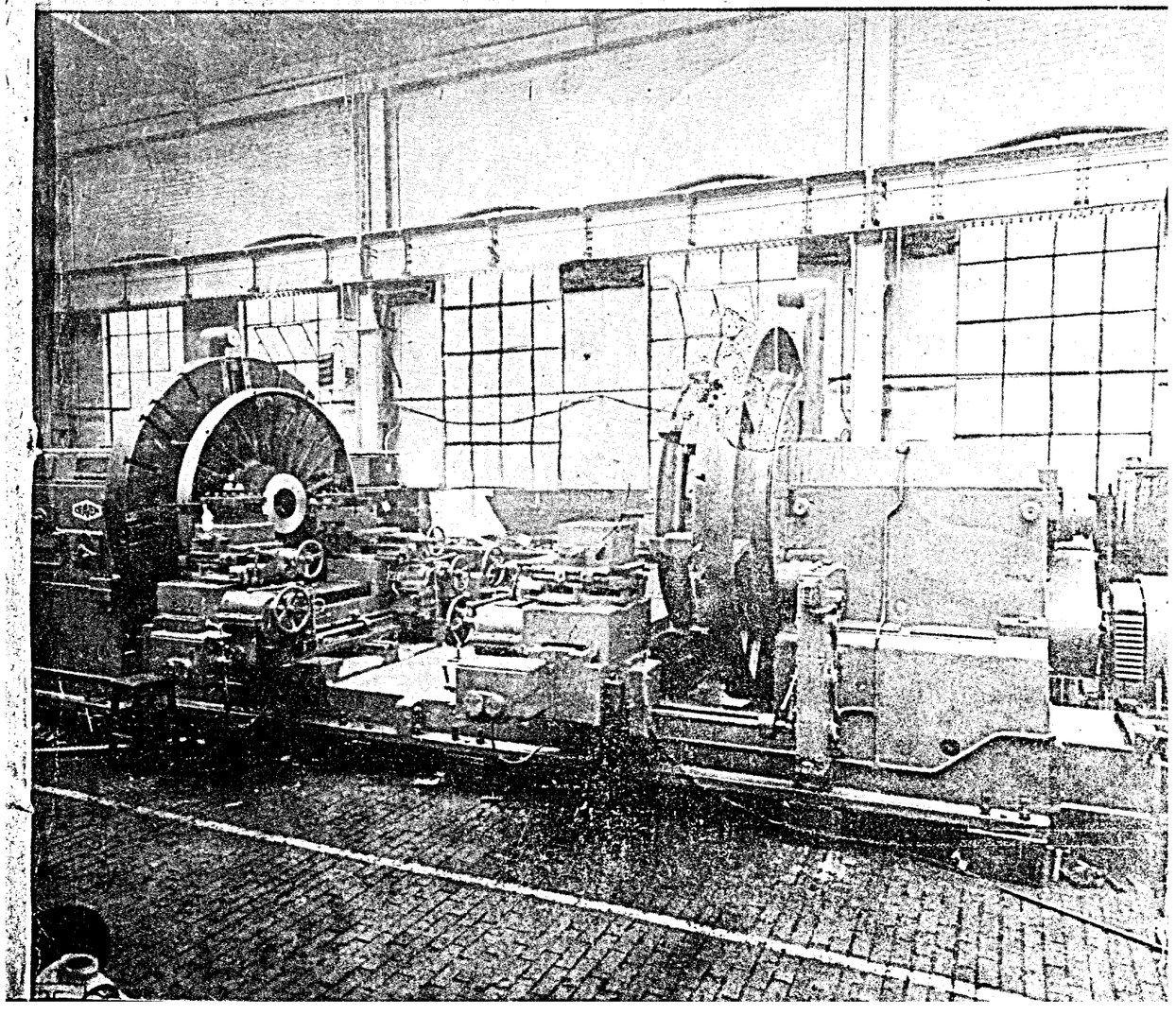

The HARRINGTON No. 1 SPINDLE SANDER has been designed to handle all normal requirements of profile sanding in wood, plastics or metal.

The general outline is smooth in appearance and the weight being distributed over a large base, the machine is stable and free inherent vibration under operating conditions.

All the materials and workmanship are, warranted to be to the best engineering standards and smooth operation and long life may reasonably be expected.

The table, which may be approached from any direction can be tilted to 45° in one plane only. Normal spindle speeds are 1740, 2350 and 3500 r.p.m. By means of a lever which engages a worm drive, the spindle is given a 1¼" vertical motion reciprocating at a rate of 1/30 of the spindle speed being used. Also the spindle may be fitted with various diameters and lengths of sanding rolls from a minimum of 1½" dia. x 3" long to 3" dia. x 9" long. The reciprocating motion may be disconnected so that the spindle rotates may without vertical movement. This combination of adjustable table, and varying diameters and speeds of roll permits intricate profiling.

The sander is powered by a totally enclosed ½ H. P., 110-120 volt motor, which is more than sufficient for normal usage. The sander has been built to withstand heavy loads in the harder metals and a 1 H. P. motor may be attached for such heavy duty work. The complete weight with motor is 325 lbs.

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(A QUARTERLY TECHNICAL JOURNAL DEVOTED TO MACHINE TOOL INDUSTRY)

2260, BHUTGOSWAMY VATTARAM

MANOJIAPPA STREET

TANJORE

(SOUTH INDIA)

CONTENTS

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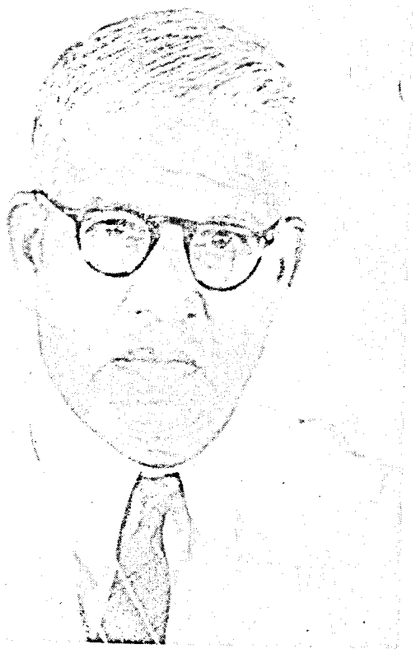


Mr. M. B. JAMBHEKAR
THE MYSORE KIRLOSKAR LTD.

Mr. E. W. H. SCAIFE
MACHINE TOOLS (INDIA) LTD.

Kearns Patent Machines for Railway Workshops

FOR many years we have been supplying our No. 5 WB Kearns Patent Machines for dealing with mono-block types of cylinders.

In order to reduce the effort required from the operator when moving the large and heavily loaded tables in a longitudinal direction on the machine, we have recently patented a special system of roller support to the saddle on the outer bed ways.

Four large diameter rollers mounted on ball and roller bearings roll on the outer ways of the bed which is 10′ overall. This patented system of support, in addition to reducing the effort required for adjusting the tables by hand, also relieves the feeding and rapid traverse motions and at the same time ensures accuracy to the longitudinal movement of the tables in relation to the spindle centre.

A machine of the type described above, but in this case with a total bed width of 15′ carrying a main table 5′×16′, is shown on page 4.

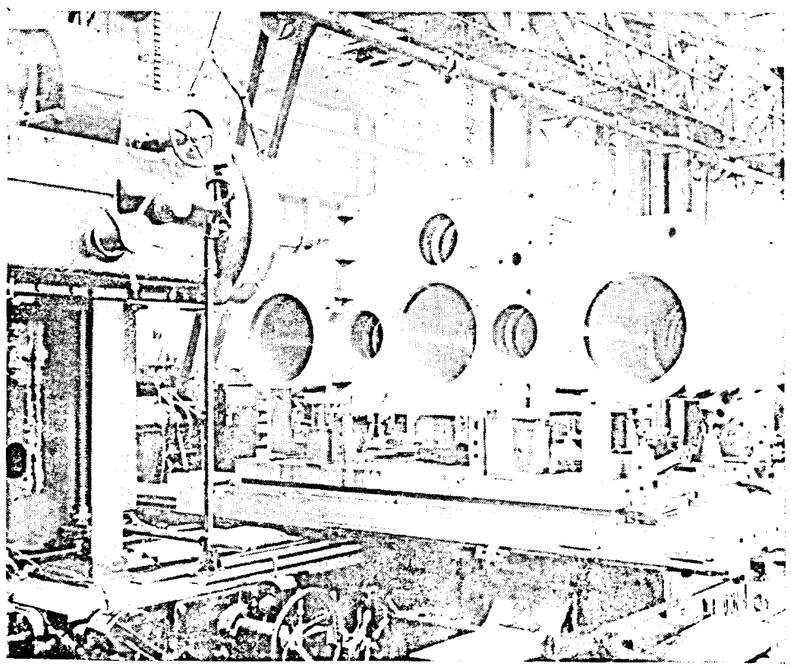
In all cases when boring locomotive cylinders we recommend the use of two boring bar stays for holding the free end of the boring bar.

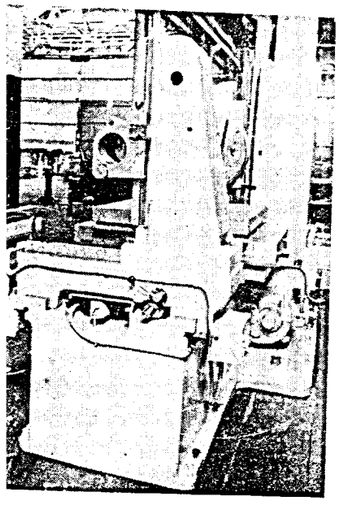
This method of supporting the boring bar enables the maximum metal removal during a roughing operation, and when finishing effectively steadies the bar and enables an accurate and smooth finish to be obtained.

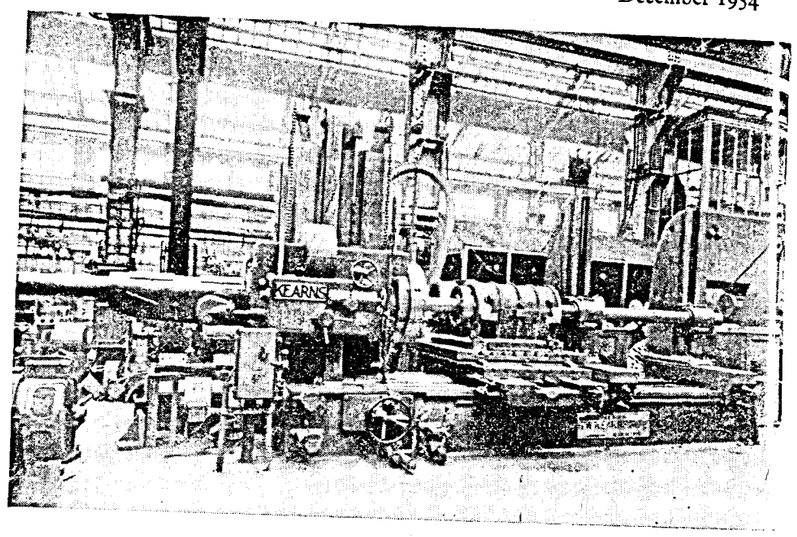
AXLE BOX BORING MACHINES

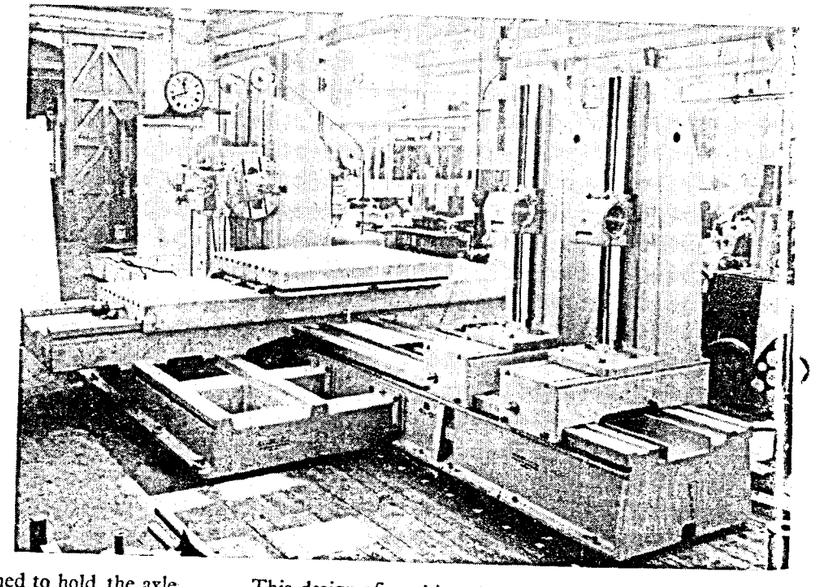
A number of alternative machines are available for dealing with locomotive axle boxes. For ease of operation, flexibility of plant, and rapid floor to floor times, the No. 2 Kearns Standard Axle Box Boring Machine, has proved remarkably successful. This machine will deal with boring, facing and chamfering operations both before and after lining with white metal.

A very important feature of this machine is the provision of a power operated boring stay. The purpose of this boring stay is to allow the large diameter boring bar to be withdrawn by power along the bed of the machine, thus leaving the axle box and fixture easily accessible and in a position for carrying out the facing and radius-









ing operations. This fixture is designed to hold the axle box firmly to the table during the heavy facing operations.

This design of machine also allows the clearance in the bore of the axle box to be quickly obtained by a small movement of the main table in the transverse direction.

We invite technical articles on the various stages manufacture of Machine Tools, Pneumatic Tools and any technical problem confronting the trade for publicity purposes.

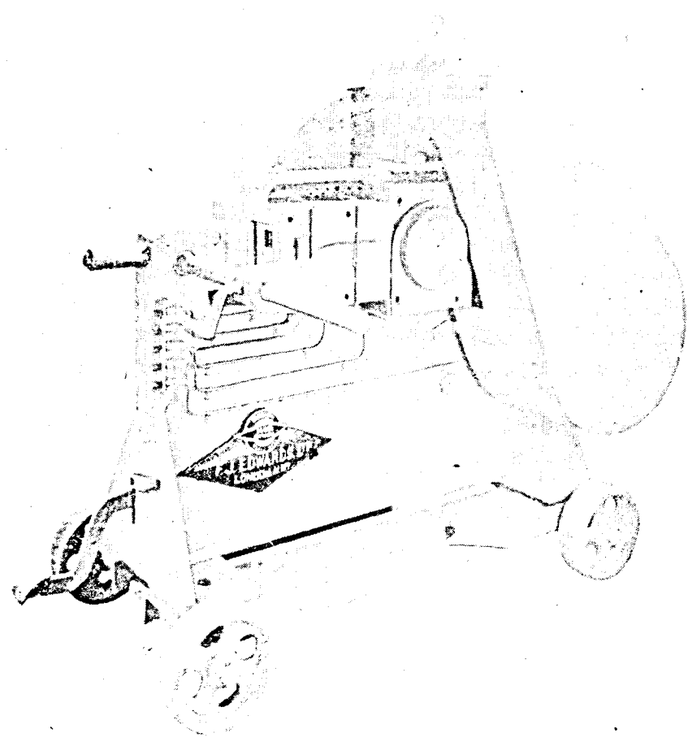
Machine Tool Industry as Applied to Light Sheet Metal Working

24

DURING the last ten decades there has been much upheavel contributory to the present position of the Machine Tool Industry in this Country.

The two dominating factors being of course the intervention of two World Wars, both of which had their effect on the development of Machine Tools.

We know the present Glorious position of our Empire on land, sea, and in the air, which rightly give a concrete understanding of the wonderful development of Machine Tools here, for such a position could not possibly have been achieved without the use of Machine Tools of the highest order. Therefore our successful development of Machine Tools has not been neglected and are today well to the fore.



Besco Model BS 50 F Bar Cropping Machine.

The development of new steels, allows and production methods have, especially during the War years al entered into the race for survival, and Britain played a very big part in producing the very Machine Tool necessary to survive and take care of all Post Wa Production problems, and future development not onl in Britain, but throughout the Empire and beyond Some sections of our Industries had to be somewha neglected during these War years, which disorganisec us for at least one decade, and one of the most affectec was the Light Sheet Metal Industry, especially the manufacture of Light Metal Containers. This wa unavoidable for the successful execution of hostilities.

For instance especially in War No. 2, the Tin Bo Industry almost came to a standstill.

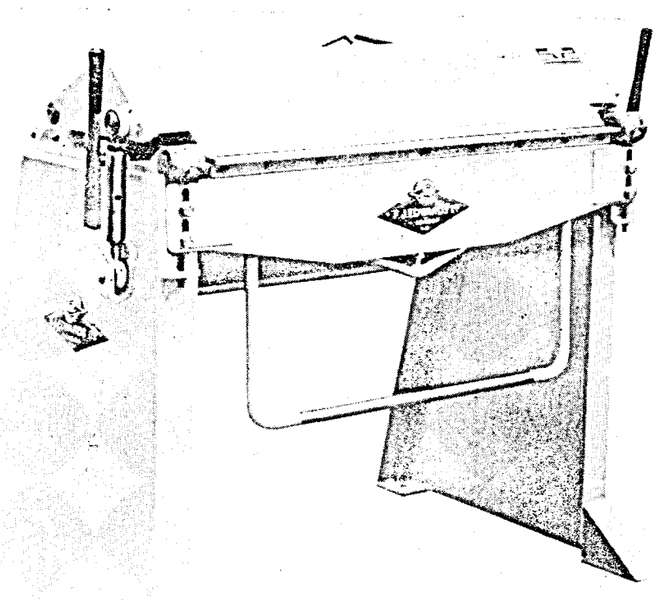
Therefore the development o Tin Box Machinery, which prio to 1914 was going ahead strongl slowed down.

The years 1914—1918 saw practically no activity in the development of Machine Tools for this Industry.

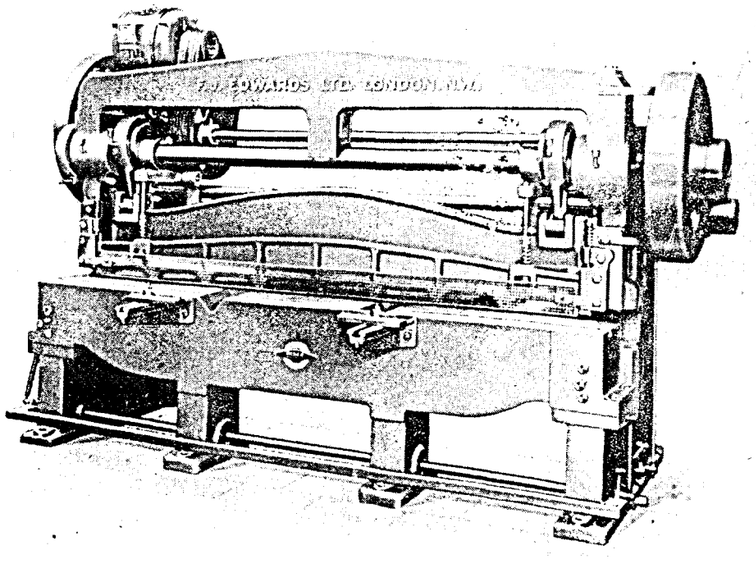
Luckily and owing to the robust quality of Machine Tools made especially for the Tin Box Making prior to 1914, the Industry was able to carry on.

The Tin Box Industry suffered so badly that many Tin Box Firms faded out, this naturally did not give our Machine Tool Industry any encouragement to hasten development of the Machine Tools, as used in this Light Sheet Metal Industry, who depend so much on economical production only obtained by Machine Tools capable of labour and time saving Machine Tools to survive.

Fortunately the makers and suppliers of BESCO Machine Tools came to the rescue by the Reconditioning of Light Sheet Metal Machinery, which proved



Besco Universal All-Steel Hand-operated Folding Machine.



Besco High Duty Model R overcrank GUILLOTINE.

(Continued on page 7)

a blessing in disguise, and went a long way in keeping the Industry alive and able to survive the obstacles of War No. 2.

This same firm are now setting the pace in Machine Tool development and new Plant is being designed and built to meet the requirements of this Light Sheet Metal Industry, and the General Tin Box Makers will soon realise that their wants will be taken care of.

The Power Press as used by this Industry is well taken care of, for of all Machine Tools the Power Press, as made in this Country are outstanding.

The adoption of the 3" stroke Press is an example of the thoroughness of Press Development. The old 2" stroke impeded production, for stampings could not get away quickly enough, and this extra 1" definitely gives a 10% increase in output.

Longer Ram Housings, larger area of ram faces, more robust Knock Out Bars are sure signs of development on the right lines.

Power Guillotine Designs have improved, being of robust design, and quicker cutting as proved on the "BESCO" Models 48—25—72—25 and 96—25.

The introduction of the hold-down action on Guillotines for light Metal cutting are all moves in the right direction.

The Production of the Gang Slitting Machine to cut

A RANGE OF DEWEX MACHINE TOOLS

(Continued from previous issue)

HEYLIGENSTAEDT HEAVY DUTY LATHES

THE Heyligenstaedt Heavy Duty Lathes provide an ideal solution to the problem of machining work up to 66 ft. long and 25 tons in weight and taking full advantage of carbide-tipped tools.

Made in three-and four-track bed types and with one or several saddles, these modern machines are designed for operation on 3-phase A. C. or D. C. supplies. On the 3-phase A. C. type, the 18-speed gear box can be laid out for 6 different speed ranges at a ratio of 1 : 50, whilst the D. C. model is given 4 coarse speed ranges permitting stepless speed variation at a ratio of 1 : 68.

The machines can be arranged for electro-mechanical control of the speed ranges from the saddle. Feed and rapid traverses are controlled by push buttons and levers centralised at the operator's position for maximum convenience.

The sturdy tailstock is operated by an electric motor and embodies on extremely substantial spindles sleeve having a built-in live centre, which is spring-cushioned to protect the spindle sleeve ball bearings from excessive thrust loads set up by expansion in the length of the workpiece.

Among the outstanding features of these machines are the synchronous motor drive (electric shaft) for the feed, and the worm rack for the longitudinal traverse of the saddles, which replaces the conventional feed shaft and leadscrew. This modern feed mechanism, which also enables accurate thread cutting, offers special advantages on long machines, since it ensures smooth and uniform operation resulting in a high-grade finish.

HEYLIGENSTAEDT DUPLICATING LATHE

Turning by the duplication method, which has for quite some time been employed by many progressive production shops, has contributed in large measure towards the increased productive capacity of the industry. Backed by 15 years of development work, Heyligenstaedt Duplicating Lathes and Duplicating Attachments represent the last word in lathe construction and meet the requirements of a wide variety of workpieces.

Besides the Semi-Automatic Production Duplicating Lathes with hydraulic tracer control for the economical mass production of parts turned by the duplicating method, the Heyligenstaedt plain and Universal Lathes ranging from $8\frac{5}{8}$" to $39\frac{1}{2}$" height of centres also can be equipped with hydraulically or electrically controlled duplicating attachments handing facing, straight and non-concentric jobs; they thus can be employed as duplicating lathes to deal with small and large production lots, as well as for ordinary universal lathe operations. Both the electrical and hydraulic control of the Heyligenstaedt Duplicating Attachments operate on the "Servo" principle whereby only a slight pressure is exerted by the tracer permitting unhardened sheet metal templates or master pieces to be used for tracing. The hydraulic duplicating attachments incorporate the single-edge control which has for years proved highly successful in the way of accuracy and certainty of operation.

(Continued from page 6)

100% accurately is going to be a boom to the Industry, and we shall see further improvements in this direction. Round and irregular semi automatic Body Forming Machines, Side Seaming Machines with standard chucks and Rolls are all sure signs that Machine Tool development is getting into it's stride.

The long felt want of the Tin Box Industry a general purpose lock Seam Body Making capable of forming and seaming both round and irregular bodies at a speed comparable with any semi automatic lay out, easy to incorporate into any general line, simple to change over, and economical on change parts is now on the market known as the No. 20 Lock Seam Body Making, made and supplied only by BESCO of London, who are definitely going all out to develope the Machine Tools, the Light Sheet Metals Industries rely on.

The Machines mentioned are only part of this Firm's achievements and comfortable stocks are available.

Therefore we can rest assured the impetus given to Machine Tool development by the last war years is not only being kept up, but is spreading to Machine Tools for Light Sheet Metal Working, and we can look forward to better, more speedy and thoroughly reliable Light Sheet Metal Working Machinery in the very near future.

With the electrical control, a tracer follows the contours of the template or master piece, its movement being transmitted to the tool through contactors, relays, and electro-magnetic clutches. The duplicating attachments are made in various sizes.

COPY-MILLING MACHINES

Copy-Milling machines have come to be indispensable to every die and mould production shop. The latest models of the Heyligenstaedt Tracer-Controlled Automatic Copy-Milling Machines are designed to meet all requirements of the economical machining of irregular contours on tools for non-cutting shaping.

The design of these machine has been further perfected to provide increased production, safety, and accuracy. A specially noteworthy of these machines is the newly designed Heyligenstaedt Tracer (German Patent) which has proved highly successful in practical operation. Whereas semi-automatic contour milling cutter with an attached sectional selector in addition to the axial tracer, Heyligenstaedt Copy-Milling machines now make it possible to carry out reciprocating and contour milling with one tracer so that handling times are reduced considerably. Maximum safety of operation is provided by a chip control device tripping the feed automatically to avoid cutter breakage when the cutter is overloaded.

TURNING MACHINE

The Heyligenstaedt Turning Machine is designed for turning large, bulky work and operates with rotating tools whilst the work is stationary. The headstock incorporating the large hollow spindle is arranged to slide on the bed by worm gear rack. The machine is especially suitable for machine kaplan turbine blade journals.

A variety of additional equipment such as, box-type jaws for the faceplate, auxiliary bed, side head, and tailstock enable the scope of the machine to be increased considerably, a synchronous motor drive (electrical shaft) being employed for actuating the traverse of the slides.

ROLL TURNING LATHE

The Heyligenstaedt Roll Turning Lathe has pioneered new ways in the design of high-production roll turning equipment. A shaft and worm gear rack drive, located below the front shear and protected from chips, has been substituted for the previous ratchet-type saddle traverse control. The worm gear rack ensures smooth, uninterrupted operation of the saddle—a particular advantage in turning hard castings at low speeds and minimum feeds. Vibrationless operation resulting in a neat finish is provided by the helical gearing of the faceplate fear rim and the employment of two bearings for the gear rim pinion.

The saddle is specially designed in box form to prevent deflection of the tools under the high cutting pressures. The narrow guide on the front shear makes it possible to traverse the saddle past the tailstock and the steadies. The tailstock is sturdily constructed to take heavy loads and incorporates a spindle with a built-in live centre, which can be replaced by a dead centre. A rack is arranged on the bed for traversing the tailstock, which is kept from deflecting under peak loads by an efficient locking arrangement.

HURTH BORING AND MILLING MACHINE V10-A

The Hurth Precision Toolroom Boring and Milling Machine combines in a single machine tool three different cutting operations which are of equal importance for the toolroom as well as for the construction of jigs and fixtures:

(1) Vertical Milling using the longitudinal traverse of the worktable which can be tilted in two directions;

(2) Infeed Milling using the longitudinal reciprocation of the spindle head and the step-by-step infeed of the cutter spindle;

(3) Jig Boring using the continuous spindle infeed which can be varied in extremely small steps.

The great versatility of the Hurth V 10-A permits even the most intricate workpieces to be machined to very close limits in a single setting. The machine fully meets all requirements made today of a boring and milling machine to be used in the manufacture of tools, jigs and fixtures, gauges, moulds, punches and dies of every description. In addition to this, the Hurth has also proved its efficiency in both small-lot and long-run production. From the gearbox the milling and boring spindle is driven through a multi-ply flat belt which is tensioned by a jockey pulley. Proper selection of cutting speeds to suit a wide variety of materials and work diameters is made possible by the provision of 13 spindle speeds covering an extremely wide range of between 45 r. p. m. and 2800 r. p. m. In order to increase belt pull in cases where low spindle speeds are used in combination with large-diameter cutting tools, a 4-to-1 planetary reduction gear has been provided within the spindle pulley. For each spindle speed nine different boring feeds are available, this permitting the most favourable operating conditions to be selected for any particular job. For example, with the lowest possible spindle speed of 45 r. p. m., boring feeds range from .005″ (.12 mm) to .080″ (1.95 mm) per revolution, while with maximum spindle speed, i. e. 2800 r. p. m., feeds range from .00008″ (.002 mm) to .0012″ (.031 mm) per revolution. The spindle nose is provided with a Standard Taper. As a rule, cutting tools, such as twist drills, end mills for jig boring work, face mills, boring heads, etc., are held in the hand-operated true-running Stieber chuck which permits tools to be changed in a few seconds without using a spanner.

The worktable of the V 10-A can be adjusted in longitudinal, transverse and vertical directions. In addition, the work clamping plate proper can be tilted by up to 15° to the front and to the rear, respectively.

The guide ways of the longitudinally movable worktable and those of the cross slide serve as reference axes for work by rectangular co-ordinates, while the circular table, when placed on the worktable, will enable work to be performed by polar co-ordinates. Besides manual adjustment, the worktable is arranged for power traverse in both directions, the six table speeds provided ranging from $\frac{5}{8}$″ (16 mm) to $6\frac{1}{4}$″ (160 mm) per minute. The worktable as well as the cross slide can be adjusted in their respective directions of movement either by means of rules and large-size graduated collars reading .001″ (.02 mm) or with the aid of gauge blocks, the latter affording greater accuracy. The worktable is supplemented by a circular indexing table $19\frac{3}{4}$″ (500 mm) in diameter, with index positions spaced 15° apart.

A push-button controlled elevating motor affords, rapid and effortless vertical adjustment of the knee.

HURTH P 5-V UNIVERSAL TYPE POWER PRESS

The Hurth P 5-V Universal Type Power Press renders excellent service in straightening jobs, push-broaching, compression riveting, embossing, forcing-in and extracting of machine components, sizing work, etc. The control of the press ram is arranged to give the operator complete "feel" of press action, this being of particular importance in straightening work and similar jobs. While this arrangement tends to preserve the work, it completely eliminates damage or fracture. Ram pressure is controlled by a pedal so as to leave both hands of the operator free.

A spindle provided with trapezoidal screw threads serves to elevate the knee-type worktable. Thus the press can be rapidly adjusted for work of different height. For broaching work a coolant system can be fitted. The ram is mechanically driven by planetary gearing.

HURTH RP SHAFT STRAIGHTENING ATTACHMENT

This attachment is intended to be used in combination with the Hurth P 5-V Power Press for the straightening of shafts, tubular parts and the like under dial indicator control. It comprises two tailstocks with supporting rollers and spring-loaded levers with locating centres, a sliding rail, a pressure rail, a number of vertically adjustable anvils, and several indicator brackets.

The portion of the workpiece on which pressure is to be applied can be rapidly placed under the ram, since a sliding rail permits the attachment, together with the work, to be adjusted longitudinally. Where necessary, the anvils which are also arranged for easy lateral adjustment along a pressure rail, are inserted. The locating centre facilitate rotation of the work for the purpose of determining the location of run-out, i. e. those portions of the work which require straightening. As soon the ram exerts pressure on the work, the spring-loaded levers are depressed so that the straightening pressure is taken up by the anvils.

For the straightening of non-centered work, such as thin-walled tubes, etc., a special model of the attachment is fitted with two roller-type supports instead of two locating centres.

HURTH INFEED TYPE VERTICAL MILLING MACHINES

These machines combine the features of high-duty vertical millers of maximum precision and of specially designed keyseating and slot milling machines.

While rendering excellent service in the entire field of mechanical production, these machines are especially suitable for the manufacture of high-precision tools, jigs and fixtures and the like. For many years they have been successfully used for a wide variety of machining operations on blanking, forging and extruding dies, etc. Owing to the provision of wide cutting speed and feed ranges the machines can be equally well adapted to the cutting of such diverse materials as high-grade steel, cast iron and light metals.

The cutting of keyways, slots and opening as well as cavities, recesses, etc., such as are encountered in tool and die work, is greatly facilitated by the Hurth method of milling. According to this method, a speed-compensated crank mechanism is used to reciprocate the spindle head in a horizontal direction. Upon each reversal of the spindle head motion the milling cutter is

given a small amount of downfeed, stock being exclusively removed by the end face cutting edges.

The machine, while also having a reciprocating spindle head, is provided with power longitudinal traverse of the worktable in order to permit general milling work to be performed.

HURTH GEAR TOOTH CHAMFERING MACHINE

This machine automatically debur in minimum time such gears as spur gears, helical gears, straight-tooth and spiral bevel gears, hypoid bevel gears and internal gears. As a rule, the deburring time required per tooth is approximately $\frac{1}{2}$ second.

In addition to this, this will render excellent service in chamfering the splines of clutch members to facilitate engagement. In this case, cutting time per tooth, depending on the diametral pitch (or module, respectively), ranges from $\frac{3}{4}$ second to $1\frac{1}{2}$ seconds.

The machine uses a reciprocating bell-shaped cutter. The reciprocating movement of the cutter spindle is controlled by a camshaft, while the indexing function is timed by interchangeable index plates.

HURTH GEAR SPEEDER

The Gear Speeder serves the dual purpose of noise testing high-speed gears and of checking tooth contact patterns.

In this machine, the gear to be tested is run together either with a master gear of high accuracy or with its actual mate. During testing, actual operating conditions are simulated, i. e. the gears are adjusted for normal backlash between teeth and or run at normal circumferential speeds. By loading the driven gear with the aid of a braking device, by reversing the direction of rotation, and by varying the speed to produce the desired set of testing conditions it is possible to obtain and check all types of noise a given gear is capable of producing.

For the purpose of checking tooth contact patterns, the teeth of the gear under test are given a thin coating of marking compound, the loaded gear then being run together with a master gear or its mating gear. By examining the tooth contact areas indicated by the marking compound it is then possible accurately to determine errors in tooth profile, tooth alignment and run-out.

(To be continued)

ROTARY TABLE NASSOVIA VR II

The NASSOVIA VR II Rotary Table, turning by 360°, it is so designed that it is ideally easy to handle and yet of strong and rigid construction.

These features make it suitable for use on all types of machine tools on which work of a suitable nature is undertaken and where the face of the machine table is of adequate dimensions to carry it, included in its wide range of application is milling, drilling, boring etc.

The top surface of the table is provided with radial T-slots and the whole is carried in well-proportioned bearings, together with a flat outer guide face, which are most carefully and correctly aligned and which are provided with seals to prevent the entry of dirt and swarf. The rotary motion is transmitted through a worm and wheel mechanism, operated by a crank handle. The worm-shaft runs in ball bearings. The table itself is accurately graduated in degrees and a secondary graduation is provided on a ring carried by the worm-shaft. This ring is arranged so that it can be loosened, reset to zero or any other required position, and relocked by means of a lock nut and internal taper.

Both, the table itself and the worm-shaft, can be rigidly locked in any decided position by means of the built-in eccentric clamping bolts.

A hardened and ground bush is provided in the centre of the table face for the positioning of locating spigots and work pieces.

DIMENSIONS AND WEIGHTS

Outer diameter	mm	600	24′
Overall height	mm	300	12′
Number of T-slots		8	8
Width of T-slots of table face	mm	18	$\frac{3}{4}$″
Table base dimensions	mm	400×600	16″×24′
Width of base clamping slots	mm	18	$\frac{3}{4}$″
Centre distance of base clamping slots	mm	525	21″
Divisions on worm shaft ring		6″ = $\frac{1}{10}$°	1 div. = 6 min. (at table circum.
Max. load	kg	1000	lbs. 220
Net weight	ca. kg	200	Approx. lbs. 45
Gross weight (seapacking)	ca. kg	250	Approx. lbs. 55

SOME PROBLEMS OF MACHINE TOOLS INDUSTRY

By S. B. Bhattacharya, B.Sc. (Eng.) A.M.I.P.E. (Lond.), A.M.I.E. (Ind.), M.I.S.E., M.M.E.A.

IT is now a well-known fact that the prosperity of a country depends mainly on economic prosperity and no nation can call itself free unless it attains economic freedom. On Industry a trade depends mainly the economic prosperity of a country. No economic development is possible without developing the industries. Again for development of any industry, we require machineries and equipments. These machineries and equipments are again produced through certain fundamental machineries which are called Machine Tools. If we want to manufacture Oil Engines we want Machine Tools to make them, if we want to manufacture locomotive engines we want machine tools to manufacture them and so on. For all the big and small industries including the manufacture of steam engines, oil engines, gas engines and parts thereof, locomotive engines, electrical machineries, textile machineries, agricultural machineries etc. we require machine tools. For their maintenance we require machine tools. Again for the manufacture of direct consumer goods like Bicycles, Motor cycles, Motor cars, Pumps etc. we require machine tools. So, we require machnie tools every where.

After Independence it becomes our foremost duty to develop all the industries within our country so that she becomes self-sufficient. We shall be simply amazed if we look to the import figures of some of the above items and judge what amount of money we are draining every year for importing them from foreign countries :—

	1952—53	1953—54
(1) Machine Tools (Drilling, Grinding, Milling, Planing, Shaping, Lathe) ..	Rs. 1,94,76,771/-	Rs. 1,99,32,158/-
(2) Other tools	Rs. 1,17,49,298/-	Rs. 63,22,506/-
Total machinery and millwork, including Prime-movers, Electrical machineries, Machine tools and other tools, Textile machineries etc. ..	Rs. 85,71,72,059/-	Rs. 83,79,96,339/-

In order to develop the above industries we require machine tools worth about Rs. 120 Crores. To this we have to add the value of machine tools which will be required to develop the direct consumer goods industry. Hence, the demand for machine tools is simply colossal.

When the demand is such the supply from foreign countries is so far too inadequate, uncertain and often takes a long time, and the prices charged are abnormally high. If the supply, thus, gets restricted we shall not be able to develop industries as rapidly as we desire. Again, if the price becomes so high it will not be possible for our poor country to pay for the adequate number of machines and our progress will surely be affected.

In the circumstances we have no other course left with us than to develop this Machine Tools Industry as rapidly as possible within our country.

BRIEF SURVEY

The Machine Tools Industry—manufacturing and supplying machine tools for others' use—was practically non-existent prior to 1935. Some of the stray factories here and there were manufacturing simple and primary types of machine tools for their own use. Subsequently, however, two or three firms took it up on a commercial scale but their total output could not exceed 100 machine tools per annum. During World War II owing to fall of import and due primarily to Government encouragement, the industry made some progress and about 4000 machine tools (graded) were produced in 1945. Since then, the Industry has been making slow progress.

PRESENT POSITION

The position of Machine Tools Industry in our country at the present moment is not very happy. There are about 16 graded and 50 ungraded firms engaged in the manufacture of machine tools but their total output can hardly meet 3 per cent of the country's requirements. Again, excepting a few, all others work with the old types of machineries and very little attempts have so far been made to organise them on a sound footing with adequate technical background. Quite

recently, the Hindusthan Machine Tools Ltd. sponsored by the Government of India has set up a factory at Jalahalli near Bangalore in collaboration with a Swiss firm, the Oerlikon Machine Tools Works of Zurich. Thus we have at the present moment Grade I machine tools manufacturers on a medium scale as:—

(1) Messrs. Mysore Kirloskar Co., Harihar.

(2) „ Investa Machine Tools & Engineering Co., Bombay.

(3) „ Cooper Engineering Co., Satara.

(4) „ India Machinery Co., Howrah.

(5) „ Maya Engineering Works, Calcutta.

Quite recently, Messrs. Praga Tools Corporation Ltd. has started manufacturing machine tools.

However, the combined production of the above five firms during the following years is estimated at:—

	Nos.	Value
1948 ..	1,692 ..	Rs. 54.72 Lakhs
1949 ..	2,240 ..	Rs. 47.29 „
1950 ..	1,101 ..	Rs. 26.59 „

The production planned in the Machine Tools factory at Jalahalli is estimated at:—

High speed lathes	.. 900 nos.
Milling machines	.. 460 „
Heavy duty drilling machine	.. 240 „

Although the Government has assured the private enterprises that it will not compete with them but will only make precision machines above certain range, fear has already spread in the private sector particularly in the smaller ungraded sector that they would possibly have to wind up their endeavours in a short time. I do not think that it is a healthy sign. This fear may probably leave them to shirk their responsibility to make precision machines and to improve the process of manufacture according to modern practice.

DESIGN AND STANDARDISATION

Apart from accuracy to be kept according to certain test charts, the development of machine tools industry depends upon other factors:

DESIGN

One of the most important factors is the design of the machine tools. At present, the range of products of the industry includes mostly copies of old models of lathes, drilling machines, shaping machines, slotting machines, chucks, presses etc. The bulk of the machineries manufactured are of primary types suitable for light and intermittent duties. With the advancement of science much improvement has been made on these machines and the new machines are almost revolutionary in character so far as production output is concerned. These new machines practically replaced the old-fashioned machines in other advanced countries and turned them obsolete.

The essential considerations to be made in the designing of such machine tools are:—(i) Cheapness, (ii) Simplicity, (iii) Usefulness, and (iv) Durability.

Again, such design depends to a great extent upon the adoptation of suitable raw materials to make the different parts of the machine tools.

So far, raw materials used in this country are grey cast iron, mild steel, brass and gun-metal. Modern machines as built in other countries use special alloy cast iron, alloy steel, special bronzes, aluminium base alloys etc. It is why they could make precision machine tools of great durability with revolutionary production capacity without making them extra-ordinarily heavy and much costly. To this end, considerable work is being carried on in other advanced countries to adopt welded structure for the machine tools in place of cast iron. Some parts are made of nitralloys.

Considerable research and investigations are necessary in this respect. It is not possible for any private enterprise at the present condition, to subscribe for any local section to function for them. Only Government can encourage by allowing local Engineering colleges and Institutions to have such development section attached to it with funds available from Government exchequer. This will also provide for the post-graduate engineering students, who may take up this subject, a field for work

and such students will ultimately be able to impart their knowledge and experience in the growth and development of this industry throughout the country.

MANUFACTURING ORGANISATION

At the present moment the manufacturing organisation in most of the factories engaged in the manufacture of machine tools in the private sector is far from ideal. The sense of precision leads to the establishment of extensive Grinding shop, the adoptation of special materials needs elaborate Heat Treatment shop. Besides, elaborate testing and inspection departments are now considered as the essential parts of a machine tools manufacturing organisation. With all these, modern foundry shop and pattern shop, adequate machine shop with general purpose and special machines for precision work, painting, electroplating and stores are also required to be provided. One unit containing the whole is an absurd proposition for the present condition of industry in our country. In fact, in other advanced countries, such organisation is splitted up pattern makers having separate organisation engage themselves in pattern making, foundries engage themselves in supplying castings, Gear manufacturers supply the gears. If we look to Howrah and places like that, we find that such splitting up is quite possible. Even then, it needs organisation and development in each sector.

FINANCE

To equip and better equip the existing plants on modern lines replacing the old obsolete machines needs large Capital investment, which is again a great problem for the industry. Manufacture of machine tools needs precision machine tools at the beginning and one of such machines may cost more than a lakh of Rupees. It is not possible for a private enterprise to invest such a huge capital as required even for a small economic unit and here again, unless Government comes forward with generous financial assistance, such scheme is next to impossible.

LABOUR

More we look for a quality production, more we have to look for a careful training of the labour. The conception of precision work or work to close tolerance in the present system of interchangeable production and quality production which is at present practically non-existent in our country should be brought in the minds of labour and their training should be planned and arranged accordingly. There are Technical Institutions in the country but there should be a better contact between Industry and Technical education. Institutions should know what industry requires and Industry should know what education is given to the trainees and whether it is according to their requirement.

SALES ORGANISATION

Industry covers sales—here and abroad. We have also wide field for sale of our products in countries around us. It is also not desirable to make any unhealthy competition amongst manufacturers—small or big—within the country bringing ruin to their door. Every enterprise has got its capacity and an equitable distribution of work according to capacity is necessary. For this, Associations have large part to play.

Let us hope that Associations like the All India Manufacturers Organisation, the India Machine Tool Manufacturers' Association, the Engineering Association and other similar Institutions will look into the interest of this Industry and will nourish it with all care as it deserves with the active support and co-operation of the Government.

STANDARDIZED SINGLE COLUMN VERTICAL TURRET LATHES

MODEL KE

FOR HIGH SPEED MACHINING WITH MAXIMUM MATERIAL REMOVAL

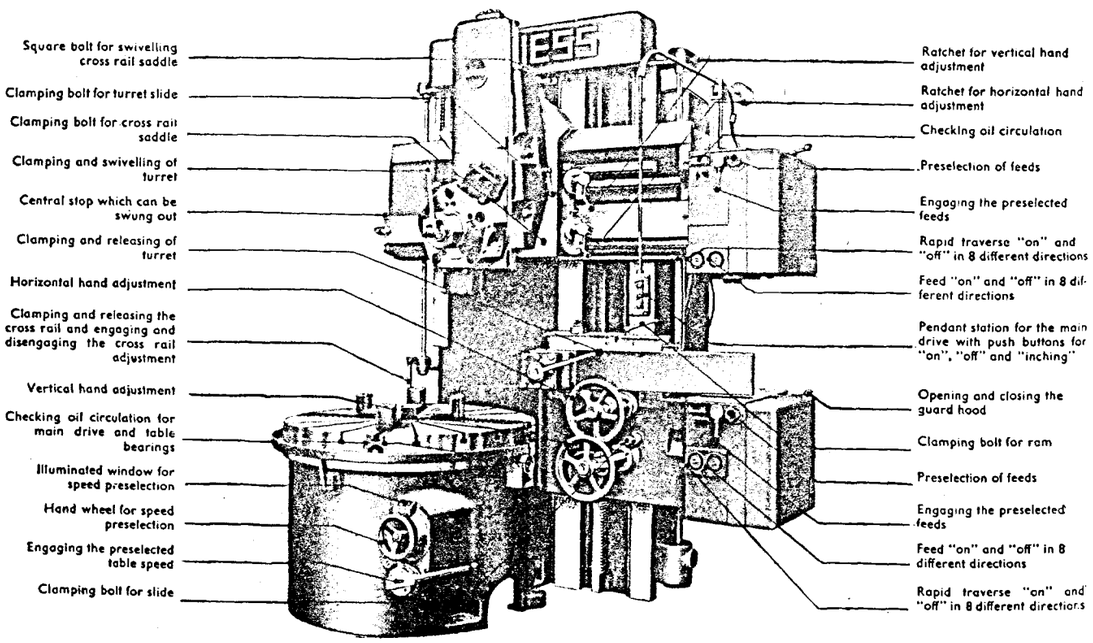
By F. Fuchs V. D. I.

THE name of SCHIESS has always been connected with the latest in the machine tool industry, to which they have made numerous and valuable contributions. Their main contributions have been made in the field of Turning and Boring Mills. As long as 80 years ago they produced some of the first Vertical Turret Lathes in their shops and over a period of years they have developed these machines to various other types, finally concluding with gigantic Boring Mills of 84 ft. table diameter with a maximum weight of 1800 tons, which today still remain the largest machines of their type. Based on these many years of experience and their constant research work, and also together with their numerous customers in all parts of the world, they have developed the Single Column Vertical Turret Lathes described in this article to a point where they are considered to be the most modern machines of their type. Their design and construction alone show that for material removal, maximum accuracy and surface finish plus minimum down times, these machines incorporate the latest and most modern features. No doubt, you will note that with the extremely high speeds and the possibility of chucking the workpieces as quickly as possible, the extremely fast changing of tools and with the many and varied feeds and speeds, these machines show themselves to be extremely versatile for the work that they are intended to do. In this day and age of maximum machining time being of prime importance and with the development of high speed carbide tools, these machines will cover all of the eventualities which may arise in years to come.

SINGLE COLUMN VERTICAL TURRET LATHES

MODEL KE 100, KE 125, KE 160

Main Parts and Control Elements



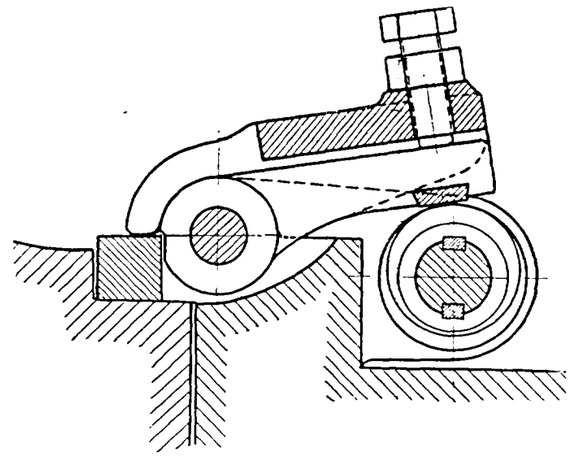
spline shafts, all of these gears in addition to the above are ground. The various shift gears are supported within the shift forks on ball bearings and at the same time are balanced through counter-weights.

The change from one table speed to another takes place through the hydraulic preselection which can be utilised while the machine is standing still, or while the machine is running slowly. It is possible to shift from one speed to another without going through all the intermediate speeds which may lie between the two mentioned here. The preselection is put into operation from the front of the machine through a simple hand wheel, which is run against a very large and well lit dial. The lever for the actual speed shift is located underneath this hand wheel. When this lever is pulled downwards the main drive motor is shut off, a safety device, just in case the stop button on the pendant station has not been utilised. When the shift lever is pushed down a slight forward movement away from the operator starts the hydraulic shift. At the same time that the hydraulic shift is put into action, a slow speed drive or escapement mechanism also takes effect. With this slow speed mechanism it is possible to have a very smooth and effortless gear shift without having the operator pay any attention whatsoever to this entire procedure.

When the operator starts the hydraulic mechanism, the light on the speed dial goes out and upon completion of the shift, this light comes back into operation. The oil for the complete hydraulic system is derived from a pump which is utilised for the lubrication of the entire gear box and the tapered roller bearing of the table. The entire oil in this system always remains cool, since the pressure is increased only upon utilising the hydraulic gear shift mechanism. The pressure of the oil is easily regulated on the rear of the machine and can be checked against a manometer at any time the operator may so desire. The rear of the column, as stated before, carries the main drive motor and also the entire gear box, both of which are closed off through a door on the machine which is adequately louvered for ventilation.

THE CROSS RAIL

is driven through a flange motor which is located on the column of the machine and driven over a screw spindle. This entire drive is dependent on the electro-mechanical clamping of the cross rail. The clamping of the rail takes place at 4 points through a



Clamping lever for the cross rail.

lever type arrangement. When the clamping mechanism is in the zero or centre position, the rail is clamped tight to the column of the machine in a most rigid manner. When the operator desires to move the cross rail, a simple movement of the lever on the left side of the machine unclamps the rail as the first operation, and then calls and the rail elevating motor into operation, the direction being dependent upon whether the cross rail is to be moved up or down. Upon moving the rail to its desired position, the elevating lever is again returned to the neutral position, the elevating motor being stopped first, and the clamping motor then going into action.

Limit switches are provided for the rail both at the top and bottom positions. Should the rail inadvertantly run against a workpiece on the table, a mechanical type safety disengages the elevating screw. The rail elevating lever is on the left side of the machine, which may be turned to a downward position when the elevating mechanism is not in use.

The five position turret on the rail head and the four position tool holder on the side head are considered the STANDARD UNITS OF THE KE MACHINES.

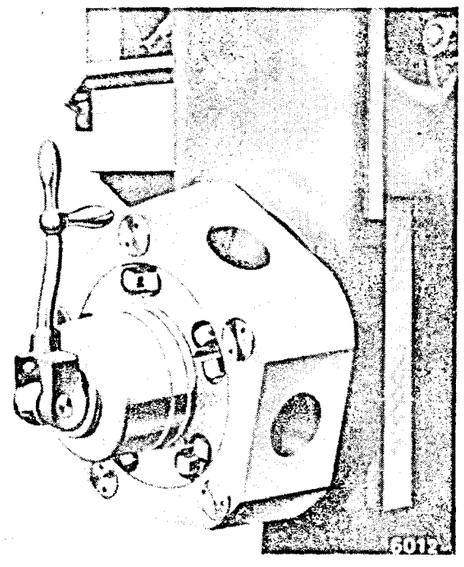
THE CROSS RAIL SADDLE

is carried in a small guide on the bottom way and can be swivelled in both directions to a maximum of 45 degrees

with power feed in vertical, horizontal and angular directions. Hand movements of the head are taken care of through ratchets on the slide, thus facilitating the observation of the tools by the operator in setting up his work. The turret slide is of cast steel construction, counter balanced, and moves in long, rectangular ways which are adjustable with the jibs.

THE FIVE POSITION TURRET

has a proven indexing and locking device which permits indexing with no danger to the operator, even when out



Turret head in locked position.

of balance occurs due to heavier tools being on the one side of the turret. The tools are held in a concentric split bushing which is below the turret surface, so that large tools or tool holders may be attached to the outside surface of the turret. A single lever indexes and locks the turret through eccentric clamping. A full rotation of this lever in either direction indexes to the next turret position. Constant accuracy of the turret position is guaranteed through a separate adjustment which may be reset at any time. A hinged mechanical interlock assures concentricity for boring operations and this interlock may be opened should it be desired that the cross rail saddle be moved beyond the centre position.

THE SIDE HEAD

is carried in long narrow guides on the column with wide bearing surfaces. Feeds can be set independently of the cross rail head, which is equipped with independent rapid traverse and balanced through a counterweight on the inside of the column. The ram is of extremely heavy construction due to the relatively large overhang sometimes required on specific operations and furthermore equipped with carefully made guides which allow extremely sensitive adjustments whenever needed. The square indexing tool holder is carefully adjusted for accurate indexing and is clamped securely in each position. The lever arrangement is similar to that of the turret. Horizontal and vertical setting of both heads is facilitated by scales and verniers. Pointers can be set on these scales wherever required. The ratchets on the cross rail head are equipped with a dial and vernier as are the hand wheels on the side head. These dials and verniers may be moved to any relative position whenever so desired without making use of any external clamping nuts or other devices.

Both the railhead and the side head are driven through separate gear boxes, each box containing an independent rapid traverse mechanism and a feed mechanism. The gear boxes for both the rail and side head are identical in all respects with only certain small exceptions. These boxes contain the gear clusters for the various feeds, as well as the desired direction of feed and traverse. The feeds are derived through a vertical shaft which rotates in a definite ratio with the table speed while the rapid traverse is by separate motor. The flanged motor on the feed box runs only while the rapid traverse is engaged. Feed change with an overall range of 1 to 100 is by preselection and mono-lever control. The engaged feed can be read directly on the appropriate dial. All feed selections are accomplished from one feed to another without going through the intermediate positions. All feed gear changes are taken up through hardened cluster gears and clutches of alloy steel.

Change of direction of feed and rapid traverse is by electro-magnetic disc clutches, actuated by a shift lever moved in the sense of direction of the feed or traverse movement. If the rapid traverse lever is moved down, the turret side will, of course, follow this movement and start downwards; should the lever be moved in the up position, the turret slide will move upwards. In both of these cases there is no horizontal movement of the rail head. Should the lever be moved to the left position, the railhead will, of course, move to the left and the same also holds true should the

lever be moved to the right, and in both the right and left positions there is again no vertical movement. It is furthermore possible to select the compound feeds by moving the rapid traverse lever to the positions between vertical and horizontal in which case the railhead will move up and to the left should the traverse lever be pushed to this position. It is thus possible to have a full vertical or horizontal movement and at the same time the operator is in a position to select a 45 degrees movement in any of the two top or bottom positions.

When the feed and rapid traverse lever are in their normal central position, no movements occur whatsoever. The feed lever, when pushed to any one position, stays in that position until returned to its central position by the operator. The rapid traverse lever is spring loaded and must be held in the desired position by the operator as long as movement of either the rail or side head is expected. If the operator releases this lever, an immediate reaction of the rapid traverse motor takes place in that the motor is automatically shut off. When the rapid traverse lever is moved the electro-magnetic clutches are actuated and at the same time the rapid traverse motor is engaged. A safety interlock precludes the possibility that the feed and rapid traverse could accidentally be engaged at the same time. The rapid traverse movements of both heads are independent of the movement of the table and thus may be engaged at any time. The use of any feed, of course, is dependent upon the machine being in operation and the table moving.

Since it is possible to use a vertical and horizontal feed simultaneously, it is quite easy to turn various tapers in connection with the swivelling of the rail head to any desired angle on the saddle. Both vertical and horizontal feed drive shafts are equipped with a special safety clutch utilising a shear pin to eliminate the possibility of damage to the gear boxes. Each feed box contains its own motor driven oil pump which lubricates the entire box at all times independent of table revolution. The lubrication of the gear boxes can be observed from the operator's position through the usual open glass arrangement. Another pump, with built in filter, supplies lubricating oil to the main drive box, the tapered roller bearings of the table and splash lubrication to several other points.

3—JAW TABLE

In mass production it is sometimes advisable to use a 3-jaw type table on the KE machines. In place of the normal type table, a table with 3 jaws can be used, which are either independently adjustable or may be used simultaneously. These jaws are moved through a screw-type spindle which is recessed into the table itself. If so desired, it is possible to remove the three jaws which leaves a completely flat surface on the table upon which any type of irregular workpiece may be mounted. It is further possible to use other various types of special jaws and fixtures, again depending on the piece which is to be chucked.

HYDRAULIC CHUCKING

The tapered roller bearings of the table are large enough that a cylinder for hydraulic chucking may be mounted within the table pivot. This, of course, brings many advantages with it for mass production when fast and accurate chucking is of the essence. With this type of mounting it is no longer necessary to grout into the foundation underneath the machine.

THREAD CUTTING ATTACHMENT

The change gears which are delivered with this attachment allow for inch metric and diametral pitch thread cutting. It is furthermore possible to do all types of scroll cutting with this particular attachment. The change gears are mounted on the flange shaft at the gear box for the cross rail and are located underneath the cover of this box, which is easily opened and thus readily accessible at all times. A simple lever on the feed box is fitted to a single tooth clutch which engages for the thread cutting and upon completion of the cut the tool itself may be brought back to the starting position in rapid return. Pitches of up to one inch are connected through the single tooth clutch and are thus synchronized with the return of the table. Should other pitches become necessary which are cut on a different position of the feed drive, the single tooth clutch will make several revolutions to one revolution of the table in order to eliminate the possibility of the change gears attaining a speed which is beyond their capability. In such cases the thread cutting is picked up with the help of a mark on the table itself. When the single tooth clutch is in operation, the electro-magnetic clutches are automatically locked out to prevent their possibility of going into operation inadvertantly. Thread cutting on this machine may be done on the rail head as well as on the side head. Figure 6 shows the drive box open and also shows the centralised location of the forks upon which the various change gears may be mounted. No. 1 is the driving shaft upon which the single tooth clutch is mounted. No. 2 shows a shaft for the vertical feed and No. 3 is a shaft which is connected to No. over a gear change in a ratio of 1 : 4. In the case of fine threads it can thus be run or driven from No. 1 to No. 3 and with steeper pitches, from No. 1 to No. 2. In the case of

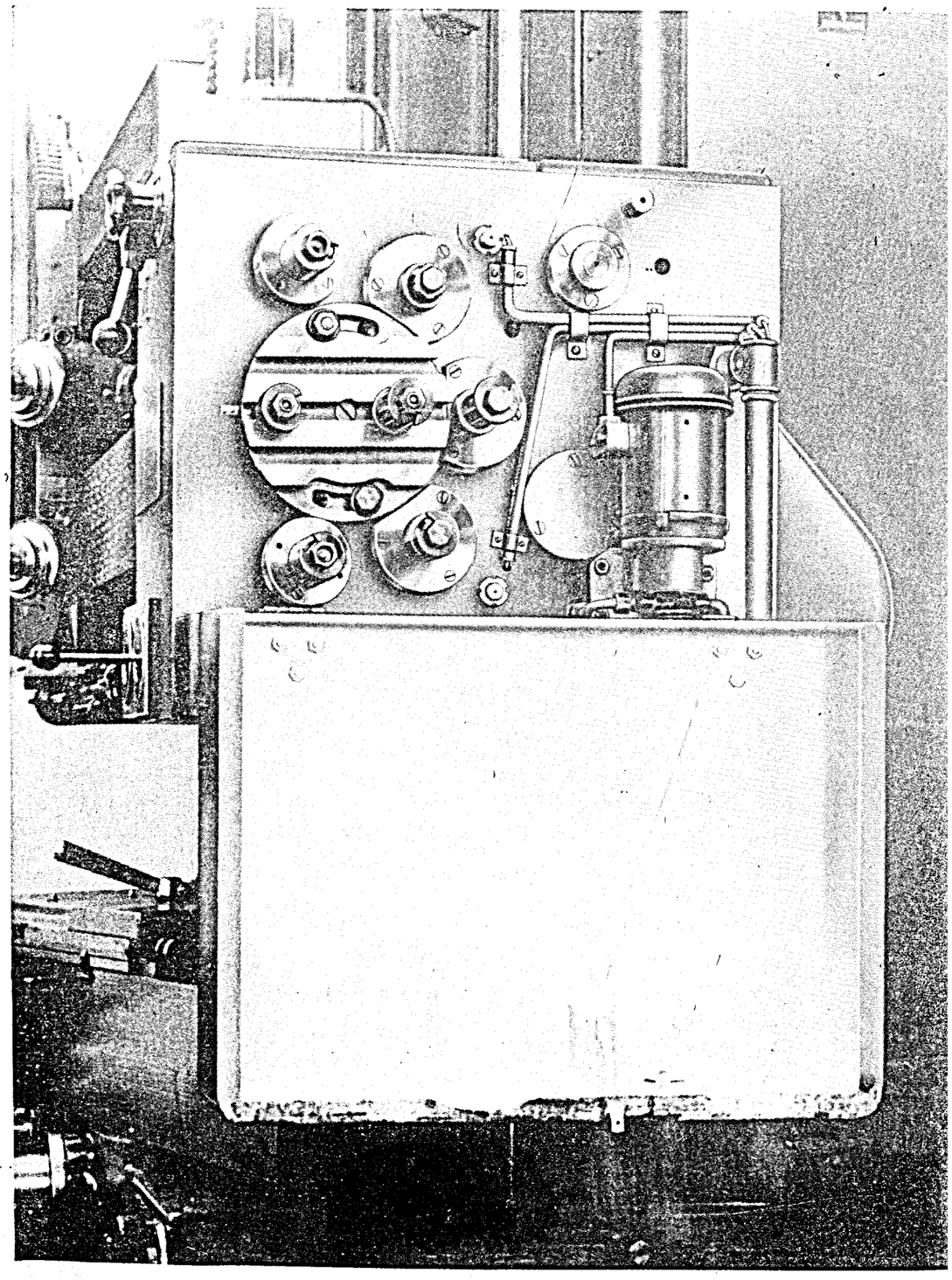


Fig. 6 Thread Cutting Attachment.

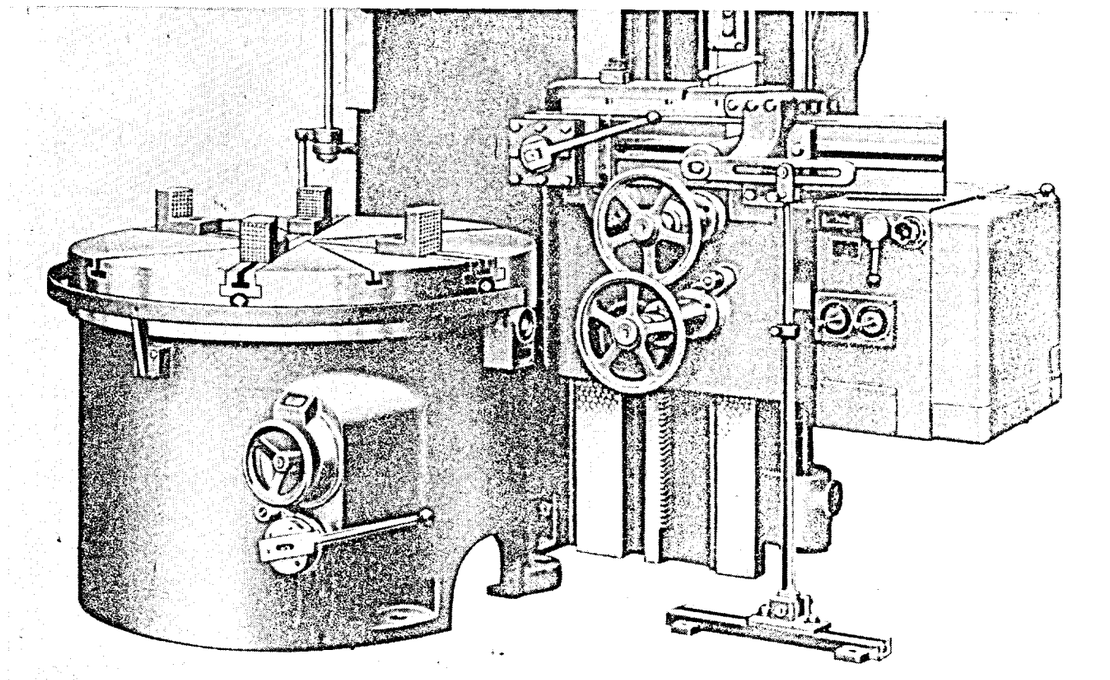
scroll cutting and other work of this nature No. 4 is used which is simply an extension of the threading spindle for the horizontal feed. An additional shaft No. 5 is shown which again is utilised for change gears for extremely fine pitches.

TAPER TURNING ATTACHMENT

In addition to the possibility of taper turning as outlined before, utilising the swivelbed rail slide, vertical feed and horizontal feed, it is also possible to use both feeds connected through change gears. A complete set of change gears is available with which angles at intervals of 5 degrees may be turned. Values that lie between these two figures are arrived at through additional angular setting of the rail head. In taper turning with change gears the possibility of horizontal and vertical feed clutches operating simultaneously is eliminated through on ingenious lock plate on the lever which controls particular attachment. If so desired, a rotating tool holder with which the tool is set to the vertical against the desired taper may be used. Figure 6 shows the lubrication pump for the feed box with its attached motor.

CROWNING ATTACHMENT

For the machining of convex faces, such as crowned belt pulleys and similar items, the sidehead may be arranged for this particular attachment. A table is



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Crowning Attachment.

supplied with the machine showing the various desired dials or the crown heights which may be desired.

OCTAGON RAM

The rail may be equipped with an octagon ram instead of the usual turret type ram.

PRECISION MEASURING DEVICE

This precision measuring device consists of a rotating drum with five and four adjustable stops respectively for the vertical and horizontal movement of the railhead and for the horizontal movement of the side head. One stop is mounted for each tool which, in turn, works on a dial

indicator upon which feed movements in thousandths can be read. For mass production and large runs of identical pieces this precision measuring device may be used to great advantage.

AUTOMATIC FEED KNOCK-OFF

This is a further improvement upon the above mentioned precision measuring device and allows for automatic knock-off in connection with the feeds. These stops on the drum for the individual tools are connected not only with the dial indicator but also to a precision micro switch which in turn is connected to the electro-magnetic clutches. After the proper stop has been reached and the feed has been knocked off, the drum is rotated to the next stop and the feed may again be engaged by pushing the start button.

WET TURNING ATTACHMENT

In case that a wet turning attachment is desired, the entire front part of the base of the machine is closed in with sheet metal. This sheet metal enclosure reaches to the top of the table. The speed dial and hand wheel selector plus the preselection shift lever are brought out through the sheet metal housing to allow the operator to keep clear of the coolant which may be running down from the table. A Second sheet metal ring is placed within the first one and this second ring is somewhat lower and it is in this space that the chips and coolant thus are collected. The coolant after passing through the built-in screen is returned to the coolant attachment, from there through the coolant pump back through the various lines to the rail and side head. The outside sheet metal covers of the wet turning attachment are removable so that the operator may remove any or all sections from time to time in order to enable him to clear the chips from within the coolant housing.

COPYING ATTACHMENT WITH TRACER CONTROL

The fact that the feed boxes are equipped with electro-magnetic clutches offer the advantage that a copying attachment may be worked in quite easily and thus enable the machine to be equipped with copying attachment and tracer control. It is possible to attach the copying device on machines which have been delivered prior to this item

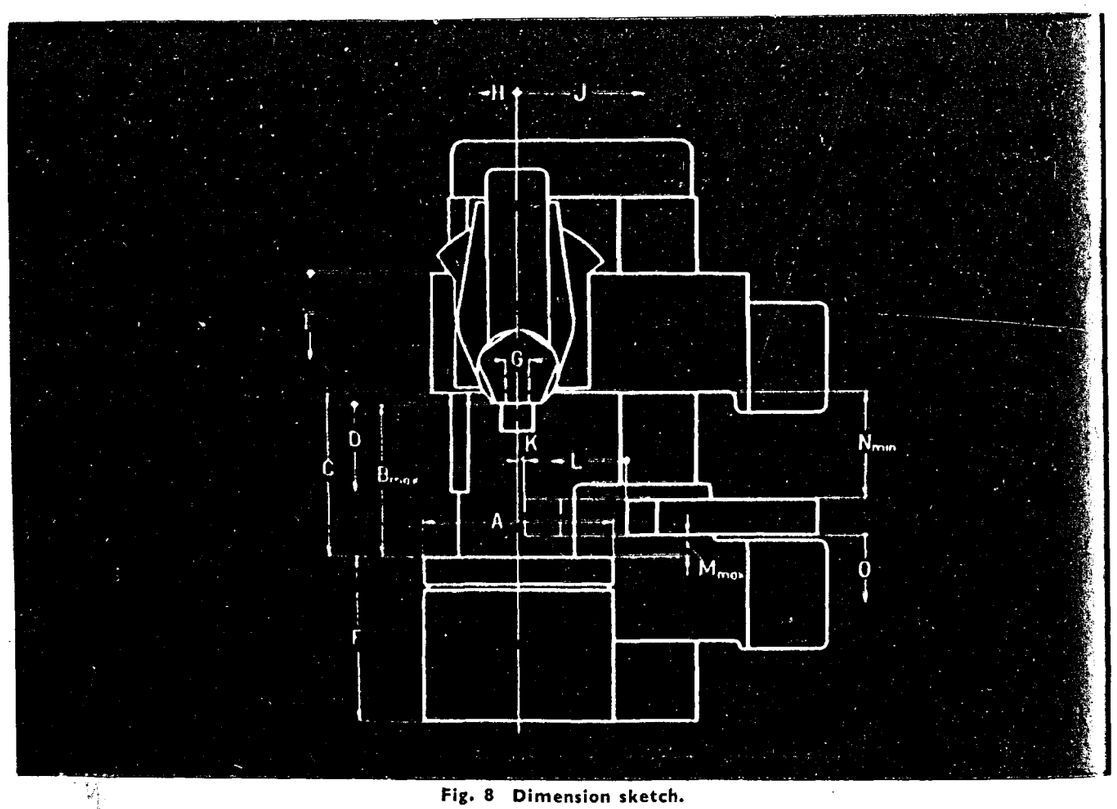


Fig. 8 Dimension sketch.

DIMENSIONS

	A	B	C	D	E	F	G	H	J	K	L	M	N	O
KE 100	39.37	52.17	44.09	27.56	29.53	35.43	3.15	2.36	27.56	0	21.65	31.50	5.91	31.69
KE 125	49.21	52.17	44.09	27.56	29.53	35.43	3.15	2.17	33.47	3.94	25.59	31.50	5.91	31.69
KE 160	62.99	52.17	44.49	27.56	29.53	35.83	3.15	1.77	41.36	5.91	27.56	31.50	5.91	31.69

	KE 100	KE 125	KE 160
Maximum turning diameter	39.37″	49.21″	64.96″
Maximum turning diameter with side head down	45.28″	55.12″	70.87″
Maximum turning height over table	43.31″	43.31″	43.31″
Lowest position of side head	under table	under table	under table
Permissible load on table	3 tons	4 tons	5 tons
Maximum cutting efforts	9921 lbs.	9921 lbs.	9921 lbs.
On diameter of	31.50″	35.43″	39.37″
Approximate chip section in cast iron	0.0775 in²	0.0775 in²	0.0775 in²
Approximate chip section in steel with strength of approximately 71.116 lbs./sq. in.	0.0403 in²	0.0403 in²	0.0403 in²
Number of speeds	16	16	16
Lowest r.p.m. of table	6.2	4.7	3.8
Maximum r.p.m. of table	310	237	191
Number of feeds, horizontal, vertical, compound	12	12	12
Feeds per table revolution	0.00264-0.264″	0.00264-0.264″	0.00264-0.264″
Rapid traverse of heads	88.58 in/min.	88.58 in/min.	88.58 in/min.
Vertical movement of rail head	15.75 in/min.	15.75 in min.	15.75 in/min.
Horse power of main motor	40 H. P.	40 H. P.	40 H. P.
Horse power of rail elevating motors	3 H. P.	3 H. P.	3 H. P.
Horse power of rapid traverse motors	2 H. P.	2 H. P.	2 H. P.
Horse power of slow speed and pump motor	0.5 H. P.	0.5 H. P.	0.5 H. P.

R. P. M. of above mentioned motors	1500	1500	1500
Horse power of lubrication motors for feed boxes	0.2 H. P.	0.2 H. P.	0.2 H. P.
R. P. M. of these motors	1000	1000	1000
Machine equipped with octagon ram :			
Maximum turning head over table	39.37″	39.37″	39.37″
Weight	26455 lbs.	29983 lbs.	40786 lbs.
Overall outside dimensions (width x depth x height)	84.6 x 84.6 x 118.1″	106.5 x 102.5 x 118.1″	110.2 x 102.4 x 124.0″
Ditto with turret head in highest position and side head drawn back.	122.1 x 84.6 x 141.7″	128.0 x 102.5 x 141.7″	133.9 x 102.4 x 141.7″

being made available. The copying attachment is made possible through the choice of the electro-magnetic clutches, with their precise control and durability. These clutches show an extremely small, if not almost negligible coasting error when the clutch is knocked off. Both the tracer and the template are attached to the left side of the machine in such a manner that the machine may be used without the attachment at any time without having to take the copying device from the machine. This copying attachment is available for the rail head as well as for the side head.

The workpieces that can be handled with this copying attachment may be machined on the top surface as well as on the circumference or on any internal boring surface.

It is possible to turn all forms in which the cutting tool moves within two quadrants, i. e., to work with a guide feed which is always in one direction and a feel feed which runs at right angles to the guide feed. It is furthermore possible to keep the guide feed running constantly in connection with the tracer while the feel feed may be stopped and started at will. The setting of the various units of the copying attachment is extremely simple and clearly marked through small nameplates with simple explanations of the various movements. In addition to this, the relative instruction manual can also be referred to. The electrical equipment for the copying attachment is built into the main control cabinet and utilizes standardized control elements which are quite simple to replace should this ever become necessary.

COVER PAGE

The photograph illustrated on the cover is a Craven's Double-Ended Locomotive Tyre and Wheel Centre Turning Boring & Boss Facing Lathe. This machine comprises two totally-independent machines with their beds bolted together so that the two separate handstocks face one another. A cross-bed fitted over the main bed shears, in front of each headstock, is adjustable to and from the respective faceplate by hand, and carries two swivelling-type compound tool rests. The left-hand rest in each case has a four-position tool turret for successive turning operations on the wheel rims or tyres, while the right-hand rest has a flat topped tool slide with tee-slots for bolt and plate clamping of boss facing tools and boss boring bars. Both rests can be used simultaneously, and the length of transverse and longitudinal feed traverses are controlled by automatic feed trip mechanism on the side of the cross-bed and swivel slides.

Both ends of the machine are able to turn and bore wheel centres up to 6′–6″ diameter or to bore the corresponding tyres up to 7 ft. diameter on the tread. Each headstock is driven by a separate 25 H. P. variable-speed motor, and has four gear changes to give spindle speeds from one to 60 r. p. m. Four independently-adjusted, reversible jaws are fitted to each 7′–10″ diameter faceplate and are able to grip either the outside of the tyres or inside the rim of the wheel centres, radial tee-slots being provided also for additional clamping purposes. Pockets in the faceplate allow wheel centres with crank-pins in position to be flat against the faceplate jaws. A feed box at the end of each cross-bed, obtaining its drive from its respective headstock via transmission gears and a short shaft at the front of the main bed, provides a total of eight feed changes ranging from 12 to 96 cuts per inch. Quick power traverse motion to the rests is obtained from a separate motor with convenient push-button control. The total weight of the whole machine is about 46 tons.

Cincinnati Machine Tools Increase Production

MEN in the Metal Working Industry whose job it is to increase production—without increasing costs or sacrificing quality—have a number of principles upon which to draw when selecting production equipment. One of the most important of these principles is also one of the most obvious—keep the machine cutting as much time as possible.

The Cincinnati Milling Machine Company of America and Cincinnati Milling Machines Limited of Birmingham, England, have always applied this principle in designing standard and special purpose machine tools. The machines illustrated in this article show how the objective has been approached.

AUTOMATIC CYCLES

Machines designed to provide automatic cycles wherein the machine performs one or more operations without attention of the operator—offer some of the best illustrations of this principle of keeping the machine cutting as much of the time as possible.

Figure 1 illustrates a Cincinnati 1–18 Automatic Milling Machine which has several time saving features.

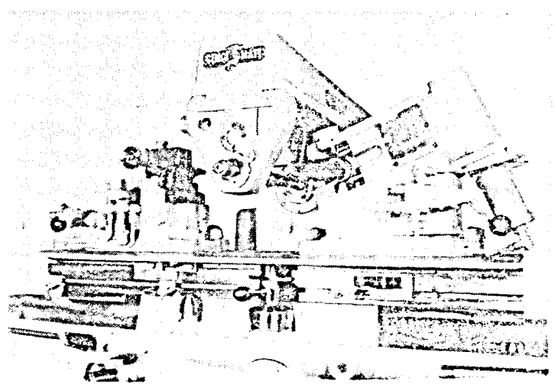


Fig. 1

The work performed is the milling of 'keeper' slots in automobile connecting rods and bearing caps. It will be seen that the air-clamp fixture on the right of the table hold the two con-rods and the one on the left of the table holds the two bearing caps. While one set is being milled the other set is being unloaded and fresh pieces re-loaded. The approach of the cutter to the work is at the rate of 300 inches per minute, so the period of time when the cutter is not performing useful work is negligible. To ensure safety for the operator the machine table stops at the central position and the cutter spindle ceases to revolve until the 'start' button is pressed.

When Milling Machines are installed for general purpose work (as opposed to production work), good design features play an important part in keeping them at work for the longest possible time. The Dial Type Milling Machine in Figure 2 has conveniently grouped

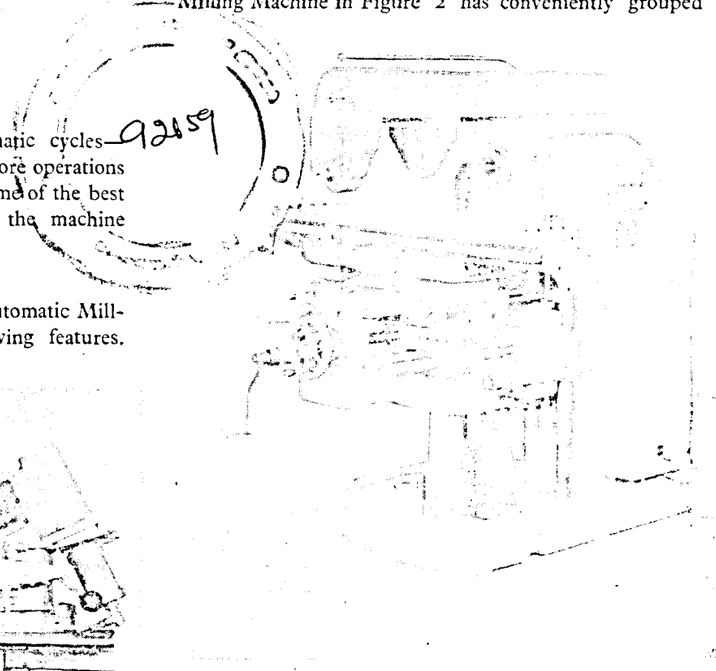


Fig. 2

operating controls at both the front and rear of the machine table to enable the operator to watch the work from the most convenient working position; and these controls are directional, the levers moving to the right and left for longitudinal movements of the table, up and down for vertical movements of the knee, and forwards and backwards for cross movements of the saddle. The operator can also change the table speeds and spindle speeds hydraulically from both the front and rear of the

machine. The machine table of all Cincinnati Milling Machines are capable of a high rapid traverse rate. Many other design features enable these general purpose machine to be set-up in the minimum space of time.

PROFILING & DIESINKING

When complicated contours must be machined accurately and quickly, tracer-controlled machines are often used. One such machine is shown in Figure 3.

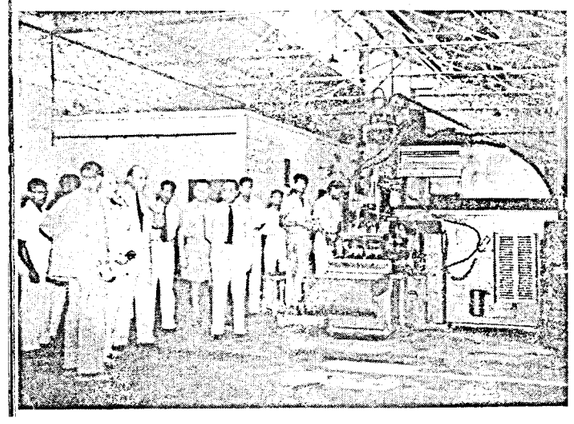


Fig. 3

It is a 28″ Hydrotel operating at the Praga Tools Corporation Limited, Hyderabad, and the photograph was taken in February 1954 on the occasion of a visit to the Praga factory of His Excellency Dr. Meyer German Ambassador to India. This versatile machine can be used for conventional milling operations or for cutting profiles or for diesinking work. For profiling and diesinking operations the machine movements are controlled by tracer fingers which actuate the hydraulic mechanisms.

A smaller and very sensitive diesinking machine is the Cincinnati 8″ × 18″ Tool and Die Miller. The one illustrated (Figure 4) is fitted with duplex rotary tables. A 'master' plaque is mounted on the right-hand table; as this revolves a tracer finger moves up and down over the design, these movements being faithfully repeated hydraulically by the cutter over the left hand table which carries the plaque to be machined. As the tables rotate, the machine saddle moves forward very slowly, thus generating a very close spiral motion. The extreme accuracy of this machine is illustrated

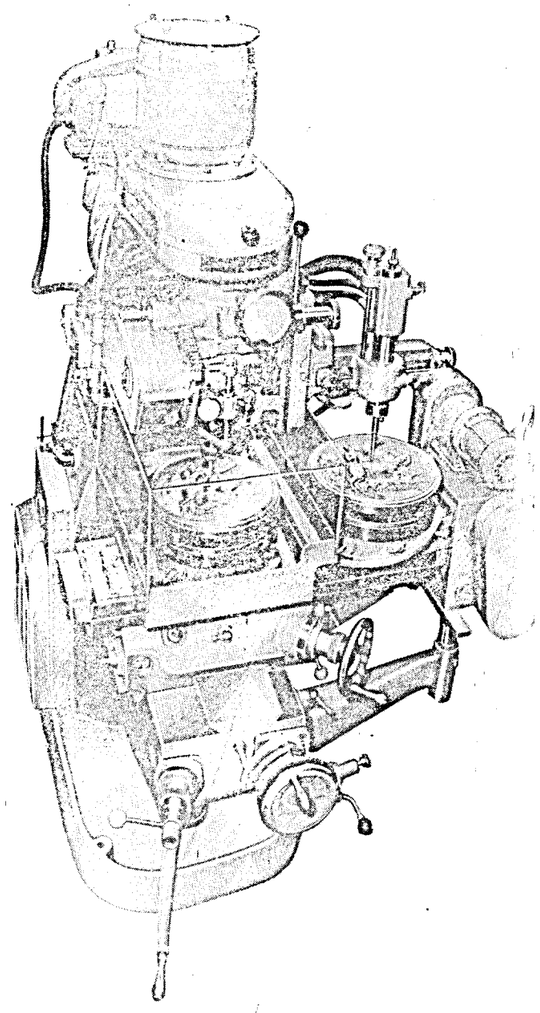


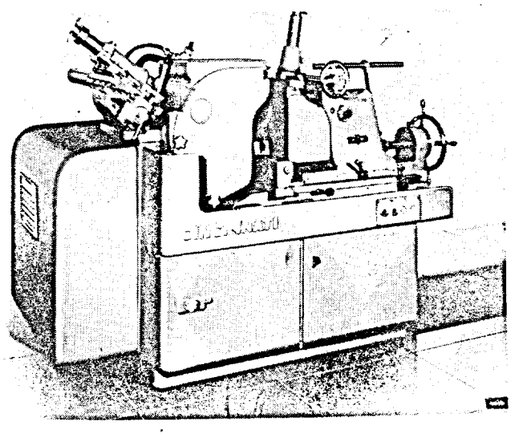
Fig. 4

(Fig. 5) by the untouched photograph of the plaque: it will be seen that the need for hand finishing is practically eliminated.

CENTRELESS GRINDING

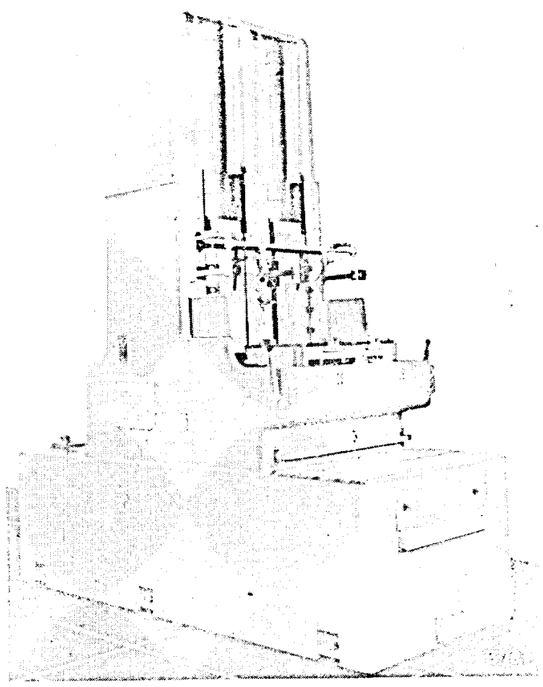
A general but erroneous opinion is that centreless grinding is adaptable only to large scale production. Actually this type of machine is well suited to short runs of different and frequently changed parts.

Fig. 5



Sometimes it is possible to keep one Centreless Grinder busy all the time on one particular job, but more often a variety of work is undertaken ranging from small to medium size parts and from through-feed to infeed methods.

The secret of economical centreless grinding of small parts lies in intelligent planning. It takes less time to change the set-up for a through-feed job to that for another through-feed job than to change from a through-feed job to an infeed one. Therefore these types of work should be grouped together. It also saves time if the parts to be ground are grouped in diameter sizes, since it takes longer to make set-up changes for large differences in size than for small ones.



SURFACE BROACHING

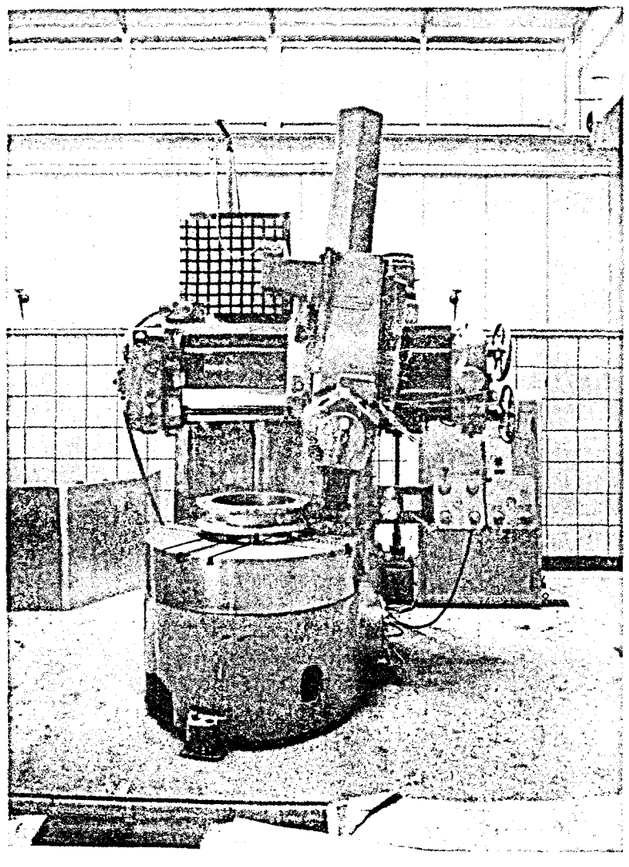
Surface broaching is a very rapid process of machining flat or curved surfaces that can be cut by a straight through pass of the tools. Due partly to this speed of operation and partly to the fact that changes of tooling, fixtures etc., cannot be made so easily as in the milling process, surface broaching is usually confined to industries specializing in very large scale production.

Engineers who are engaged in planning for the automobile industry, for example, would do well to investigate the possibilities of surface broaching. Cincinnati application engineers are specialists in both milling and broaching and they are, therefore, able to give unbiased advice as to the better method for any particular job.

Webster & Bennett Boring Mills

THE firm of Webster & Bennett was founded in Coventry, England, in 1887 for the purpose of manufacturing Machine Tools. Even in those far off days many of the machines made were exported. In a few years exports to India alone included Screw Cutting Lathes, Two Spindle Drilling Machines, 24″ Surface Boring Lathes, Horizontal Profile Milling Machines and 30″ Chucking Machines.

Much valuable experience in machine tool manufacture was gained during these early formative years, and as time went on the firm followed a steady course of expansion closely linked with an equally steady policy of specialisation on one type of machine—the Vertical Boring and Turning Mill.



Webster & Bennett Vertical Boring and Turning Mill with 48" Chuck and Built-in Electronic Profile Turning Equipment, on Test in Demonstration Room.

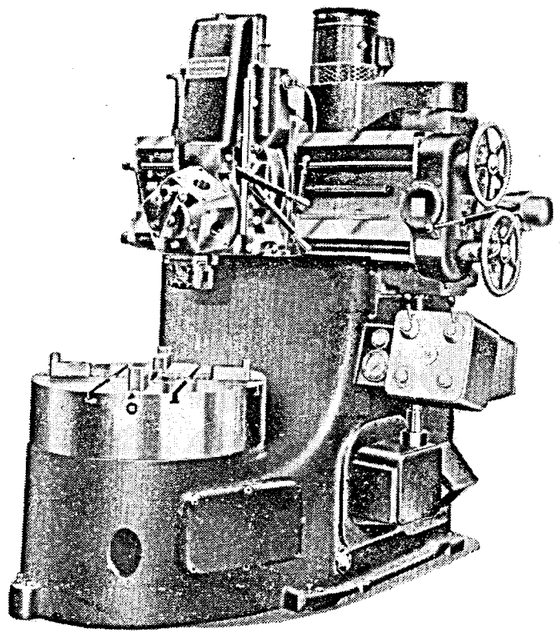
This policy, pursued with much forethought and determination, has proved its worth and now, with many years of specialised knowledge backed by nearly 70 years of machine tool manufacturing experience, Webster & Bennett can look with justifiable pride on its place amongst the world's leaders of machine tool design and construction.

India has always been one of the firm's most highly esteemed customers. Conversely the Webster & Bennett Boring and Turning Mill has made a definite contribution to Indian industry, particularly to the smooth and efficient running of the Indian Railways. The machine has come to be regarded as a standard tool both in the Production and Maintenance shops of many Railway organisations because it is ideally suited to the machining of Railway Wheels and Tyres, Axle Boxes, and Piston Heads and Rings, all apart from the fact that it is a general purpose machine of a very high order.

The machine is built in 3 sizes, with a chuck diameter of 36″, 48″ and 60″, and Duplex Mills are available in the 2 smaller sizes. It is of solid build, and consequently the best use of carbide tipped tools may be made resulting in heavy cuts being possible. It should not be forgotten however, that it is equally efficient and economical when employed in machining non-ferrous metals. All the main controls are hydraulically operated on the latest type of machine (the Series 'DH') giving the operator complete control of his machine whilst calling for the minimum amount of physical effort on his part.

Various types of attachments can be supplied with the Boring Mill and include Screw Cutting, Taper Turning and Taper Generating Attachments, and two types of Profile Copy Beams.

These attachments have been in use for many years, but let it not be thought that the machine design is not constantly under review. A major step forward has recently been made in this sphere for, after several years of intensive research, Webster & Bennett now offer a Boring Mill with built-in



Webster & Bennett Standard Vertical Boring and Turning Mill with 60" Chuck.

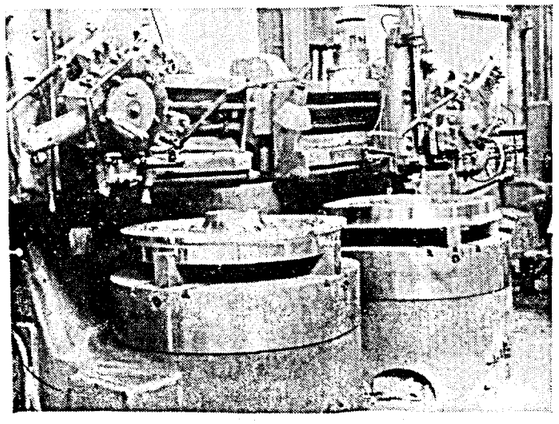
Electronic Profile Turning Equipment. A number of orders for machines with this equipment have already been received, and the export market shows considerable interest in it.

The Electronic Profile Turning Equipment has been built not as an attachment, but as part of the machine thus allowing the machine to perform the dual role of a standard or tracing machine as required.

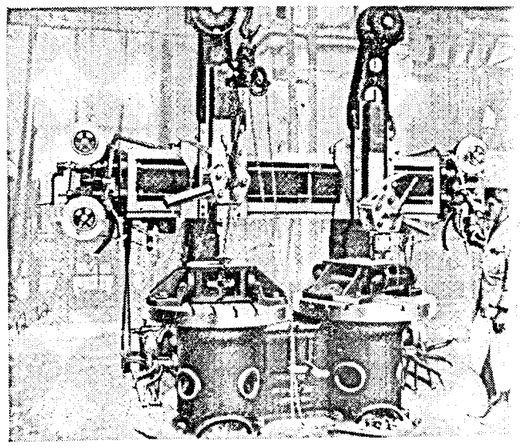
The design of this Equipment incorporates a patented automatic Bias Control and, as a result of this, any shape of template can be followed without any recourse to hand control. The only limitations of the shape which can be turned are those imposed by the cutting tool design.

The accuracy both of form and of repetition of size are of a very high order. Under ideal test conditions repetition of size within .00075" on diameter has been obtained, though this limit is not guaranteed since the nature of the work material, the depth of cut and the likelihood of tool wear have to be taken into account.

It will be thus seen that Webster & Bennett are keeping well abreast of modern trends of design, and this is no less true regarding production methods as well. Full advantage is taken of the fact that, because the range of manufacture is restricted to variations of a single basic type of machine, production can be rationalised and this in its turn results in relatively low manufacturing costs which are naturally reflected in sales prices.



Solid Disc Wheels being Machined on a Duplex Mill.



Webster & Bennett Vertical Turret Lathe 1920 Model.

Since November 1st 1954 all sales in India have been conducted through the agency of **Machine Tools (India) Ltd.**, with offices in Calcutta, Bombay and Bangalore.

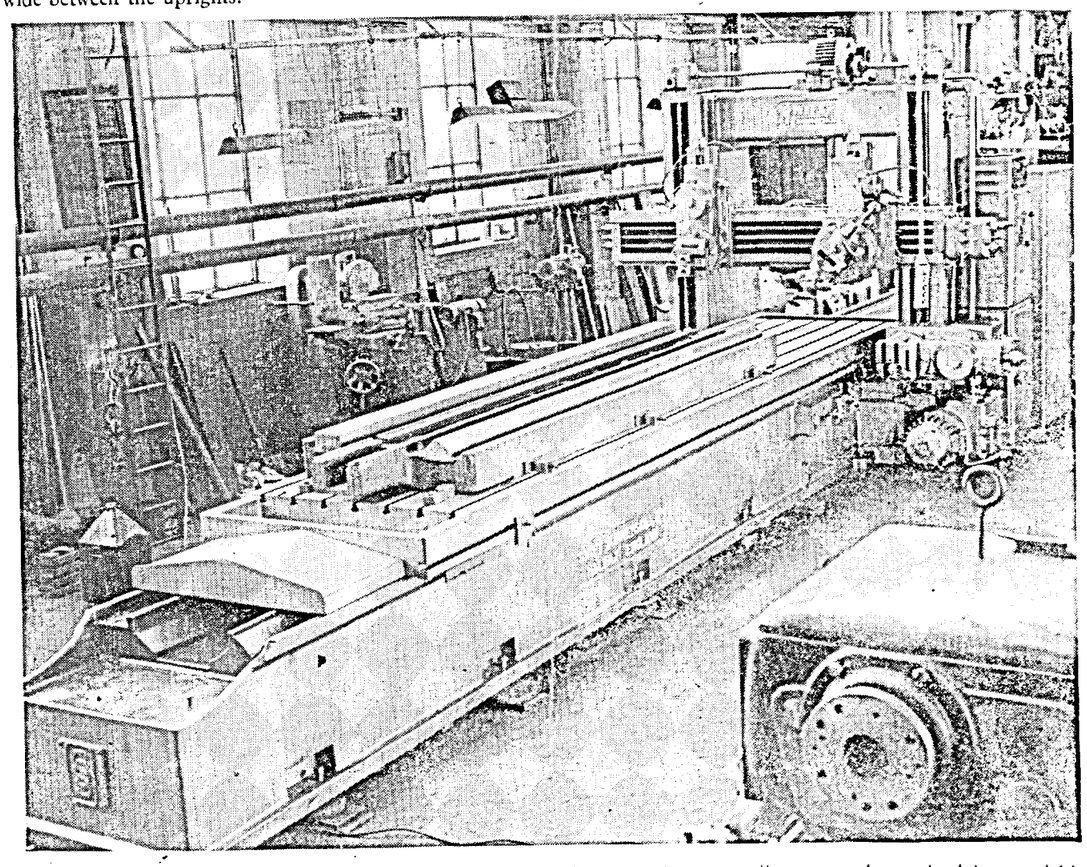
Swift-Summerskill Planing Machines

THE photograph published below shows one of the latest 'Swift-Summerskill' Planing machines, which have recently been redesigned and offer several special and unique features.

The machines are very robust and capable of standing up to continuous, heavy duty. These are manufactured in both Double Column and Openside Types, and while the majority of the machines are built with All Electric Drive a special Two Belt Driven machine is manufactured for the Indian Market in sizes up to 42" wide between the uprights.

The bed is a sound casting of close grained cast iron, having one vee and one flat guide on which the table reciprocates. The central portion of the bed forms an oil well from which oil is circulated by a pump to all bearings, gears, feedboxes, etc.

The drive of All Electric machine is by a spiral gear engaged with the table rack, suitable reduction from the motor being obtained, through a spiral reduction gear box running in oil. The spiral gears for both reduction box and table are of case hardened steel profile ground, and the worm wheel in the reduction box is hollow cut



and is of the best phosphor bronze. The drive is from a D. C. reversing motor, which is supplied with current from a Ward-Leonard Set, which gives an overall speed range of 8 to 1, the standard cutting speeds being from 25 to 200 f. p. m. although, if required, for very hard heavy work, the range can be dropped as low as 10 to 80 f. p. m. The manually operated panel giving variable cutting and return speeds, control to solenoids, feed motion, etc. is mounted on the upright, and a pendant box carrying push buttons gives 'start', 'stop', 'inch cut', 'inch return', and 'power traverse'. The panel containing the contactor gear is in a separate

casing altogether, and that, along with the generator set, can be mounted in any convenient position, if required at some distance from the planing machine.

On the Belt Driven machines the drive is by helical gearing, two high speed belts giving alternatively cut and return speeds. A 3 speed gear box can be fitted giving cutting speeds of 40, 60 and 80 f. p. m. with a constant speed of 100 f. p. m. for the return. The drive can be from the line shaft, although usually a self-contained motor drive is fitted.

The cross rail is a rigid casting solidly clamped to the upright by means of a differential screw operating through cast steel levers, operated from one point at the end of the cross rail.

The uprights are massive castings secured by numerous bolts and a solid tongue to the bed, and are tied together at the top by a strong cross rail.

The toolboxes are of 'Swift-Summerskill' special design giving long traverses and clapperboxes to swivel through 350 degrees. Solenoid tool relief can be fitted when desired. Either one or two toolboxes can be fitted on the cross rail and one on each upright, if required.

Special attention is called to the feed motion, which is covered by 'Swift-Summerskill' Patent, and gives feeds from a minimum of .005" to a maximum of 7/16". In all cases, however, the feed is completely applied before the motor has completed it reversal. This means that no over-run is required in which to apply the feed—a feature unique to 'Swift-Summerskill' Planing Machines.

SPECIFICATION

The reversing switch is mounted in a special pocket beneath the toof centre, and is arranged with the minimum of inertia, so that the switch mechanism is not hammered to pieces as so often happens on high speed machines. The reversing switch motion is mounted on a hinged cover which can rapidly be swung out for inspection and servicing.

Finally, these Planing Machines are built from 2'0"×2'0", up to 6'0"×6'0" in the Double Column Series, and 4'0"×3'6" in the Openside Series, any length being accommodated.

Because of the vee flat table guide arrangement cup wheel grinding heads can be used with absolute success, and the illustration shows such a grinding head mounted in place of the usual toolbox. By the turning of a switch low speeds can be obtained for finish grinding, and the same switch also operates a solenoid valve so as to reduce the oil supply to avoid floating the table.

Richards Horizontal Boring & Facing Machine

THE Richards No. 5 Horizontal Boring and Facing Machine is perfectly adapted to the machining of all cylindrical work and particularly in connection with the boring and facing of locomotive cylinders, piston valve chambers, etc. These machines are to be found in all the principal locomotive works throughout the world. A typical example, in the British Railways Workshops at Horwich, Lancashire, is shown in Fig. 1 in operation on a cast steel cylinder block for a 2-6-0 No. 4 Freight Tender Locomotive.

MOUNTING AND CLAMPING

The cylinder as cast weighs 26 cwts., and is mounted as in Fig. 2 on a special fixture which is machined at an angle that brings the centres of the main cylinder barrel and steam chest in the same horizontal plane. This makes for ease of setting and reduction of operating time, as the spindle frame and boring stay bearings are set and locked in position throughout the complete machining cycle. A locating strip seen at the front of Fig. 2 with four clamps passing across it, is incorporated in the fixture to ensure that the axes of the bores are true to the angular face and supplementary joint and locating surfaces.

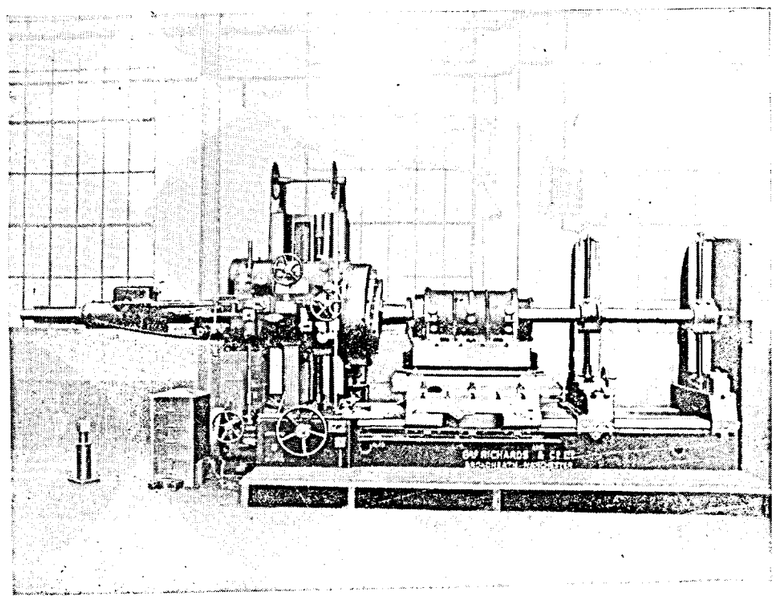


Fig. 1

The fixture is mounted on the revolving table of the machine, thus making it possible to perform operations on all four sides of the component at one setting of the workpiece. Substantial clamping arrangements hold the component to the fixture, and the fixture is rigidly held on the revolving table, allowing heavy cutting to be carried out with ease.

After rotation, extreme accuracy of location of the revolving table is ensured and maintained by Richards Patent Squaring Lock, which is incorporated in all Richards Horizontal Boring Machines. This is illustrated in Fig. 3, which shows clearly a rack operated wedge running the whole length of the table.

The most modern machines of this type incorporate a patent chain drive which eliminates high pressures to the main spindle bearings, which were inseparable from the older belt driven machines. Moreover, all belt slip, with consequent loss of power, is avoided. A further recent improvement which has been incorporated in Richards machines, and which is not shown on the braking is employed, the braking current being derived through a rectifier. This eliminates mechanical brakes, is positive, and ensures that even when using heavy, out-of-balance tooling, the head can be stopped in any position, thus giving the operator greater freedom of movement with complete control, irrespective of his working position.

The machines can be fitted with screw-cutting arrangement which is neatly incorporated at the left-hand end of the machine, and the bed slides are effectively machine illustrated, is the introduction of complete push button control to the main and rapid power traverse motors. The push buttons are mounted in a pendent switch, which can be swung to any position convenient to the operator. Dynamic braking is incorporated in

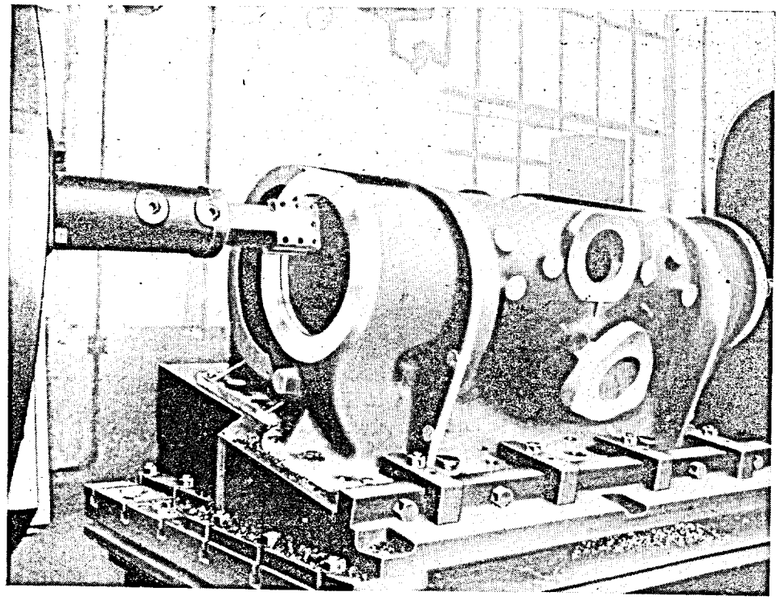


Fig. 2

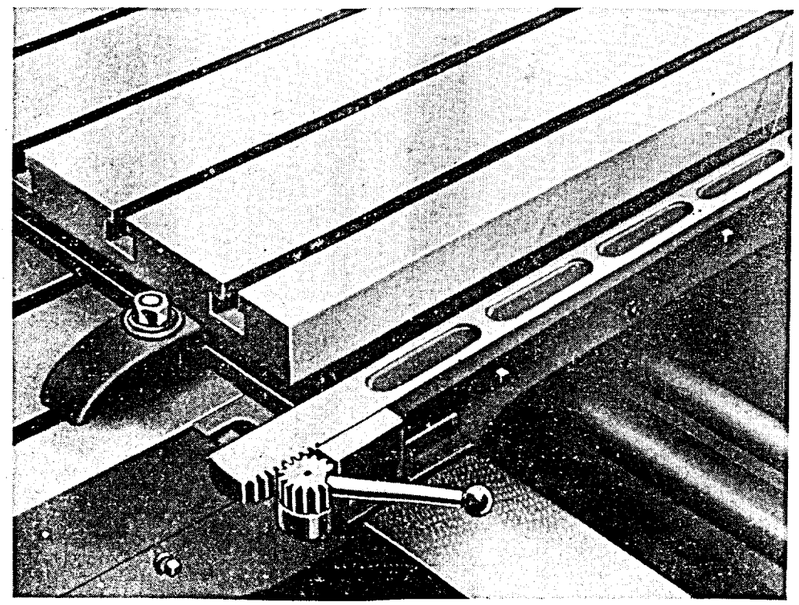


Fig. 3

all machines, when driven from the D. C. supply, but when only A. C. supply is available, injected D. C. covered to prevent damage by falling cuttings etc.

TOOL SET-UP

The sequence of operations has been so arranged to minimise changing of tools and handling of workpiece and full use is made of the Richards Telescopic Snout Toolholder incorporating a patent Universal turret bar. This fitment consists of a socket carrying a sliding adjustable toolholder, the latter being secured by powerful screws which engage with the flat on the bar, as seen on the left of Fig. 2.

The employment of the snout for certain work, obviates the use of the outer stay, which is required when long boring bars are used. The proportioning and strength of the main spindle bearing adequately, supported by the patent prismatic slide, ensure absolute rigidity and render it practicable to operate on work at a considerable distance from the facing head. The taken, and when the spacing block is removed and the slide brought directly in contact with the stop, the second tool is then in position for the finishing and sizing operation.

As can be seen from the foregoing, the telescopic snout toolholder is a most useful fitment, but it will be

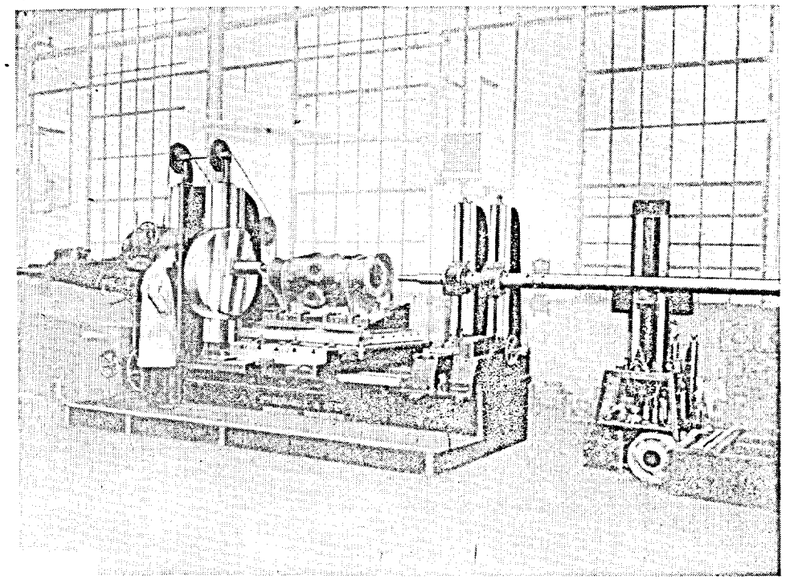


Fig. 4

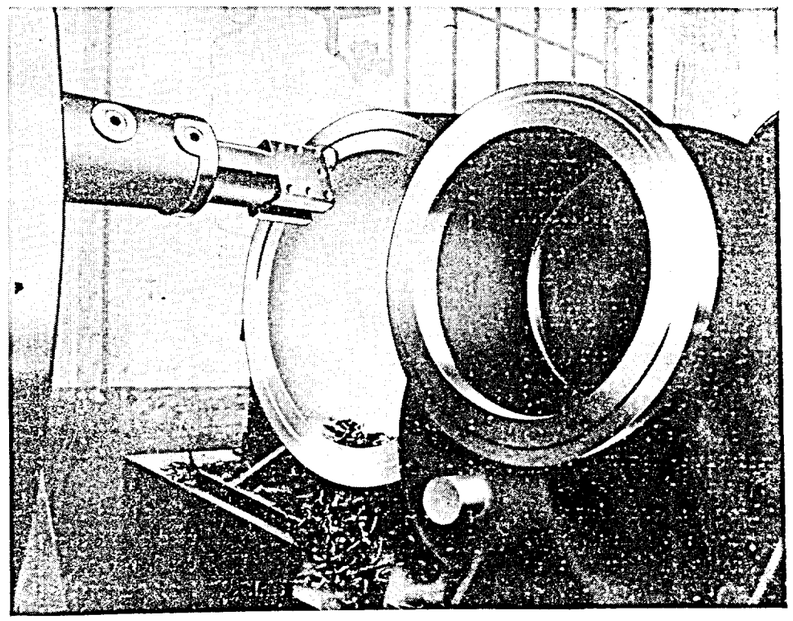


Fig. 5

appreciated that it is not suitable for every boring job. The main cylinder bore of the component under projection on the machine under review is 30". The use of the Patent Universal Turret Bar enables the position of a standard tool to be varied in many ways to cover a wide variety of work, and as the same tool can be employed for different operations, considerable economy is effected in tool costs and setting time. If required, two tools, roughing and finishing, can be mounted simultaneously in the bar. By inserting a spacing block between the end of the facing slide and the centre stop, a roughing cut is consideration is a case in point. This is machined by means of a boring head mounted on a boring bar driven by the traversing spindle of the machine. The boring bar is supported at its outer end by two boring stays, by means of which deflection of the bar is eliminated.

When not in use the boring bar is withdrawn from the work and left in position in the stay bearings, being supported at its outer end by a special column, see Fig. 4, designed by the engineers at Horwich for this specific purpose. The boring bar is, therefore, always ready for immediate use, thus eliminating waiting for cranes and the use of additional labour.

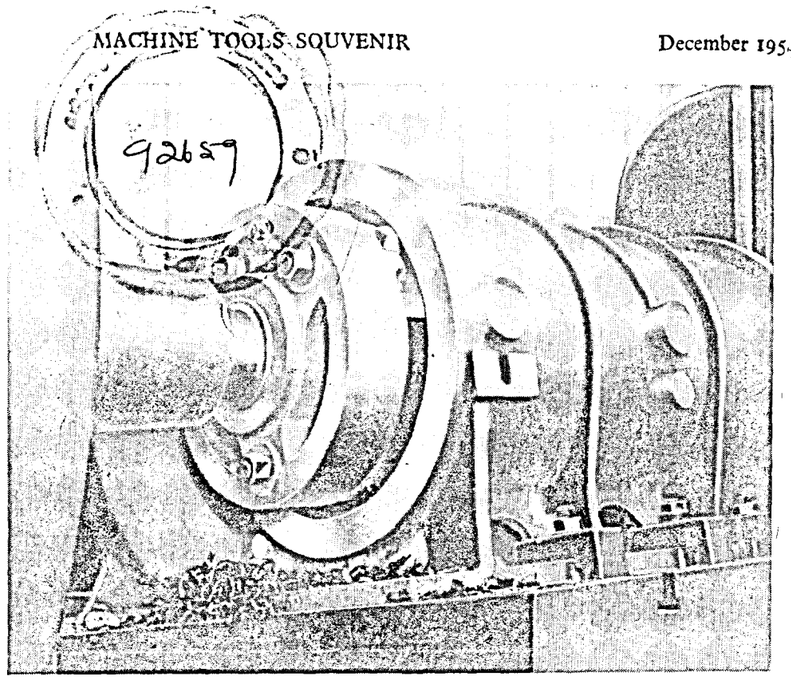


Fig. 6

SEQUENCE OF OPERATIONS

1st Operation .. Rough and finish face of steam chest (see Fig. 2)

2nd Operation .. Rough and finish bore registers inside steam chest (see Fig. 2)

3rd Operation .. By means of the cross traverse to the tables, set the distance between bores from the verniers fitted to the sliding table of the machine.

4th Operation .. Rough and finish face of cylinder end. (See Fig. 5)

5th Operation .. Rotate revolving table through 180 degs, Repeat operations 1, 2, 3 and 4 on opposite ends.

6th Operation .. Remove telescopic snout bar and set boring bar and head.

7th Operation .. Rough and finish bore main barrel. (see Fig. 6)

The boring head utilized carries three tools, two for roughing and one for finishing, and after the roughing cut has been taken, the finishing tool is swung into position for the final cut, thereby making only one tool setting.

Cutting speeds for roughing out the main cylinder bore are 118 f. p. m. Feed 0.13" per rev., 3/8" depth of cut. Finishing speeds 118 f. p. m., at .019" per rev., and .020" depth of cut. Facing the flanges—118 f.p.m. Feed .019" per rev., and 1/4" depth of cut.

For the steam chest a cutting speed of 99 f. p. m., is used with a roughing feed of .009" per rev., and 1/4" depth of cut. Finishing speed 99 f. p. m., with feed .019" per rev., and .020" depth of cut. All machining is maintained to fine limits.

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