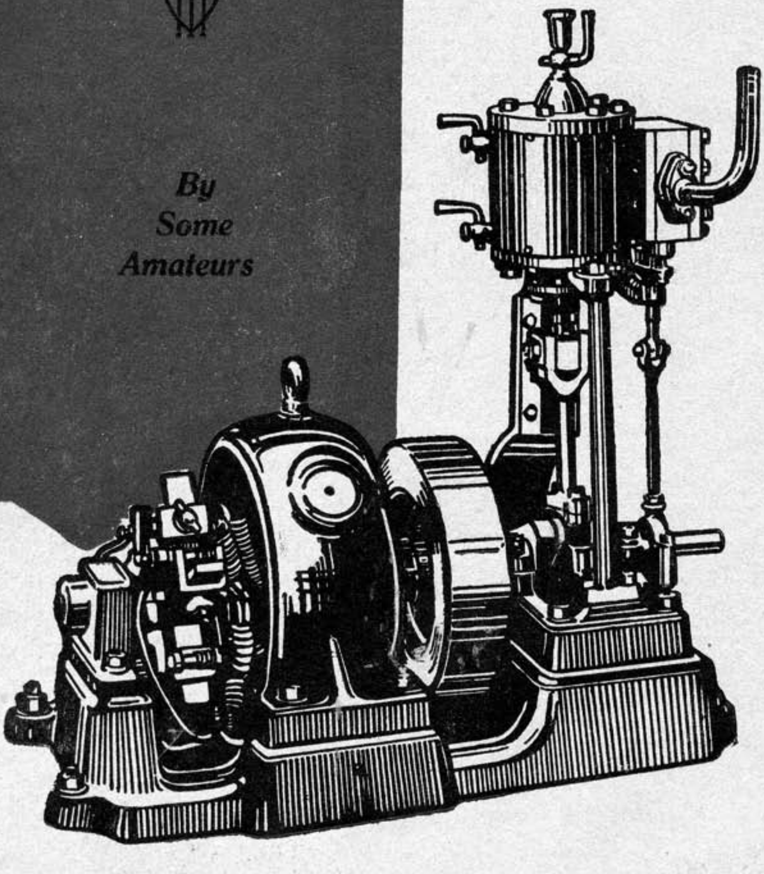
LATHE WORK

By Some Amateurs



DRUMMOND BROS. LTD.
GUILDFORD

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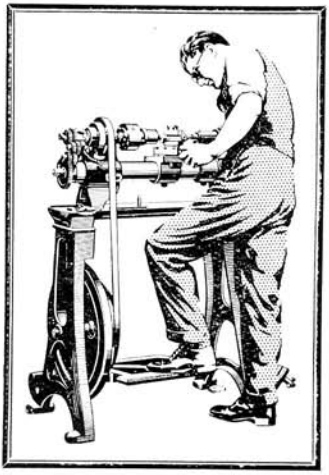


Some excellent examples of work done on Drummond $3\frac{1}{2}$-in. and 4-in. Centre Lathes, illustrating the special capabilities of these famous tools

New Edition

DRUMMOND BROS. LTD.
GUILDFORD

Telegrams: Lathes, Guildford. Telephone: Guildford 153

D.B.C. No. 109/1

INTRODUCTION

THE lathe has been called the King of Tools, and rightly so, for its uses in engineering are universal and unlimited. To the amateur worker a good lathe is always a first consideration, and such a tool will be a right-hand assistant in many an interesting job of work.

Although it is wonderful what a really patient and clever worker can accomplish with poor tools, it never really pays to try to work with a makeshift lathe. The examples of work of various kinds—models, engine building, repair work, etc., shown in this booklet, were all carried out on Drummond $3\frac{1}{2}$-in. or 4-in. Lathes. They indicate what can be done with the assistance of a lathe that is specially designed with full knowledge of the exacting requirements of such work, and of the conditions under which it is carried out.

For over twenty-four years Drummond Lathes have been foremost in this field, and thousands of amateurs, located in all parts of the world, have found them staunch and valuable friends. Many are the tales that are told of the splendid work that has been successfully carried out against almost insuperable practical difficulties, and many are the letters of appreciation that we have received from the proud owners.

We are not printing any testimonials here—we prefer to let the work illustrated speak for itself. We cannot give more than just a few specimens in a booklet of this size, but hope that our readers will find therein some inspiration and instruction.

Model Engineering is an extremely fascinating hobby, and many of our foremost engineers gained their first practical experience with a lathe in the home workshop. Many professional men find in mechanical work of this nature a real change and recreation. Some of our most wonderful scientific developments and inventions owe their success to the work done in the experimenter's workshop where a Drummond Lathe was the sole tool of importance. In addition, many Drummond Lathes are used by garages, repair depots, and other workshops where lathe work is an everyday necessity.

We shall be pleased at any time to assist readers in the choice of a suitable lathe and equipment, or with information as to the best method of carrying out work of any kind where our long experience will often prove invaluable. Drummond Service and a Guarantee backs every Drummond Lathe.

DRUMMOND BROS., Ltd.

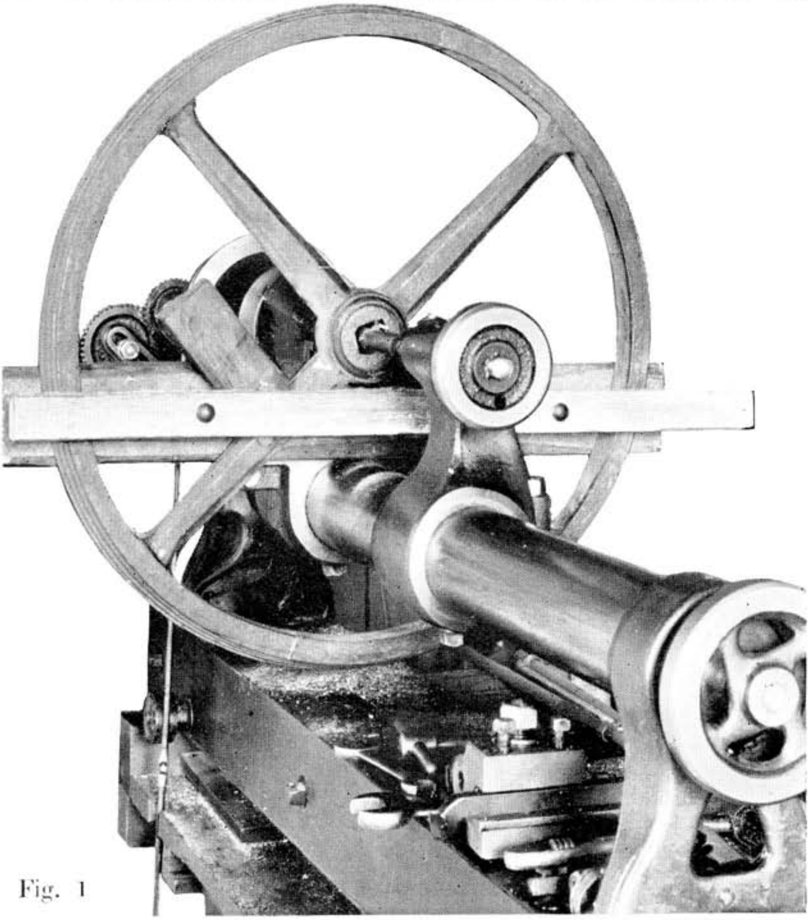


Fig. 1

BORING A LARGE FLYWHEEL

This photo shows how a lathe flywheel, much too large in diameter to swing in an ordinary amateur's lathe, was set up for re-boring. As will be seen, the lathe bed was passed through between the spokes of the wheel, and it was necessary to take off the right-hand leg of the lathe, the back centre, and the lead-screw hand wheel in order to do this. When the wheel was passed over the bed these parts were replaced as shown.

On the saddle an angle plate was bolted and to this a long piece of wood, to which the flywheel was bolted. Various wedges and an iron back strut completed the setting-up arrangements.

The wheel was centred by first plugging the old hole (which was square and out of truth), and a new centre point found by careful measurement, and centre punched. This was then centred with the back centre of the lathe, and the wheel bolted in position. The boring was successfully accomplished by means of a bar between centres, the wheel being fed along past the tool by the lead-screw.

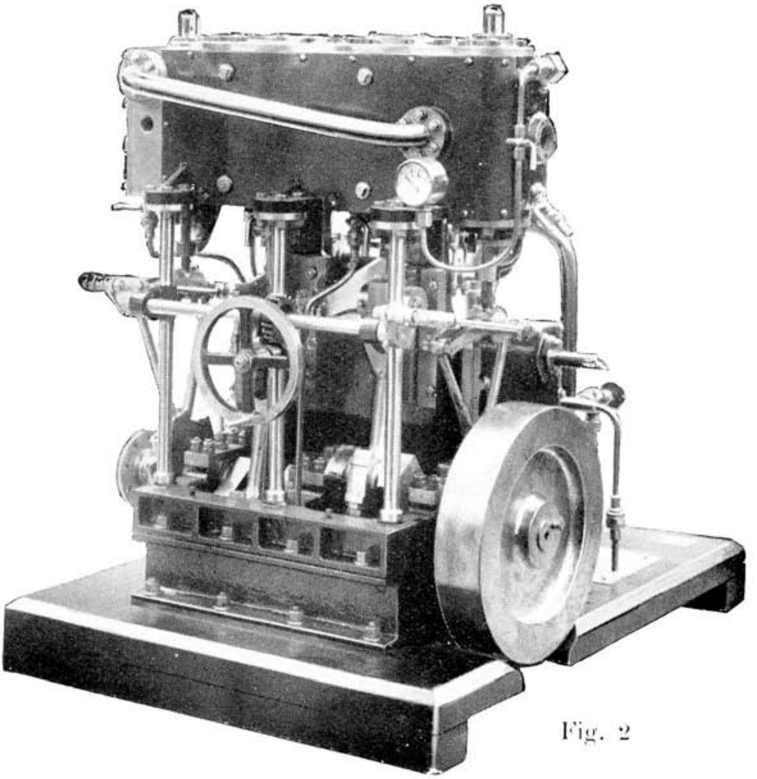


Fig. 2

A COMPOUND STEAM ENGINE

The maker says " . . . A start was made with the crankshaft. A piece of mild steel 1 ft. long and 3 in. diameter was obtained from a local engineer. This was centred for the two cranks and four eccentric blocks, and as this had to be turned down to $\frac{3}{4}$ in. diameter for the bearings, plenty of material had to be removed. Then the cylinder block was tackled. This was about $10\frac{1}{2}$ in. long and $3\frac{1}{2}$ in. deep, and cylinders were closed at front end. First, the block was faced truly top and bottom. Then, after carefully marking out, it was bolted to a large angle plate, which itself was bolted to the saddle of the lathe, and each cylinder and also the piston valves were bored in turn. This took much time, as casting had to be re-set for each bore.

" There was difficulty with the bed plate. This was about 7 in. by 10 in., and at the back was a circular recess for the air pump. It was impossible to swing this in the lathe ($3\frac{1}{2}$ in.). So it was bolted to the angle plate on saddle. Then a small angle plate was bolted on the face plate, and on this a short flat-nosed tool, and by taking very light cuts the recess was truly faced. It was then necessary to bore for the air pump. Another tool was bolted to the angle plate on face plate and so arranged to take a very small cut. After boring to necessary depth, the tool was placed a tiny bit farther from the centre and the operation repeated until required diameter was obtained."

BUILDING A MOTOR CYCLE ENGINE

The $1\frac{1}{2}$ h.p. 2-stroke engine shown was built with the help of a $3\frac{1}{2}$-in. lathe; the starting point was an old scrapped cylinder casting, which was first cleaned up and then re-bored by the method shown in Fig. 5. Two methods were considered—that of using a stiff snout bolted to the face plate and carrying the boring tool, or the boring bar method. It was just possible to pass a reasonably stiff bar through the plug hole in the cylinder head, so this method was actually used. The great advantage of the boring table was found in doing this work, the cylinder being bolted down with wooden packing pieces under and upon the fins, in a very simple, straightforward manner. Several cuts were taken, the last being a mere scrape, and as the bar was fed through the work a truly parallel bore was obtained. The cut was put on by tapping the tool out a shade at each traverse. (A cylinder for a 4-stroke motor-cycle engine was also bored out by means of a similar setting, but using the snout tool holder as there was no through hole for a bar.) Aluminium castings for the crank-case were obtained, and after fitting the two halves together carefully, the holes for the crankshaft bushes were bored as shown in Fig. 4 in order to get them both in perfect alignment. If the halves were bored separately it would be very difficult

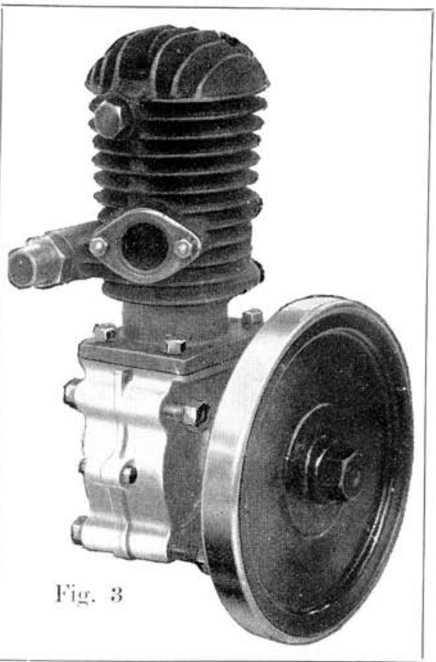


Fig. 3

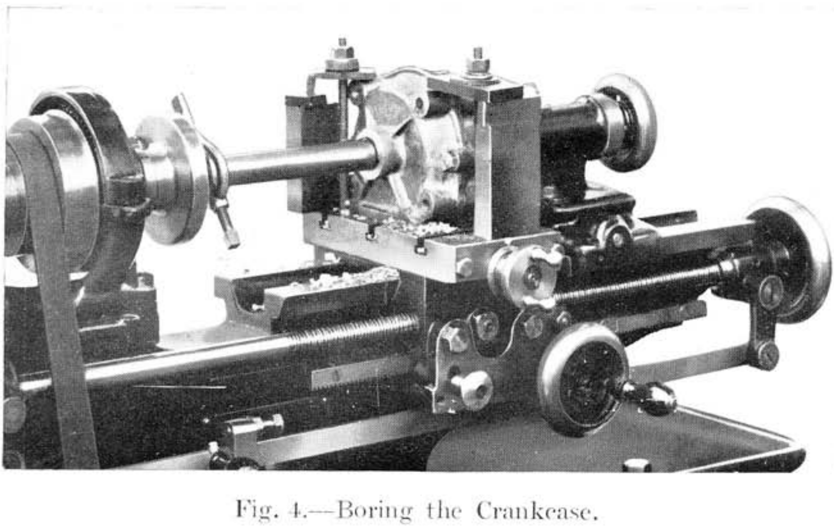


Fig. 4.—Boring the Crankcase.

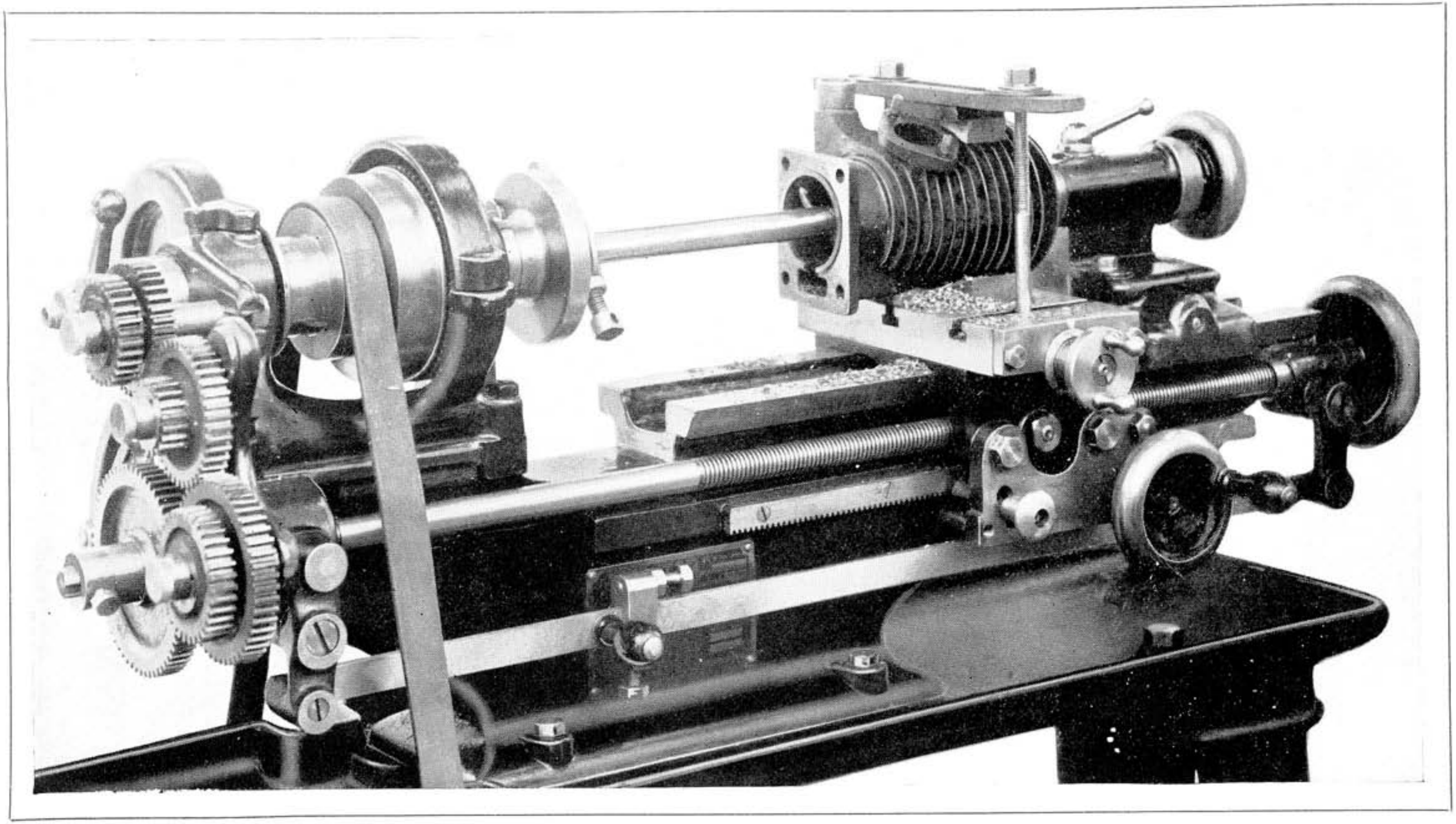


Fig. 5.—Boring Motor Cycle Cylinder on $3\frac{1}{2}$-in. Lathe.

to ensure this, but by passing the boring bar right through, perfectly aligned and parallel bores were secured. The crankcase was then separated and a spigot turned to fit the bores. This was turned to fit the lathe mandrel, and then turned to size in position and used to centre the halves for machining the inside of the case. Bronze bearing bushes were made a press fit in the bosses.

For the connecting rod a forging was obtained. The big end of the connecting rod was bored on the boring table, as the rod was too long to swing on the face plate. The small end was first machined, and a gudgeon turned from mild steel (afterwards case hardened). The gudgeon pin was placed in the small end and used to line up the rod in both directions, after which the white metal recess, and afterwards the white metal itself were bored to size by means of a bar between centres.

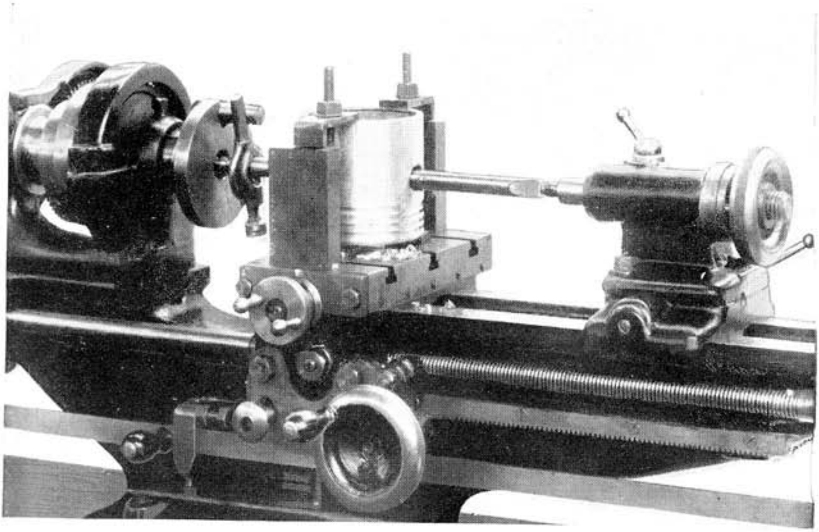


Fig. 6.—Machining Gudgeon Pin Hole.

The flywheel was machined from a disc of steel, and successfully finished without chatter causing trouble. The crankshaft meant a large amount of work, it being cut from a steel slab by drilling and sawing. Balance weights were attached to the webs by bolts.

The piston gave no trouble, and was machined from an aluminium casting. The gudgeon pin holes were bored by bolting the piston down to the boring table, first drilling and then boring the holes with a small bar to ensure perfect alignment and a good parallel hole. This method is shown in Fig. 6, which shows a flat-topped piston for a car engine being machined in the same way. It will be noted that great use was made of the boring table of the lathe in building the engine ; in fact, this feature was found invaluable, and without it the job would have been impossible.

Much repair work is regularly done on the lathe, including facing valves and valve seats, making bushes and tappet guides, new pins, etc.

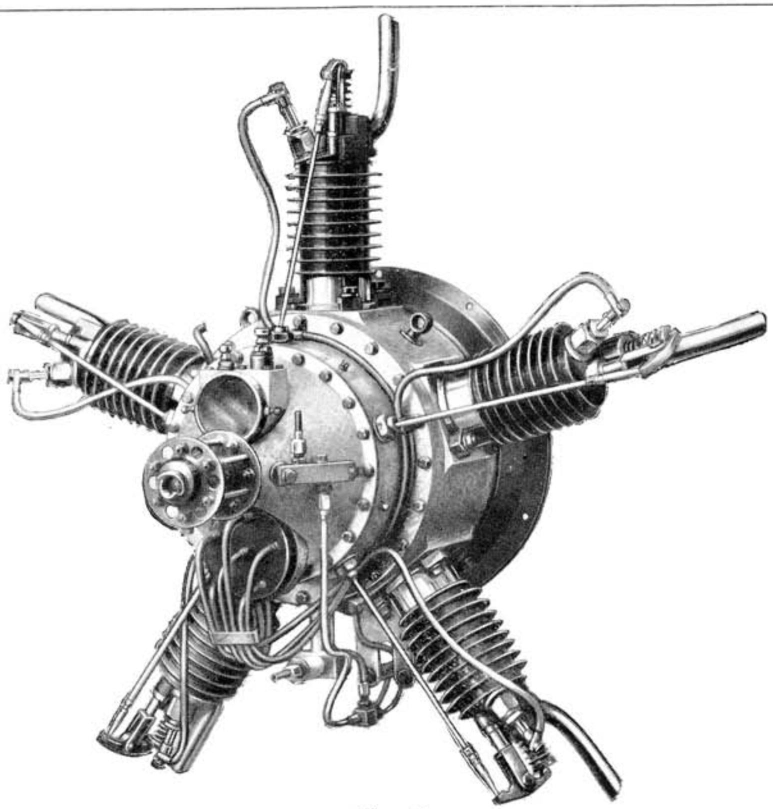


Fig. 7

FIVE CYLINDER RADIAL AERO ENGINE

The whole of the machining on this model was done on a Drummond 4-in. Lathe. Every part, including such small details as bolts and nuts, was made by the constructor, in preference to buying ready-made. The patterns for the castings were made on the same lathe. The cylinders are of cast iron, turned from the solid bar: the cylinder was first chucked and machined on the outside, including the fins, and then drilled and bored to size, with 0·0005-in. limit. The cylinders were then held by the portion which fits into the crankcase, and the heads finished. The angular boring for the sparking plug, and the exhaust valve pocket were machined by bolting the cylinder to an angle plate on the face plate.

The crankcase was turned and bored, but owing to being much too large to swing in the lathe for machining the cylinder holes, these had to be accomplished by bolting the casting down on the boring table, and using revolving tools held in the chuck. The flat faces were machined in the same way, by traversing past the revolving tool.

The master ring, into which all the connecting rods are assembled, is a fine piece of turning. It was machined from a piece of steel weighing at the commencement $3\frac{1}{2}$ lb., but when finished weighed only $2\frac{1}{4}$ oz. Special miniature sparking plugs were made for this model. The weight of the complete engine is $11\frac{1}{2}$ lb. when fitted with propeller, and it delivered 4·6 b.h.p. on test at 5,800 r.p.m.—a truly wonderful performance. The bore is $1\frac{1}{4}$ in.; stroke $1\frac{1}{2}$ in. This engine gained the Sir Francis Spring Prize at the Model Engineer Exhibition, 1924.

An 18 Cylinder Aero Engine

Following the success of his 5-cylinder model, the same maker embarked on an 18-cylinder engine, with four O.H. valves per cylinder, as shown in Figs. 8 and 8A. This remarkable piece of engineering work—admittedly more than many professionals would care to attempt—won for the builder the "Model Engineer" Championship Cup in 1930. For the maker's own description of the work we refer the reader to the *Model Engineer* for September 25th, 1930. A few details are all we can give here.

The bore is 37 mm. and the stroke 40 mm., the total cubic capacity of the engine being 770 c.c. On test the engine gave approximately 15 b.h.p. at 4,000 revs. per minute. The overall diameter is 13 in., and the total number of parts in the engine is 3,000. It has 72 valves and 36 sparking plugs. The compression ratio is $6\frac{1}{2}$ to 1. The total weight of the engine is approximately 22 lb.

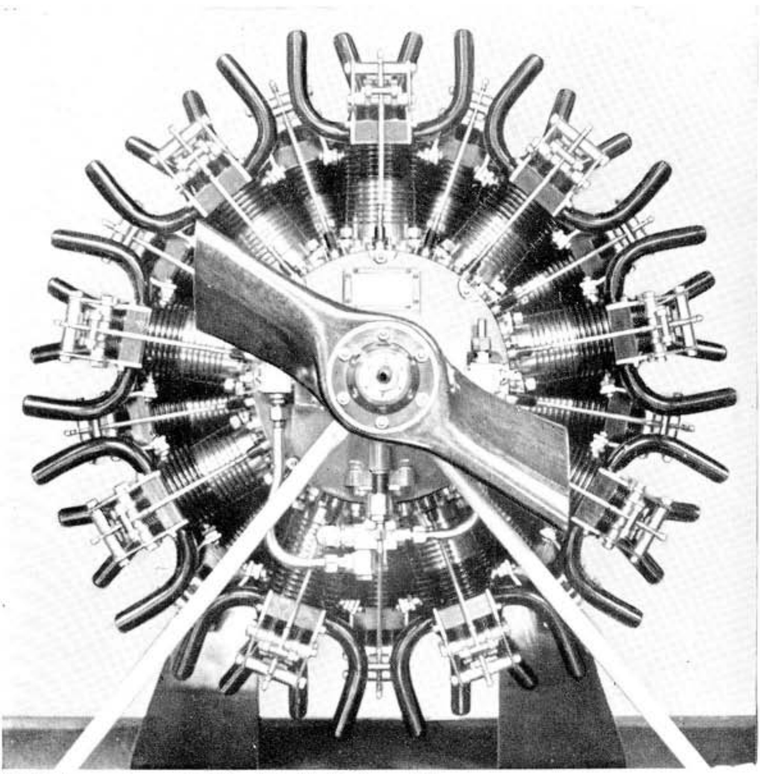


Photo by courtesy of "The Model Engineer"]

Fig. 8.—18 Cylinder Aero Engine.

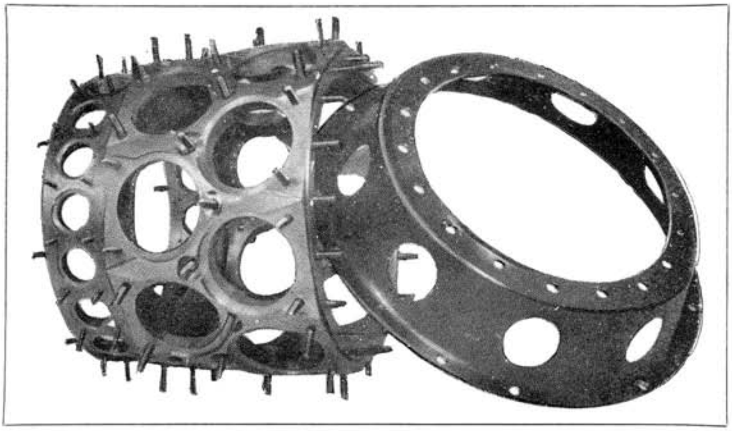


Fig. 9.—Crankcase and Engine Bearer.

The cylinders were turned from steel tubing, every fin being tapered, and only 0·025 in. thick at the bottom. The bores were all ground out by means of a special attachment made for the lathe. This, and all other machining operations, were done on the same Drummond 4 in. Lathe with treadle drive. The designs for the engine were made with the fact always in mind that this was the only machine tool available.

The general arrangement of the crankcase and cylinders can be gathered from the illustrations. Pressure and scavenger oil pumps are fitted, with dual ignition, a dual carburettor (on the back of the engine, not shown in Figs. 8 or 8A), and a fan blower incorporated in the induction system to ensure thoroughly even distribution of the mixture to each cylinder. The engine is designed, therefore, in the light of the most up-to-date practice for full-scale aero engines.

On account of its size and the large number of machining operations called for, the crankcase (shown in detail in Fig. 9) was one of the most difficult parts to make. Another difficult portion, and one requiring great accuracy, was the cam drum and the necessary planetary gearing to drive the cam rings to operate the inlet exhaust valves.

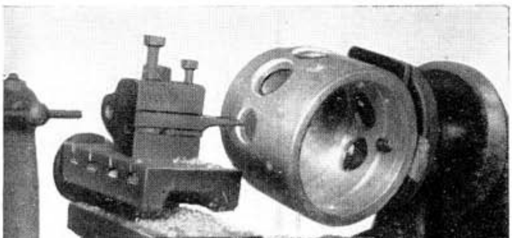


Fig. 10.—Boring Cylinder Holes in Crankcase.

Even the carburettor and sparking plugs (except for the porcelain insulators) were made by the builder, and the whole job involved an enormous amount of patient work which was actually spread over several years. We illustrate some of the main operations in progress.

Fig. 9 shows the crankcase and engine bearer. The aluminium crankcase casting weighed about 9 lb. in the rough, but when machined all over weighed only 1 lb. 3 ozs. The finished diameter is 6 in., the holes into which the cylinders fit are $1\frac{1}{2}$ in. diameter, and the methods of machining these are shown in Figs. 10 and 12. The front row of cylinder holes were machined on the face plate (Fig. 10). As there were nine holes, a through boring bar could not be used, but as the rear row of holes come in between the front row, holes $\frac{3}{8}$ in. dia. were carefully drilled and reamed in the rear row and these used for bolting the crankcase to the face plate. The gap of the lathe did not allow the crankcase to be swung for boring the rear row, so these were machined on the saddle as in Fig. 12. The crankcase circumference was divided into 18 (twice the number of holes) so that when the lathe centres coincided with two opposite division marks the work was truly central and in position for boring. The boring tool was held in the chuck and adjusted out by tapping to give it the required set for the cuts.

Fig. 11.—Crankcase and Cylinders.

Fig. 13 shows the engine bearer on the lathe. It is a gunmetal casting, and was $7\frac{3}{4}$ in. diameter in the rough. The trouble was to hold so large a piece in the lathe. It was first chucked on the inside and the outer edge turned and faced. A piece of hard wood was then shaped up so that it would just rotate on the lathe, and screwed to the face plate. A recess was then turned in the wood to take the bearer, which was retained by means of wood screws round the circumference, as shown in Fig. 13. This enabled the outside of the bearer to be turned; to turn the inside the bearer was held in the chuck by the bore. The finished thickness was only 0·05 in.

Fig. 14 shows the finished crankshaft for the engine. It has two throws of $\frac{11}{16}$ in. at 180°. The two outer webs are solid with the shafts, the centre web being separate and has

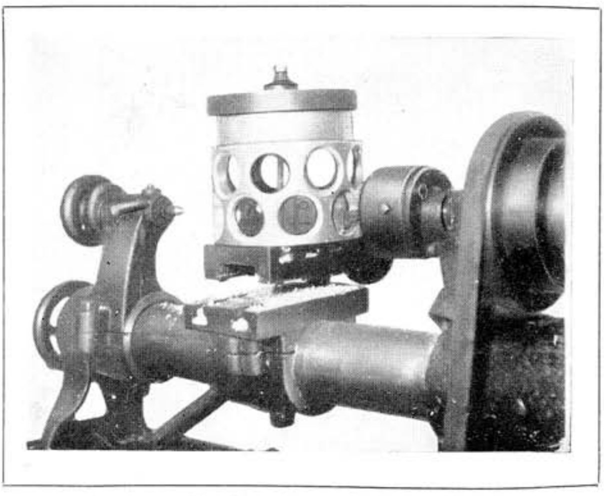


Fig. 12.—Boring Second Row of Holes.

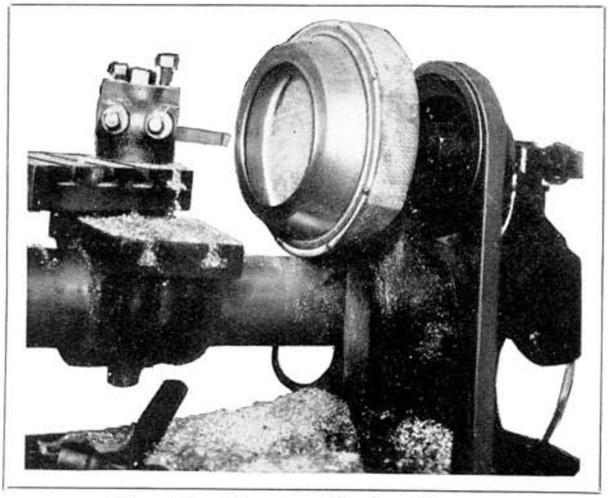


Fig. 13.—Turning Engine Bearer.

the crank pins fixed to it. The shaft was turned from a solid piece of chrome steel bar 3 in. diameter by 10 in. long, and cut into three parts after turning down.

Fig. 15 shows the crankshaft, before cutting into three, set up for machining the holes for the crank pins. The webs had to be perfectly flat and parallel, and the holes absolutely true, or the finished shaft would have been useless. If the faces had been

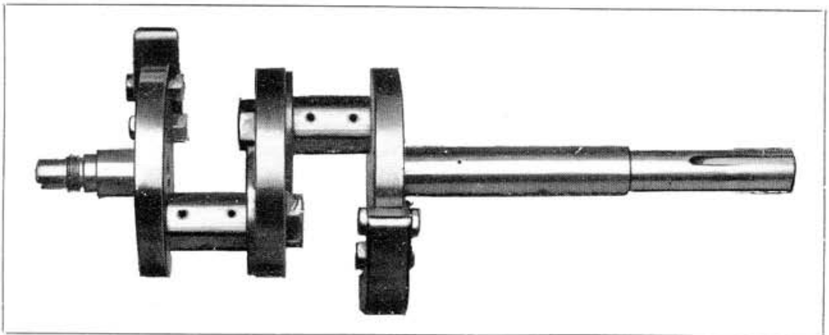


Fig. 14.—Crankshaft Complete.

0·001 in. out the end of the shaft would have wobbled at least 0·015 in. In Fig. 15 the crank pin holes are being recessed by means of a bar and counterbore cutter.

The few operations shown give an idea of the way in which difficulties are overcome and the highest standard of work done efficiently on the 4-in. Drummond.

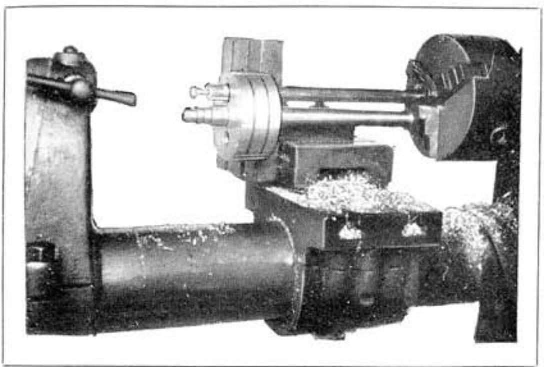


Fig. 15.—Machining Crankshaft.

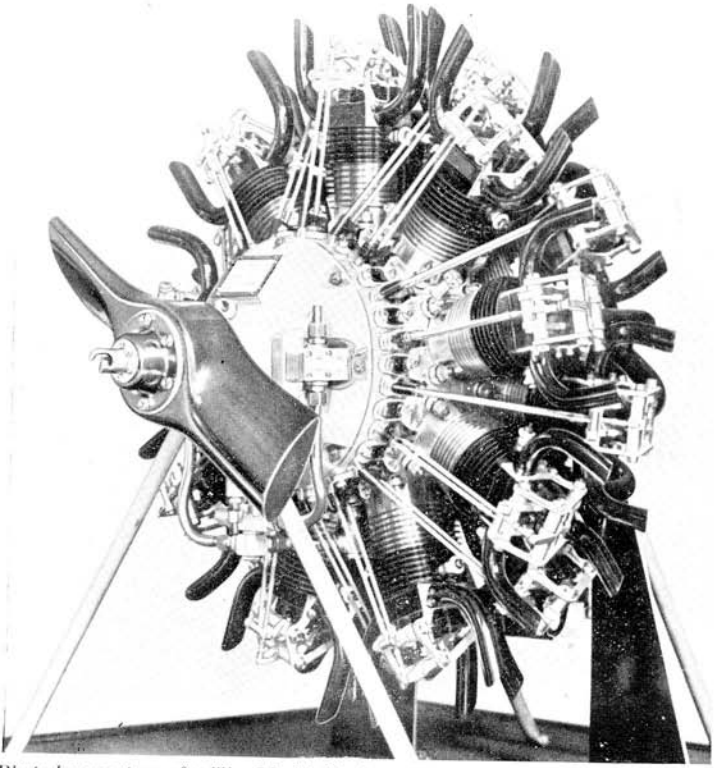


Photo by courtesy of "The Model Engineer"]

Fig. 8A.—18 Cylinder Radial Aero Engine.

TAPER TURNING MANDRELS

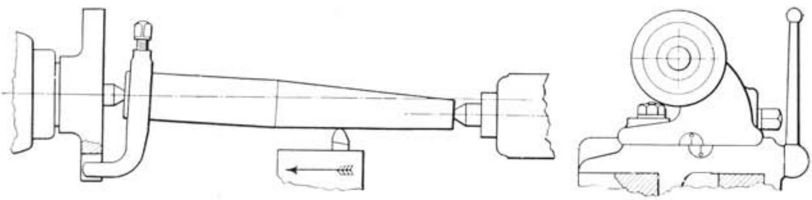


Fig. 16

In order to machine some parts requiring to be located on a bar in the hollow mandrel of a large lathe, a special mandrel as shown in Fig. 16 was required. The figure shows the use of the set-over tailstock of the Drummond 3½ in. Lathe for turning the taper, a simple though exacting operation demanding a high degree of accuracy. The degree of taper can be adjusted to a nicety by varying the amount of set-over, care being taken to see that the cutting tool is exactly at centre height. It is advisable to use a pair of old centres when taper turning in this way in order to avoid wearing the regular ones.

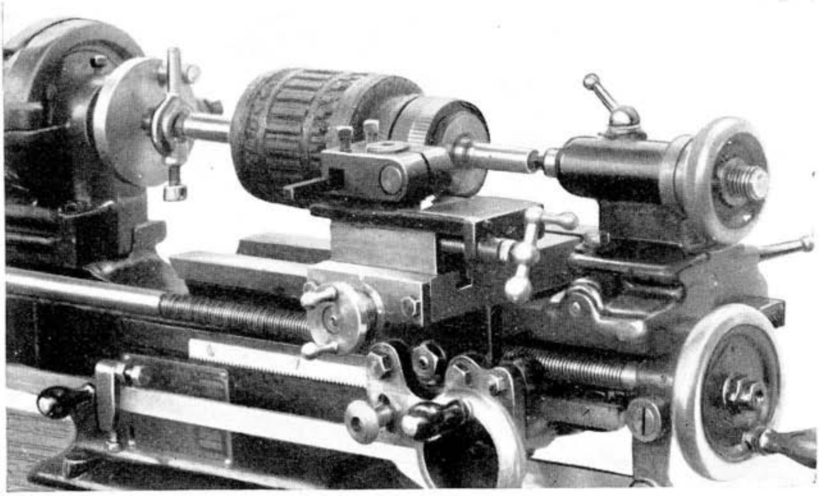


Fig. 17.—Skimming Commutator of Armature.

ELECTRIC MOTOR REPAIRS

Many electrical engineers have installed Drummond Lathes in their workshops to handle jobs which call for turning work, such as the skimming up of worn commutators, as shown in Fig. 17. This shows an armature being turned on its own shaft centres after seeing that these were true with the journals. A light cut is being taken over the worn copper segments. This, of course, produces a surface in which the mica insulator insertions are flush with the copper. In order to avoid this the mica is afterwards undercut, and this can readily be done on the lathe by means of a narrow tool held sideways in the tool post, the saddle being worked longitudinally by means of the rack or lead-screw, while the work is held stationary.

For making electrical instruments and laboratory apparatus the Drummond forms an ideal tool—ebonite formers, special coils, panel cutting by means of a circular saw running on an arbor between centres—all jobs can be carried out without loss of time.

BORING A CONE CLUTCH CASTING

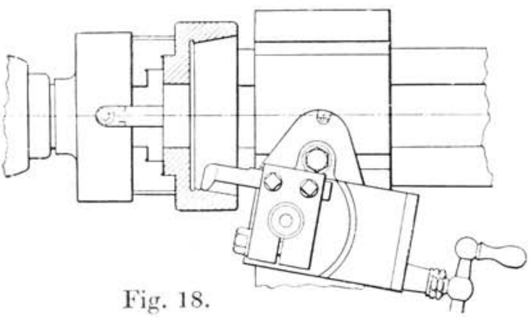


Fig. 18.

Fig. 18 shows a simple taper turning set-up on the 3½-in. Lathe, for machining the tapered inner surface of a worn cone-type clutch for a special machine. This shows how readily the tool-holder may be used for holding boring tools as well as for turning; this tool-holder also makes it easy to get correct centre height—a very important matter in taper turning.

A SIMPLE DIVIDING DEVICE

There is scope for considerable ingenuity in the methods of setting up various jobs in the lathe, and in improvising attachments, etc. Figs. 19 and 20 show a simple means adopted for holding and indexing a small end-mill during the fluting operation on a 4-in. Lathe. The standard lathe tool-holder and angle plate are used, the tool-holder being bolted on the face of the angle plate, and thus provided with means of adjustment for vertical position. When once the job is in the approximately correct position, the tool-post may be locked up, and the final adjustment for height and depth of cut made by rotating the whole saddle partially round the bed. The round bar which holds the work (by means of a setscrew, seen in Fig. 20) is a nice fit in the hole in the tool-post, but the back end is made large enough to be a tight fit for the standard lathe change-wheels; the change-wheels are used as division plates; thus, for milling a cutter with five flutes, every fourth tooth of a 20-tooth wheel is used to indicate the position of the work. Note that the only part requiring making for this handy rig is the actual work spindle.

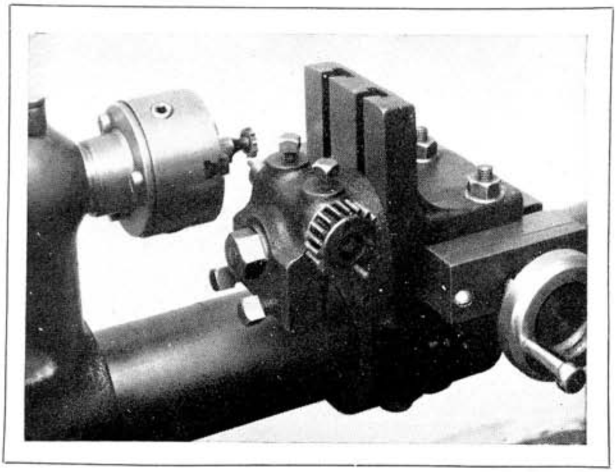


Fig. 19.—Using Toolpost as Work Head.

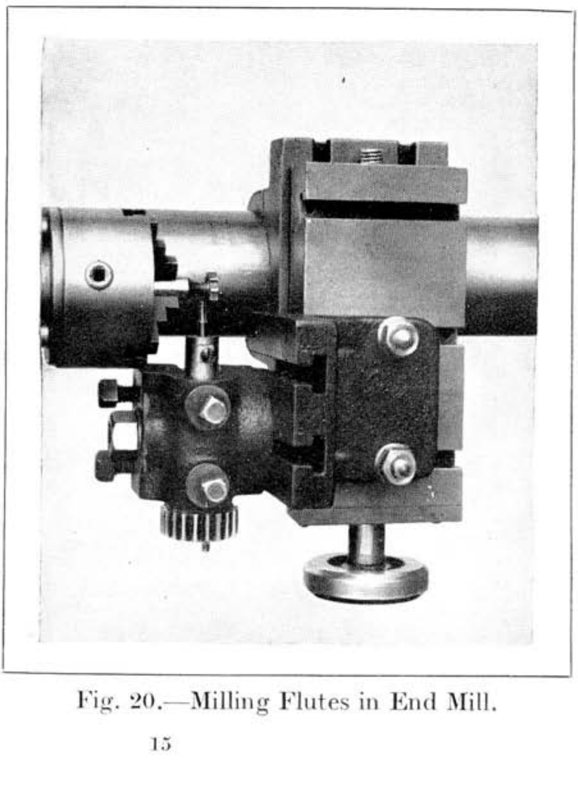


Fig. 20.—Milling Flutes in End Mill.

A MODEL 4.7″ Q.F. NAVAL GUN

(Made on a 4-in. Lathe, 40-in. Bed)

Fig. 21.

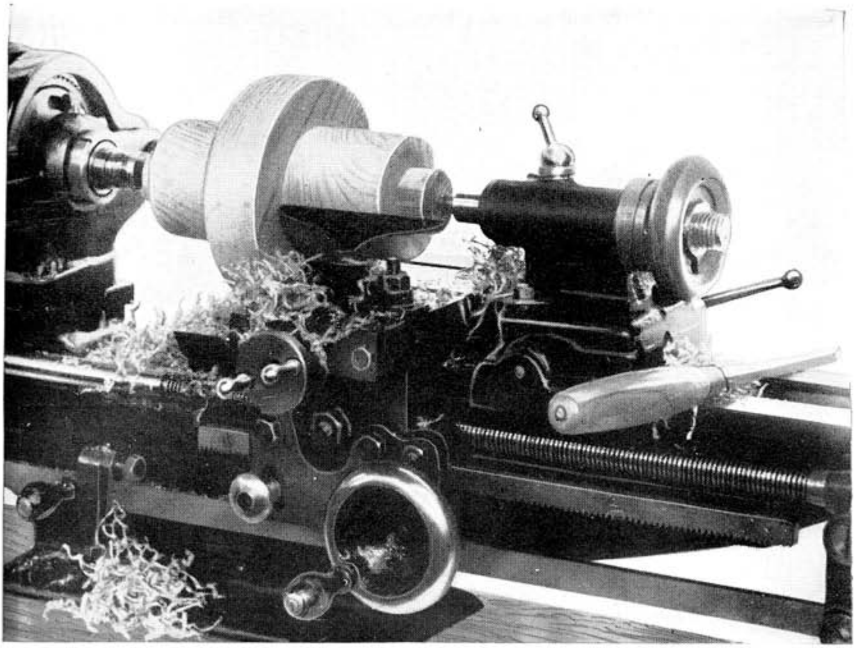
The maker says :—" I do not claim that it is true to prototype, as details about gunnery have been so very hard to procure during the past years, but I believe it is a very fair representation of the original. The model is made to fire a .380 revolver cartridge, and for short ranges it is fairly accurate, but as it was my first model I did not think of rifling the barrel, so contented myself with a smooth bore. The barrel is turned out of a piece of 40-ton steel, which gives a very nice finish, the metal working up to a very fine face. The principal dimensions are as follows :— Length of barrel, 17 in. ; bore, ⅜ in. ; overall length, 19½ in. ; height, 9¼ in. The boring of the barrel was done by drills which were passed through a gunmetal bush which was pressed into the tailstock."

ELECTRIC GENERATING SET

(See design on Front Cover)

Even very good models often have a particular "modelly" appearance which arises from their not being correct to scale, or from slight alterations in design necessitated by working conditions. This could not be said of the splendid model shown on the front cover, it being scarcely possible to tell it from its prototype in photographs, such is the general excellence of its design and construction.

The engine is of the high-speed type, developing ½ b.h.p., coupled to a 4-pole, shunt wound dynamo, running at 1,500 r.p.m., at a boiler pressure of 60 lb. per square inch. The cylinder is 2-in. bore, 1½-in. stroke, and is lagged with asbestos and blued steel. The crankshaft is of the balanced type and is turned out of the solid mild steel bar. The dynamo yoke is bored out to take the magnets, and was machined, as were all parts of this fine electric generating set, on a 3½-in. lathe.



TURNING WOODEN PATTERNS

Drummond Lathes are quite suited for wood turning, their top speed being high enough to give a good fast cut. Often the patterns necessary for making castings can be made on the lathe itself, as shown in the above example of a pattern of a special pulley. The tee-rest may be used with hand tools, or tools with proper rake held in the slide rest, and traversed as in turning metal. The lathe can, of course, be used for all ornamental turning in wood, ivory, ebonite, fibre, etc.

END-MILLING SLOTS IN QUADRANT

Fig. 23 shows a typical end-milling operation on a $3\frac{1}{2}$-in. lathe. A new gear quadrant is being made, and the slots for the gear studs end-milled out. The job is bolted to a small angle plate on the boring table, and traversed past the revolving milling cutter by the cross slide hand-wheel. All that is necessary for milling the second slot will be to rotate the casting into position. The arc-shaped slot can be milled by pivoting the work about the central bolt, and swinging past the cutter at the correct radius by means of a long, powerful handle or lever bolted to the job.

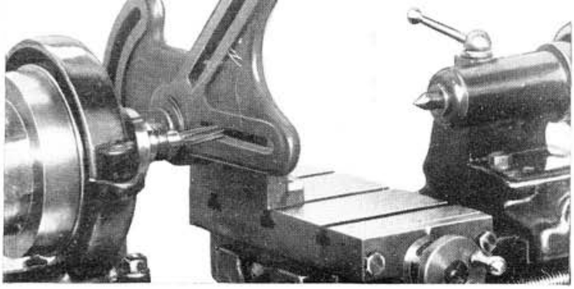


Fig. 23

BUILDING A VERTICAL STEAM ENGINE

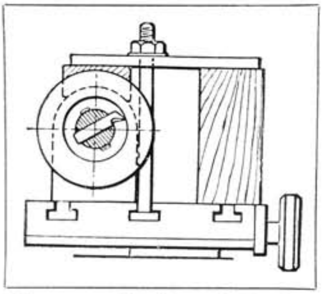
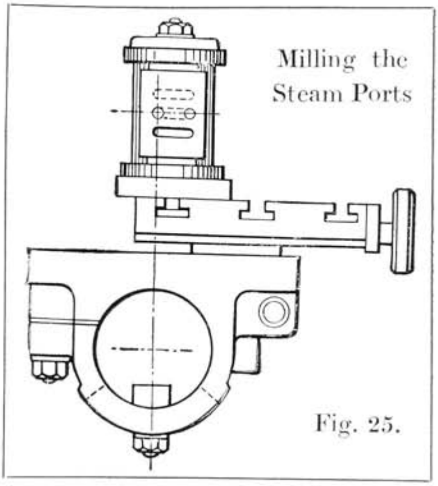


Fig. 24.—Boring Cylinder.

This model was built on a 4-in. circular bed lathe, and all steel and gunmetal parts, including the disc flywheel, were machined from scrap. The cylinder casting was bored on the top slide (see Fig. 24). The cylinder is shown bolted down to the table, and the centre height for the boring bar is adjusted by swinging the saddle round the bed. The cut is adjusted by tapping the tool, which is held in the boring bar by a taper cotter. A perfectly parallel bore is readily obtained by this method. Note the hardwood packing piece, shaped to fit the cylinder. The bolt is slacked off during the finishing cut to avoid distortion. The steam ports were end-milled out by the method illustrated in Fig. 25. A small "tweedler," or end milling cutter, was made to the correct diameter, and held in the chuck. The first port was located for correct height, and the port milled out by traversing the top slide, taking a shallow cut at each passage. Then, without unbolting the work, the saddle was rotated sufficiently to bring the



Milling the Steam Ports

Fig. 25.

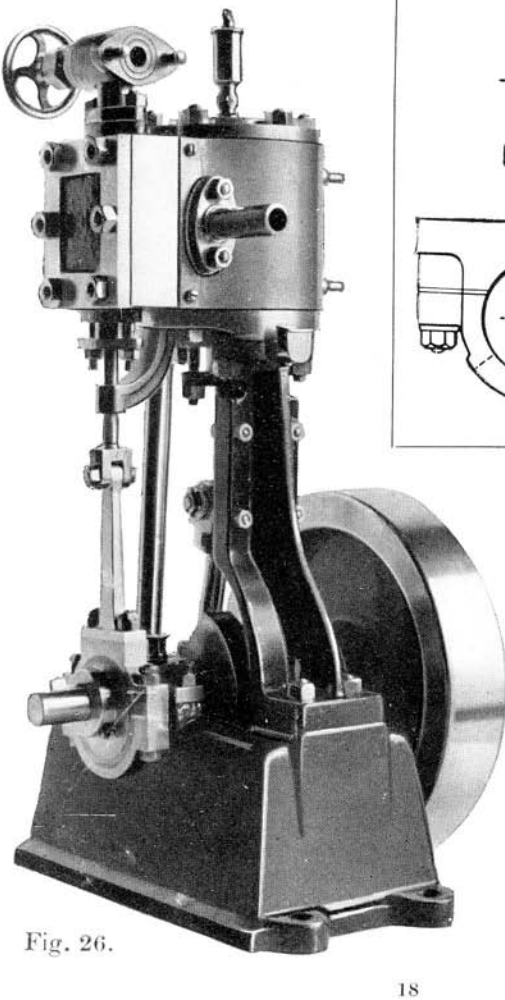


Fig. 26.

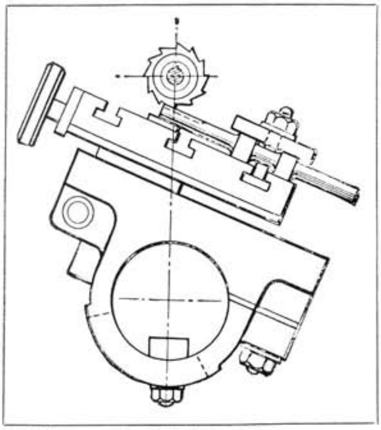


Fig. 27.—Milling Keyway.

second port to the height of the cutter, thus avoiding re-setting and packing up, etc.; the third port was milled out in the same manner, by just swinging round the saddle still farther, thus bringing the work to the right height.

The method of milling the key-way in the crank-shaft is shown in Fig. 27, the depth of cut being adjusted by swinging the saddle a shade farther round the bed. The shaft is bolted to the topside and lined up. The milling cutter is carried on an arbor between centres.

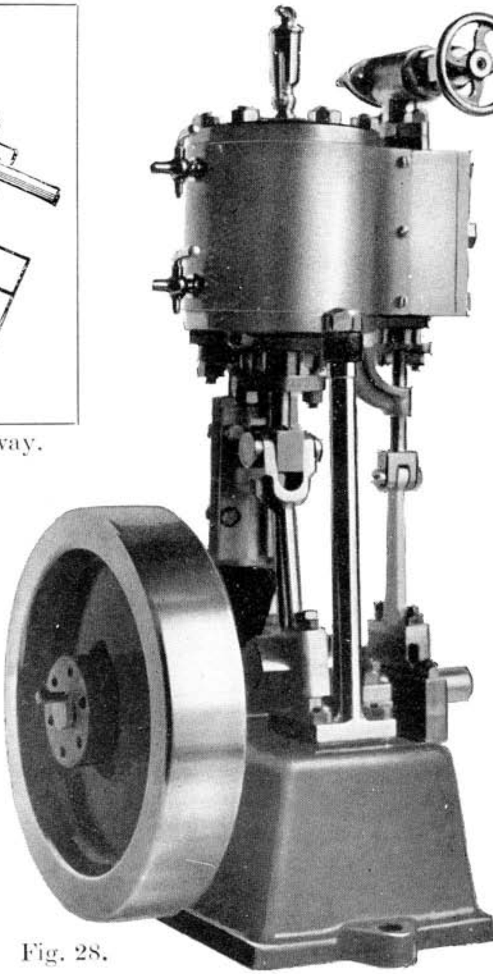


Fig. 28.

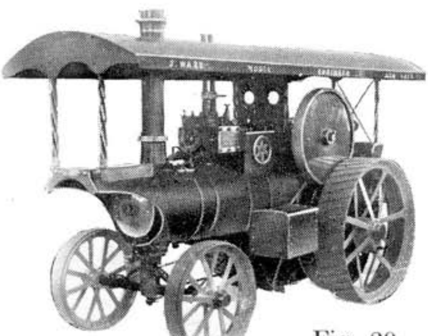


Fig. 29.

MODEL SHOWMAN'S ENGINE

This model is 2 ft. 4 in. in length, and stands 19 in. high, and was built throughout on a 4 in. lathe. The cylinder is $\frac{15}{16}$-in. bore and $1\frac{1}{4}$-in. stroke, and weighed 7 lb. in the rough, yet was successfully machined on the Drummond. The engine is fitted with side water tanks, water pump, steam water lifter, winding gear, full Stephenson's link motion, blower, and sprung front axle ; the boiler is of the water tube type. The engine pulls a good load, with a 10 to 1 gear doing four miles per hour.

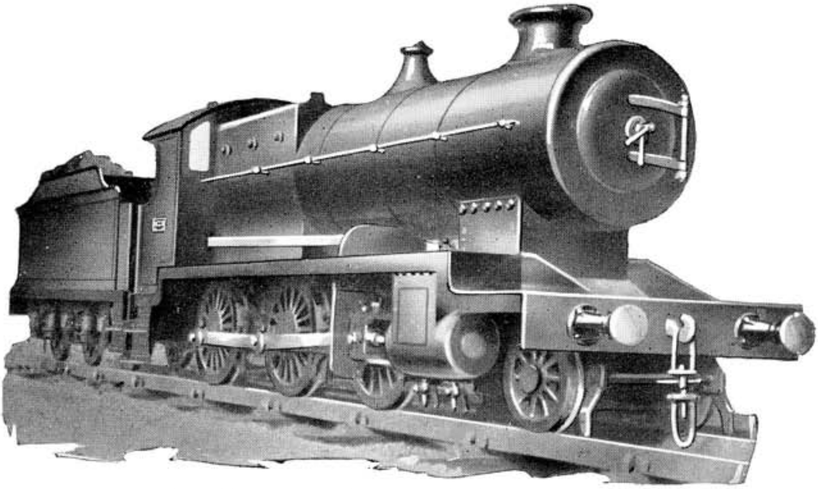


Fig. 30.—$1\frac{1}{2}$ in. to 1 ft. Model Locomotive.

BUILDING MODEL LOCOS

There is a subtle fascination about model railway engineering. The hobby is one which appeals to all ages, and the older one grows the keener one becomes, and the more accurate and realistic is the work produced. The enthusiasm which is always found in makers of model locomotives can be readily understood by any who have experienced the pleasure of starting an engine, such as we illustrate, on its first trial journey.

The photograph shown above (Fig. 30) shows a good example of the wonderfully realistic scale models produced on a Drummond 4-in. Lathe. Such an engine, $1\frac{1}{2}$ in. to the foot, is 7 ft. long, including tender; the coupled wheels are $7\frac{1}{4}$-in. diameter, the cylinders 2 in. bore by $2\frac{1}{2}$-in. stroke. A few moments consideration of the quality of the work essential if a locomotive such as this is to be a success, will make it evident that the efforts and skill of the maker must be adequately backed up by an accurate and adaptable machine. Many splendid models have been made on the multi-purpose "4 in." with "a few odd tools," and these are eloquent testimonies to the value of the machine.

Many Model Engineering and Model Locomotive Clubs are now in existence, and we advise all enthusiasts to get into touch with such an organization.

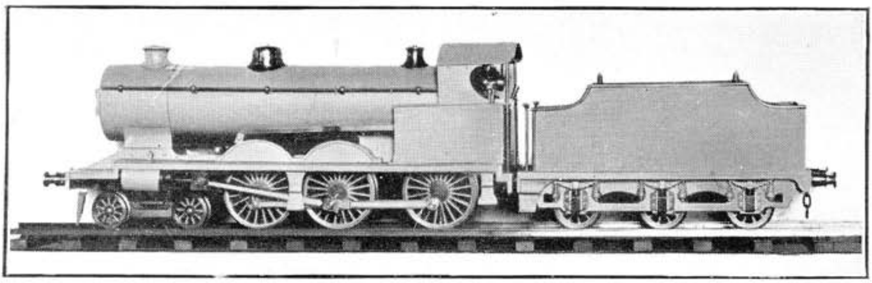


Fig. 31.—Another Fine Model made on a 4-in. Lathe.

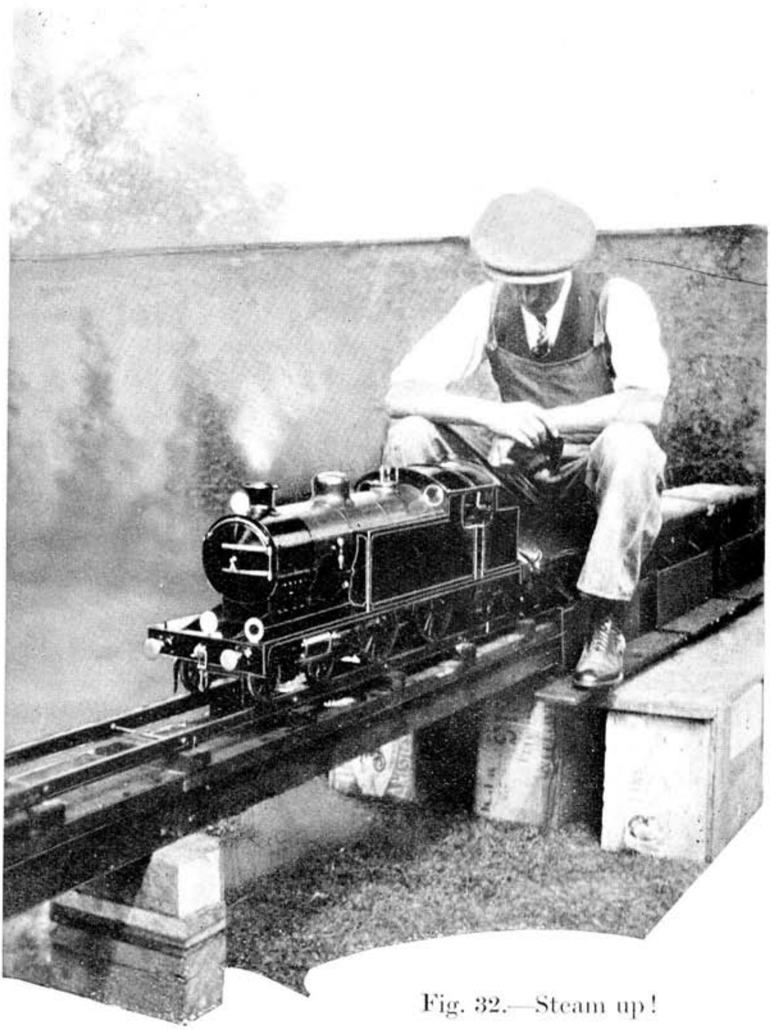


Fig. 32.—Steam up!

This picture shows a one-inch scale model locomotive being tested out by the maker on an outdoor track. The lathe used was a Drummond 4 in. round bed type which, after six years' work, was referred to by the builder of this splendid engine as "as good as ever, and the most accurate lathe I ever had."

DRUMMOND SERVICE DEPT.

If you find yourself in a difficulty with an unusual piece of machining on your Drummond, or are at a loss to know the best set-up to tackle a certain job, write to our Service Department to see if we can be of assistance. There is no obligation, of course. We may have the very thing you require, a special tool, perhaps; or we might be able to suggest a sequence of operations that will give good results and will save time. We shall also be pleased to advise at all times on questions of installation, forms of drive, etc.

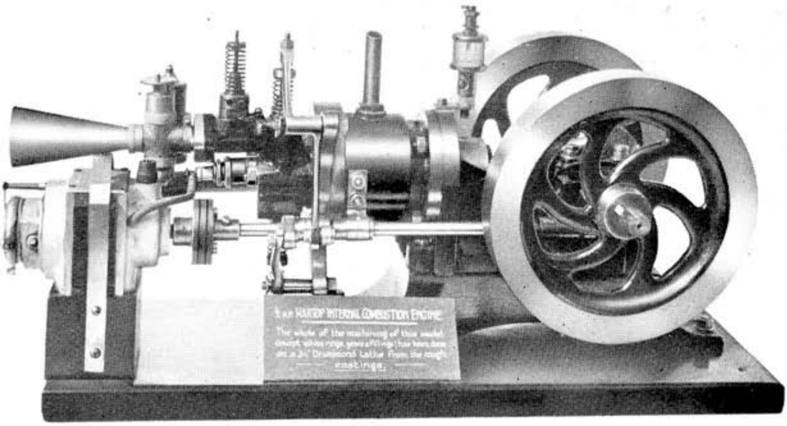


Fig. 33.—Model Gas Engine.

HALF HORSE-POWER GAS ENGINE MADE FROM CASTINGS

Fig. 33 shows a working model gas engine which was exhibited at the "Mode Engineer" Exhibition, 1931. The engine, which gives about half a horse-power, was made from a set of "Hartop" castings. It would be powerful enough to drive a line of light shafting, lathe or other machine. The maker writes very modestly of his work : ". . . . the whole of the machining has been done on a 3½ in. Drummond Lathe, except for the valves, rings and gears, which were supplied with the castings. There is nothing in the actual machining to remark about, but I have had to contrive and scheme quite a bit to swing and support the pieces and tools to avoid strain and chatter in so small a lathe."

TURRET LATHE ATTACHMENT

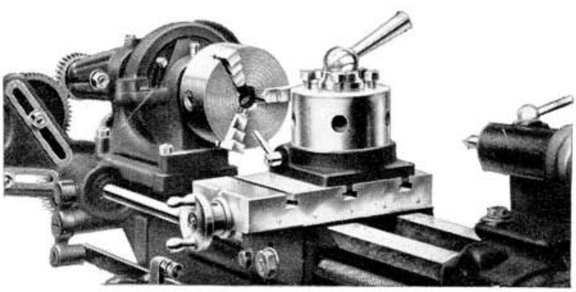
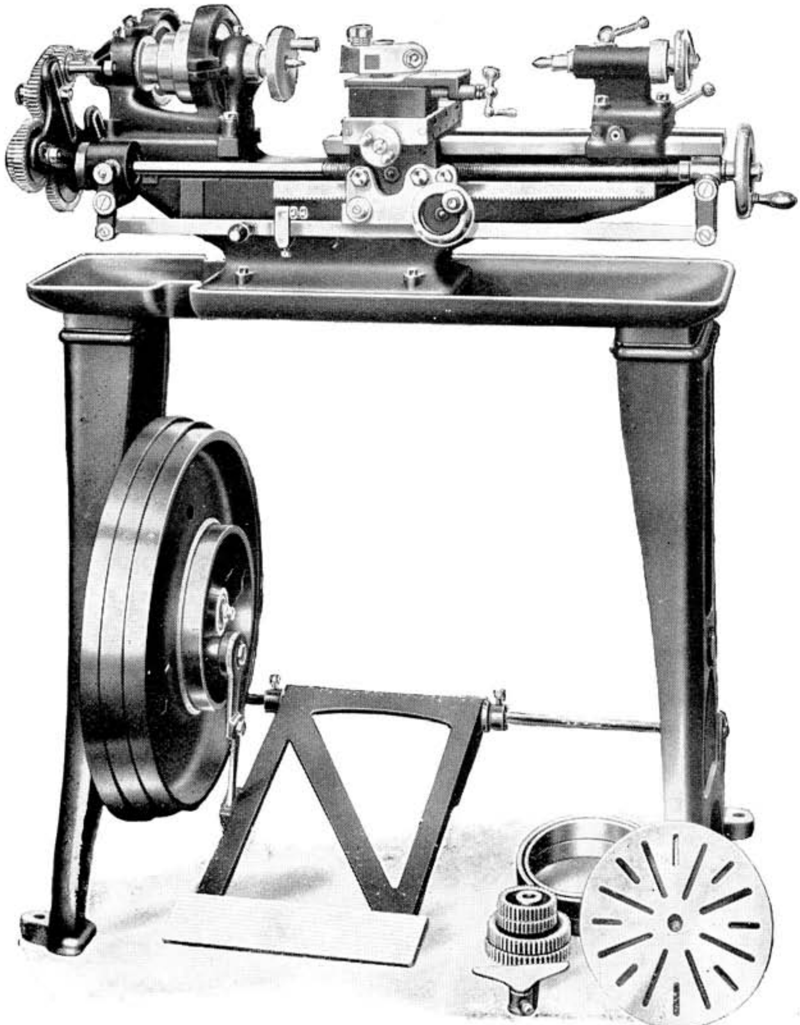


Fig. 34.—Turret Attachment for 3½-in. Lathe

Where there are large numbers of duplicate parts to be made, the lathe can be converted into a turret lathe by means of a turret attachment, as illustrated ; this obviates the necessity for constantly changing tools and re-setting them. Great care is taken in the manufacture of the turret to secure accuracy, and the positioning is such as to ensure repetition to close limits.

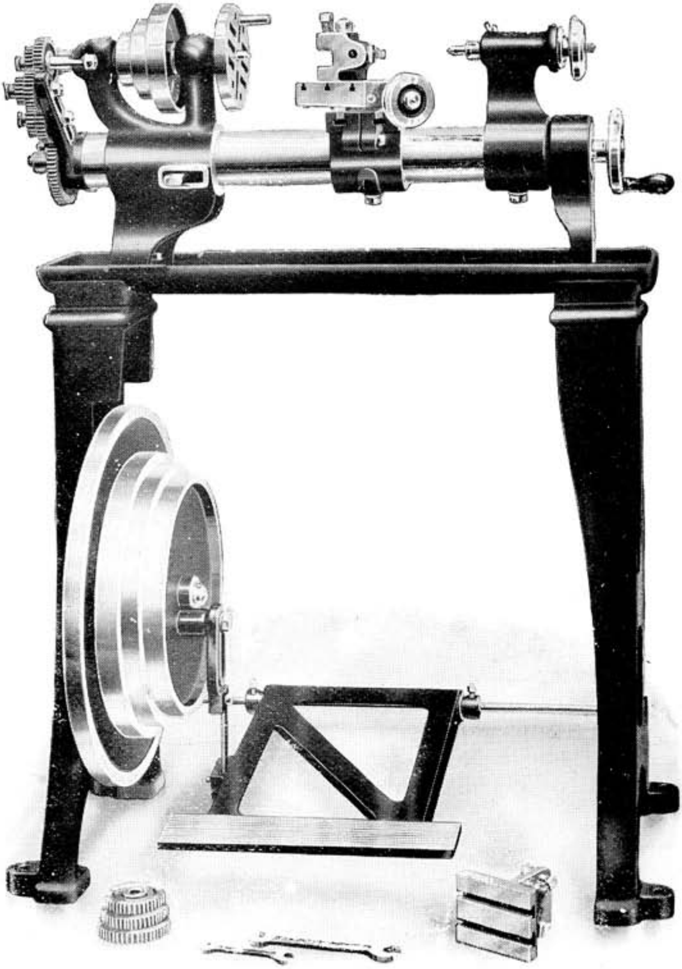


THE DRUMMOND $3\frac{1}{2}$-in. LATHE, TREADLE DRIVE

The modern $3\frac{1}{2}$-in. Drummond Lathe is a highly developed, massively built tool, in all respects the most complete and capable tool of its class obtainable. It is fitted with ball-bearing treadle and pitman; concentrically adjustable bronze bearings with ball thrusts; heavy cantilever bed that obviates any distortion due to uneven floors; quick-release spindle lock; set-over tailstock for taper turning; tee-slotted boring table; special patent tool-holder with height adjustment, locked in any position by one nut without altering tool angles or straining top slide. Rack saddle traverse in addition to hand-wheel on lead-screw; automatic feed throw-out, English and Metric change gears, etc.

For full details ask for Catalogue from nearest Tool Dealer, or direct from

DRUMMOND BROS., Ltd., Guildford, Surrey



THE DRUMMOND 4-in. LATHE, TREADLE DRIVE

Probably the most widely used lathe in the world, this tool is remarkable for its ability in handling varied work. It is more than a lathe; it is a machine shop in miniature.

Face milling, boring, slotting, key-way cutting, sawing, end-milling—all can be conveniently done in addition to plain turning and screw-cutting. The tee-slotted saddle, angle plate and top slide make work-setting easy and *height adjustment* of work relative to lathe centres is provided for. The lead-screw runs the full length of the bed, and is completely protected from dirt and chips. Powerful flat-belt drive is provided, with extra heavy flywheel.

For full details ask for Catalogue from nearest Tool Dealer, or direct from

DRUMMOND BROS., Ltd., Guildford, Surrey

DRUMMOND MACHINE TOOLS

The various high-class machine tools manufactured by DRUMMOND BROTHERS, LIMITED, are listed separately.

They include the following:—

4-in. Circular Bed Multi-purpose Lathe.

3½-in. Gap Bed, Back-geared Screw-cutting and Boring Lathe.

5, 6, & 7 in. Lathes for large workshops, Toolrooms, etc.

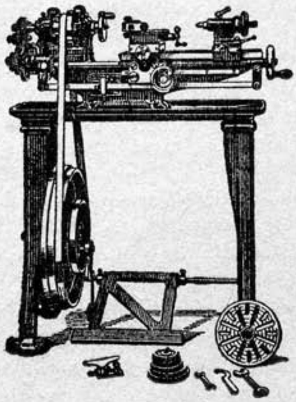
Sensitive Radial Drilling Machines.

Hand Bench Drilling Machines,

Hand Bench Shaping Machines.

A complete range of Accessories and Attachments for the above.

Catalogues of any of these tools, together with all information and any advice or assistance on the subject of installation, etc., will be gladly furnished on request.



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