"M" Type 3½in. Centre Lathe.

DRUMMOND BROS. LTD.

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HIGH CLASS MACHINE TOOLS

The Improved Design

DRUMMOND 3½-in.

Centre, Back Geared, Self-acting, Sliding, Boring and Screwcutting

LATHE

Foreword.

A few words on the origin and development of the Drummond 3½-in. lathe may be of interest, and will show how uniformly successful this design has been since its first appearance.

The original 3½-in. centre lathe was introduced in 1902, and was the first lathe of its size designed on really efficient lines. The details of the design were gradually improved in the light of experience with lathes of this type and in accordance with current practice, and in 1912 a revised design, incorporating the results of continuous experiment towards efficiency, was marketed. This model enjoyed even greater popularity than its predecessor.

The lathe was again modified in 1921; the points in design previously found to be most desirable as giving great ease of handling, large scope for varied work, and accuracy in operation being retained, and other features incorporated in the light of further experience gained during and after the war. Here our work on precision screw production and measurement to fine limits had its effect in influencing both design and manufacturing methods. The lathe was made heavier throughout, the round belt was replaced by a flat one, ball-bearings were fitted to flywheel and pitman—a special [illegible] lock fitted to headstock—etc., etc.

Design has continued to progress, and details to be improved, and now the modern lathe, complete with the many special features described in this list, can confidently be claimed without hesitation to be in every way the finest and most complete 3½-in. centre lathe obtainable.

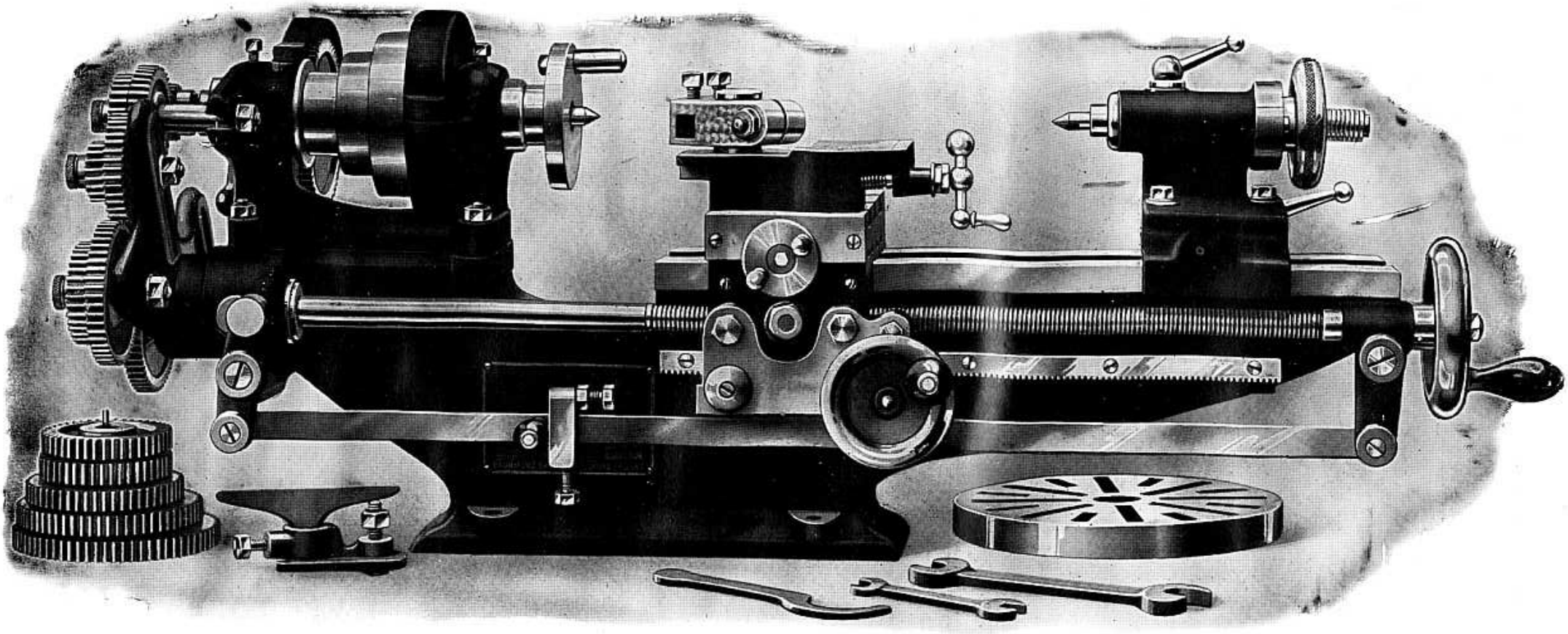


Fig. 1.—Latest design Drummond 3½-in. Centre Lathe arranged as Bench Machine without driving arrangements.

DESIGN FEATURES of the DRUMMOND 3½-in. Lathe

THE BED AND SADDLE.

The bed has a longitudinal form that is completely self-contained and stiff in itself, and therefore needs no outside support whatever. This Drummond cantilever design is unique in that it enables the lathe to be bolted down on any floor, no matter how uneven, without distorting or affecting its accuracy in any way; **it is the only form by which a small lathe can be made or guaranteed to remain accurate wherever placed.**

The bed is a complete box section casting, stiffened internally, and is of the same general design as our new toolroom and manufacturing lathe beds. Although the top surface of the bed is flat, it is not the ordinary so-called "flat English bed." **The Drummond form of lathe bed combines the accuracy of the long narrow guides of the "American" type with the long wearing qualities consequent on the large wearing surfaces of the "English" type.**

Referring to Fig. 2, it will be seen that the design gives a 90° vee saddle guide at the front of the bed, the centre line of which coincides approximately with the average line of cutting thrust. The vertical downward component of this thrust is taken on the top surface of the front way, A; the horizontal forward component of the cutting thrust is met squarely by the back face of this way. The rear way C is separated from the saddle by clearance D, and the saddle is firmly held to the top face of this way by the stiff gib shown. **Thus the cut itself holds the saddle to a long narrow guide at the front of the bed.**

The leadscrew B is brought close in under this saddle guide, thus reducing to a minimum the unavoidable "wringing" action between these elements, and ensuring a clean, steady saddle movement.

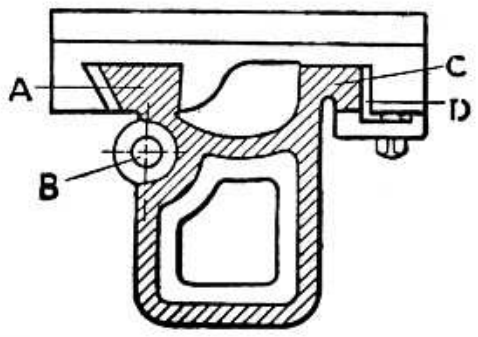


Fig. 2.—The Bed and Saddle Design.

THE HEADSTOCK.

This is positively and permanently clamped against the flat vertical face of the front way of the bed, thus ensuring alignment of the spindle with the ways. In earlier designs an overhead arm joined the two main bearing bosses of the headstock casting, but the modern design is provided with a heavy cast beam on base, which ensures absolute rigidity and great strength with fully adequate support for the spindle bearings.

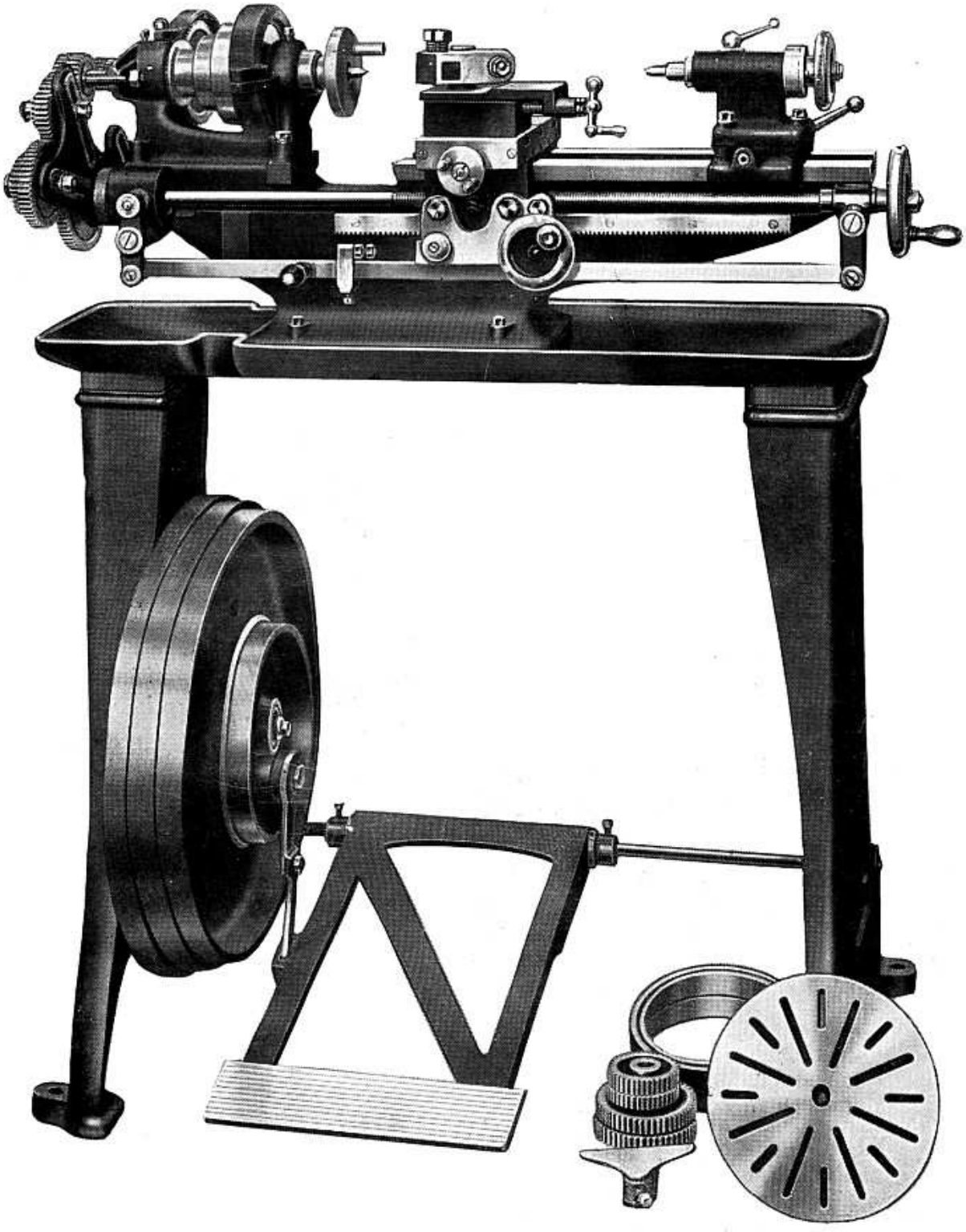


Fig. 3.—The Drummond 3½-in. Treadle Lathe.

The hollow spindle is fitted with ball thrusts (see Fig. 4) and runs in hard phosphor bronze bearings, which are adjustable by contraction into their coned seatings in the headstock casting. These bearings are exceptionally long and are spaced widely apart.

A special spindle and cone pulley lock is provided. To disengage the cone pulley from the gear keyed to the spindle, so that the back

gears may be used, the knurled knob on the front face of the gear is pushed away from the operator; this automatically withdraws the locking pin by means of a cam slant cut in the face of the plate gear; to re-engage for direct drive the knob is pulled towards the operator, when a spring action automatically returns the locking pin. This lock has thus the simplest motion possible, requiring the least time and trouble in its operation; no nuts, screws, spanners or pull-out pins are employed, and in the somewhat restricted space available it forms a very accessible and convenient arrangement. Just a push of the knob, forwards or backwards, and the cone is freed or locked.

The back gears work on an eccentric bearing spindle, and cast iron gear guards are fitted. The whole headstock is of massive design and of great length for the size of lathe.

The mandrel nose is provided with a square ground shoulder as register behind the thread; this ensures perfect running truth of faceplate or chuck.

METHOD OF ADJUSTMENT OF BEARINGS

(See Fig. 4).

The method of adjustment of the main bearings will show just how these are constructed. **First slack off thrust nut C.**

Front. (a) Slack bearing locking screw A. This allows bearing to be contracted
(b) Adjust bearing by screwing down bearing nut E. This contracts bearing by pulling into taper housing.
(c) Lock bearing by screwing down locking screw A.

Back (d) Slack bearing locking screw B.
(e) Adjust bearing by screwing up bearing nut D.
(f) Lock bearing by screwing down locking screw B.

Readjust thrust nut C.

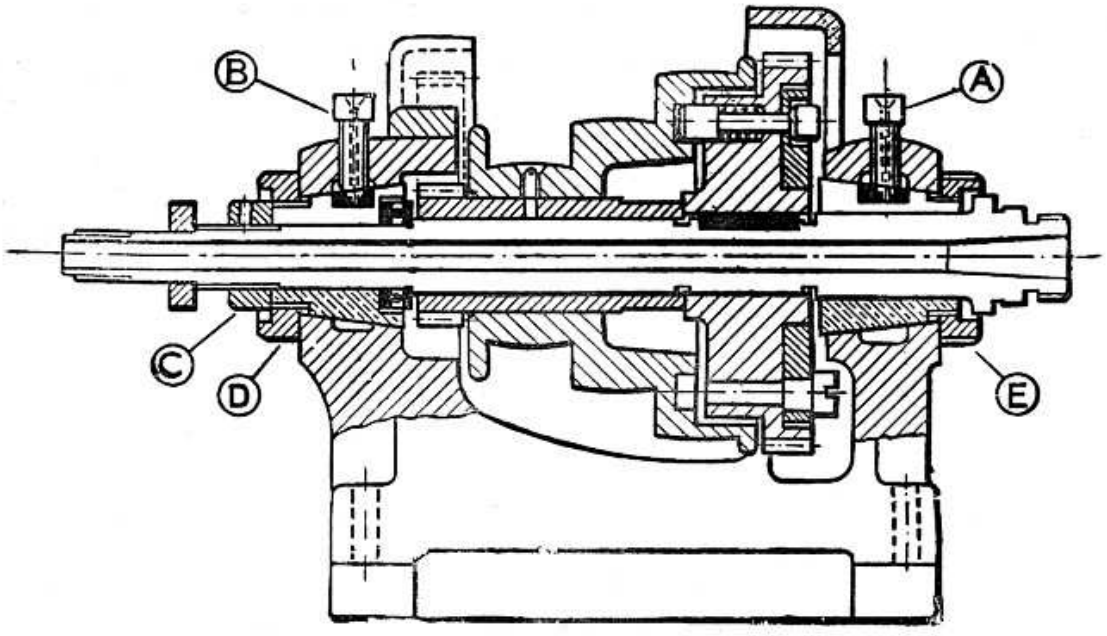


Fig. 4.—Section of headstock.

THE TAILSTOCK.

The tailstock is a stiff box casting, with steel barrel and square thread screw, and for turning long tapers it has a set-over adjustment, which may be set by means of a zero graduation.

It is guided in similar manner to the saddle (see Fig. 5). A single action of the lever at its back rigidly locks the tailstock to both the front and rear ways by means of adjustable eccentrics. This is done without putting any distorting or squeezing strains upon the bed, and gives a very large weight taking and wear resisting area. Note that the alignment of the tailstock is obtained by locking to the same vertical face of the ways as the headstock, and that this face also guides the saddle.

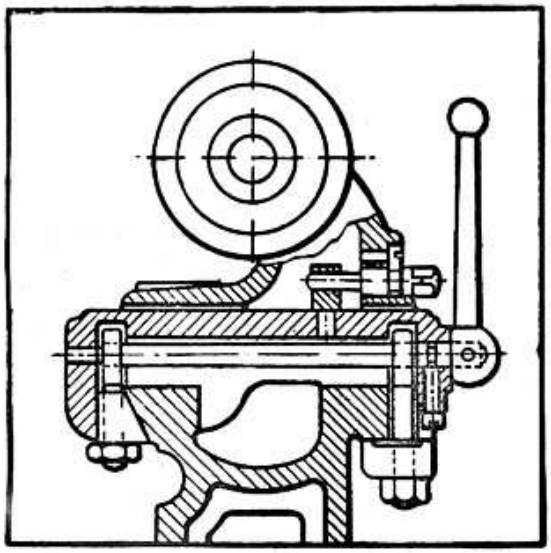


Fig. 5.—The Tailstock Design.

THE SPECIAL TOOLHOLDER WITH HEIGHT ADJUSTMENT (Norman's Patent).

The toolholder on the new Drummond has been evolved as the result of continuous experiments and many years of experience in the design of various types, and we think we can now confidently claim to have produced what has hitherto been lacking—a perfect toolholder for small lathes.

A comparison with other types. In considering the advantages of the new holder over other types the following points should be noted.

Firstly, there is the question of the manner in which the tool is clamped to the topslide, and on this depends to a great extent the rigidity and accuracy of the latter, as well as the freedom from chatter, etc., of the tool. The single clamp bolt with tool block and double setscrews, as provided in the previous DRUMMOND 3½-in. lathe, gives an excellent holder, providing care is taken in securing the block on the topslide before the tool itself is screwed in position. The four bolt and double clamp plate method is exceedingly cumbersome, and in both these methods the stresses due to clamping the tool are imposed on the topslide itself, with a tendency to impair the accuracy of the latter. In the case of the tool post holder, this means a weakening of the topslide caused by the necessary base slot.

Secondly, there must be some means of adjusting the height of the tool; this is usually done by packing or by the provision of a holder of the tool post type. Packing the tool is not an ideal method, and in the case of the tool post holder with its arc-shaped packing wedge—although this gives a fairly simple tool setting in one respect—it alters the cutting angles of the tool with each adjustment for height.

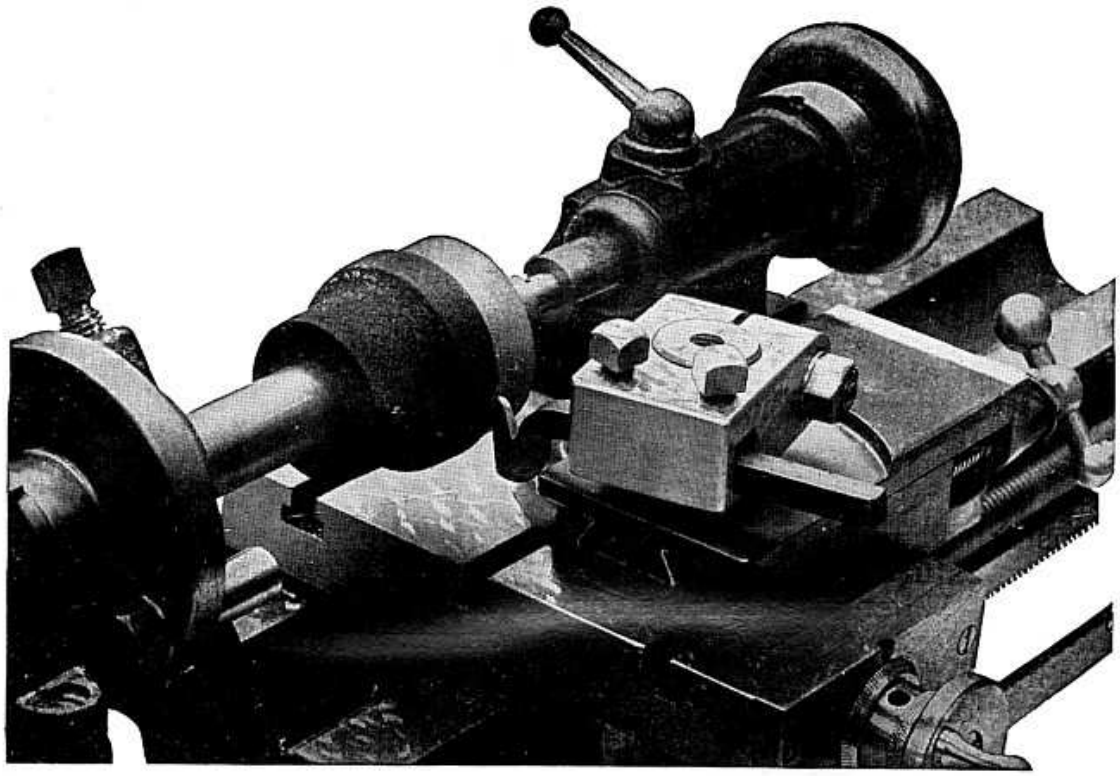


Fig. 6.—The new toolholder with height adjustment.

Thirdly, there is the question of convenient holding of boring bars and tools, and all of these methods are subject to limitations in respect of their ease of tool setting.

All these points are successfully dealt with in the new design toolholder. It will be seen that the toolholder itself is clamped to the cylindrical post or pillar which is cast integral with the topslide, and thus all clamping stresses are confined to the toolholder itself. Only the normal cutting stresses are carried by the topslide, which in itself has additional strength owing to the extra metal just in the right place which the post gives.

The toolholder itself consists of a hardened steel block cut from the solid with a central hole a sliding fit on the topslide pillar. The block is split so that it may be clamped to the pillar by means of a hardened clamping bolt. The tool itself is carried in a square hole through the toolholder, and is held by means of two hardened set-screws. It will be seen from the two illustrations reproduced herewith that this toolholder is quickly adaptable to turning or boring operations, and it has a complete range of movement round its pillar.

Perhaps the greatest feature, however, of the new toolholder is that it provides for **height adjustment** of the tool relative to the lathe centres. A range of movement of about ⅜ inch is provided, the tool being clamped firmly in its square hole all the while, and one quick movement of the spanner on the clamping bolt being the only action required for locking the holder in any position.

It should be noted that the cutting rake and clearance of the tool remain constant for all height settings, as of course the tool is shifted bodily up or down, and does not change its angle with relation to the slides.

Fig. 6 shows the lathe set for plain turning. It will be noticed how simple the tool setting is and how the provision for height adjustment simplifies this operation. Tools made of different sections of tool steel are accommodated to bring their cutting edges to the correct height and in setting tools for side cutting, facing or taper turning, the correct position may be obtained immediately, and the single clamp grips the holder tightly in a second.

Fig. 7 shows another close view of the new toolholder, with the lathe arranged for boring. This shows another advantage of the toolholder, that is, the way in which the boring tool or bar may be used with as great facility as the ordinary turning tool. The wide range of positions available for tool setting will be noted, and again the valuable feature of height adjustment, which is so essential, is readily obtained. When the extra strength and ease of setting with this toolholder for such an operation is compared with that when using a toolholder of the tool post type, or one of the old clamp plate style, the value of the new toolholder will be appreciated. The manner in which the height of the tool is altered, while still keeping its horizontal position, is a feature peculiar to the new holder, and is not found in any other.

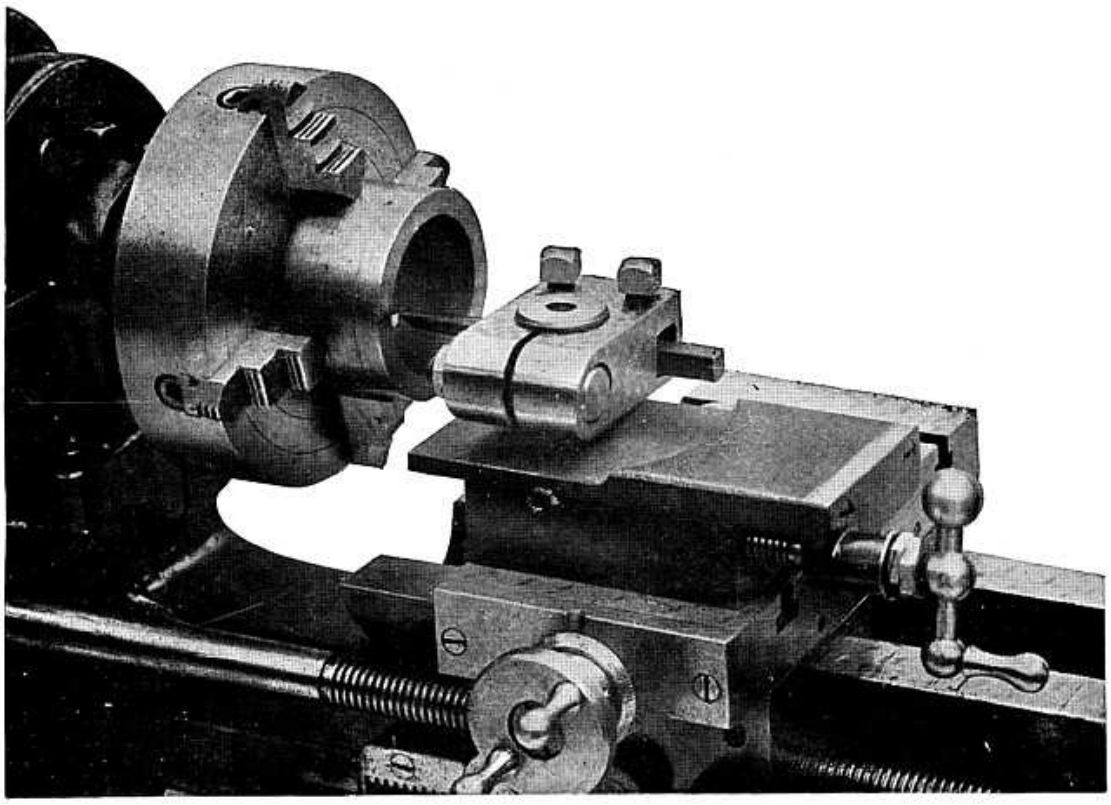


Fig. 7.—Lathe set up for boring. Note ease of toolsetting.

SOME FURTHER FEATURES.

The Leadscrew is cut on a special machine fitted with pitch correcting gear; its rear end bearing is bronze bushed, and at its headstock end a clutch is fitted for both hand and automatic throw-out, which can be set to operate at any position of the saddle along the bed to prevent overrunning.

The Saddle is provided with rack and pinion traverse motion operated by handwheel, and a split-nut device for disengaging the leadscrew is operated by means of the knob on the left of the apron. The sliderest is fully compound, and the cross-slide is formed as a large ⊥-slotted boring table. The cross-slide screw is fitted with micrometer index. **The Topslide** is fitted with a graduated base; its leadscrew is brought to the side of the vees, thus enabling the use of a much longer nut than formerly, and giving longer life and protection from chips, etc. Both slides have unusually long bearings, giving great accuracy and firmness in operation.

The set of **Change Wheels** supplied as standard is as follows:—two 20, two 30, one each 35, 38, 40, 45, 46, 50, 55, 60, 65, 73. All gears are machine cut from the solid blanks, and the set covers Whitworth threads from 40 to 8 threads per inch, metric from 0.5 m.m. to 5 m.m. pitch, and a wide range of other threads and feeds. The screwcutting change gear studs are fitted with a patented spring plug retainer; to remove change wheels the plug is merely pulled out by its head, when the wheels can be instantly changed without bother with nuts. The change gear quadrant is provided with a second quadrant to the rear for the clamping nut.

The treadle lathe **Flywheel** and the head of the pitman link run on large ball bearings; the flywheel is balanced and of great weight for the size of the lathe. All slides are hand scraped to surface plate.

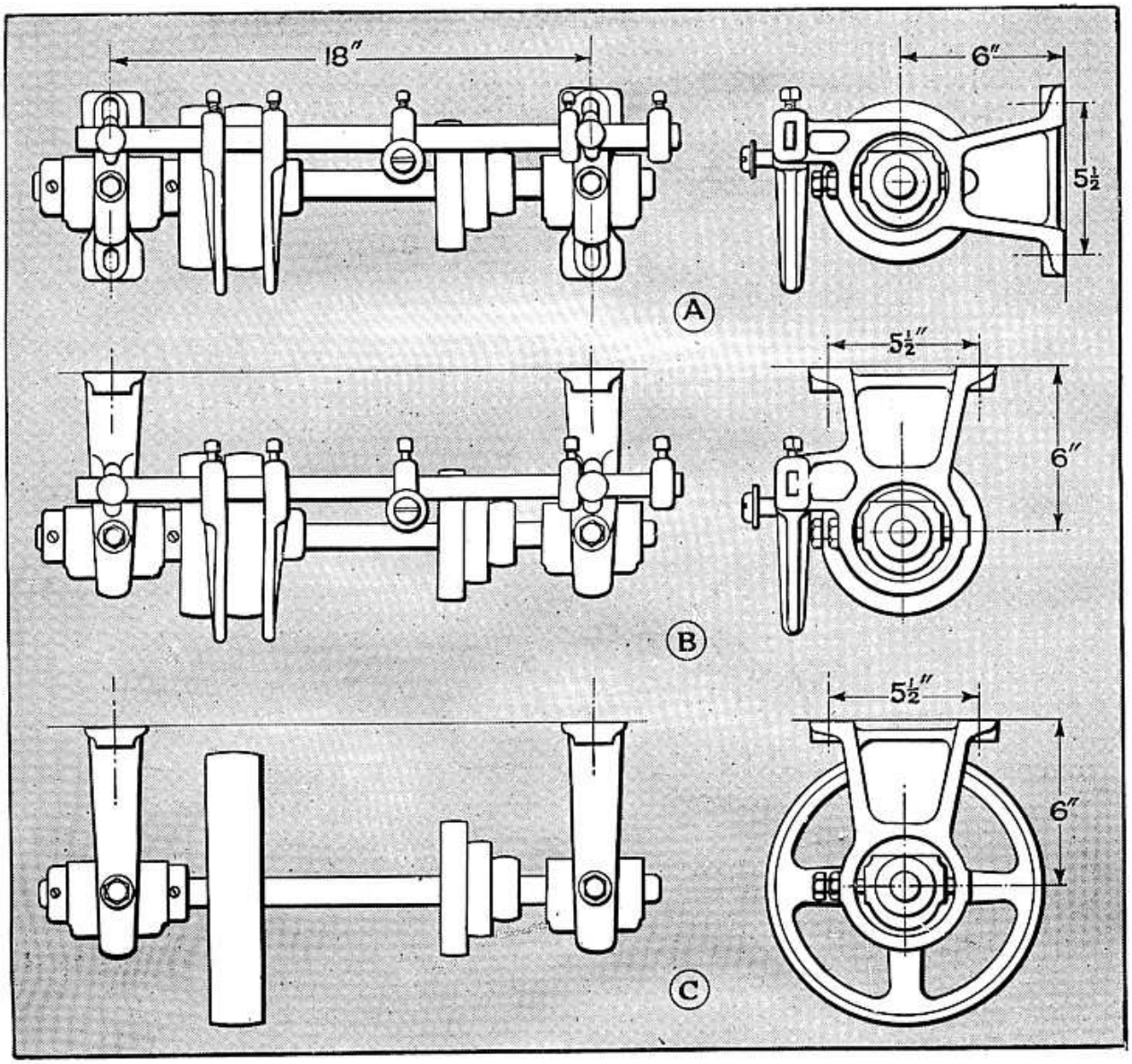
The Standard Accessories supplied with each lathe are:—large faceplate, driverplate, handrest, one hard and one soft steel centres, spanners. Belt supplied with treadle lathe.

DIMENSIONS OF STANDARD MODEL.

Height of centres	3½in.
Maximum length between centres (see p. 12, longer beds)	1ft. 4in.
Maximum swing over saddle	4¼in. diam.
Diameter of faceplate, maximum swing in gap	9in. diam.
Maximum width admitted in gap, from faceplate	2in.
Diameter of hole through mandrel	⅝in.
Size of centre hole	No. 1 Morse.
Dimensions of boring-milling table	8in. x 4¼in.
Pitch of leadscrew	⅛in.
Diameter of mandrel nose thread	1in.
Pitch of mandrel nose thread	12 per in.
Diameter of steps on headstock cone pulley	2 3/16in., 3 11/32in., 4½in.
Diameter of steps on flywheel	20⅜in., 19⅜in., 10⅞in.
Width of belt	1in.
Length of bed	2ft. 8¼in.
Length over all	3ft. 3in.
Breadth over all	1ft. 10½in.
Net weight approx. (bench lathe)	1 cwt. 2 qr.
Net weight approx. (stand and treadle lathe)	4 cwt. 1 qr. 14 lb.
Weight of flywheel	92 lb.
Speed countershaft should run	290 r.p.m

COUNTERSHAFTS.

The lathe can be equipped to order with either "wall" (A) or "roof" (B) type countershafts for power drive, or with countershaft for driving from electric motor, (C). These countershafts are as carefully designed and built as the lathe itself; lubricating arrangements are fully adequate, and the fact that the countershafts are frequently to some extent neglected owing to their inaccessibility has been borne in mind in their design. The question of convenience in erecting has also received due consideration, and the most amateur worker can install these countershafts without the slightest difficulty.



Roof and Wall Types—Specifications.

Two hangers of rigid girder section carrying long swivel shaft bearings; bearings have chain lubricator running in central oil sump which is connected by machined ducts to circular end channels for collecting and returning oil to sump. Polished steel shaft carrying three-step cone pulley and fast and loose pulleys for first drive. Striker bar, supported by arms extended from hangers, with belt forks of strong section and carrying heavy pin for striker handle fitted on boss that is adjustable for position along the bar. All pulleys, forks, etc., can be locked in any position longitudinally as required. Diameter of fast and loose pulleys, 6 inches.

Type for Driving from Electric Motor—Specification.

Specially large pulley, 10ins. in diameter, in place of fast and loose on shaft. Bearings, etc., as above, no striking arrangements are necessary and none are fitted. The specially large pulley fitted to this countershaft enables the necessary speed to be obtained from any usual motor, and does not necessitate the use of an abnormally small pulley on motor.

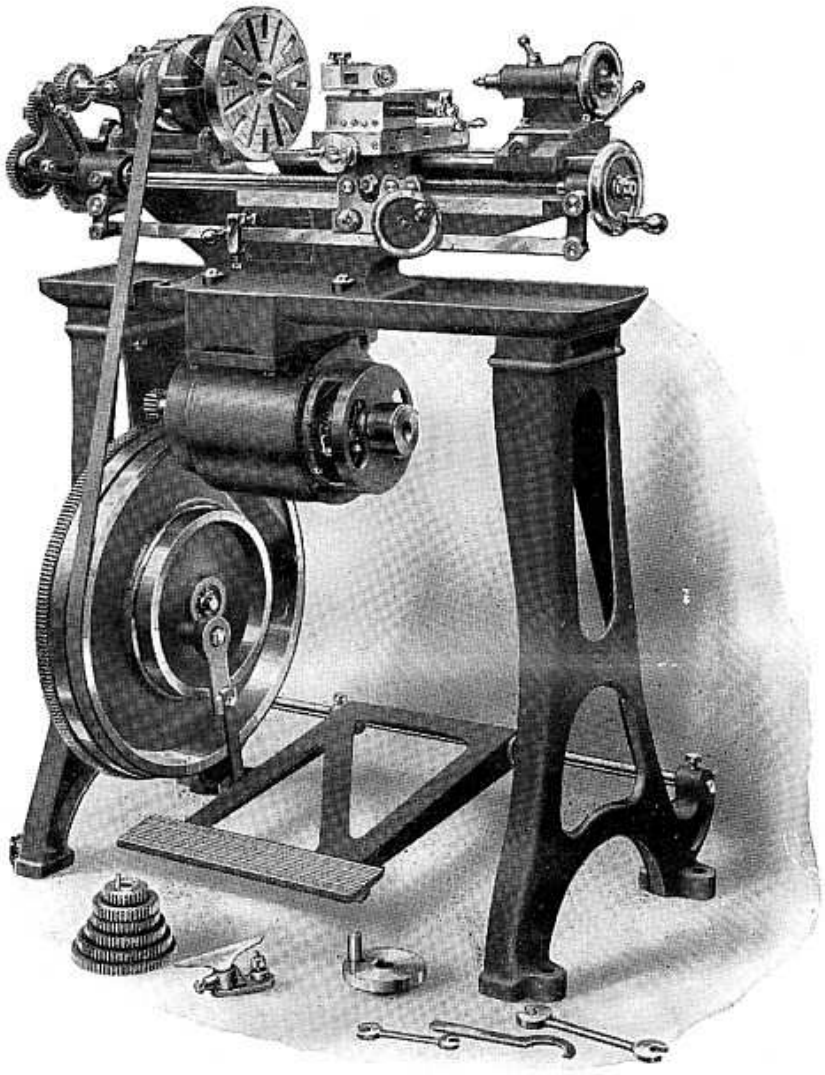


Fig. 9.—Lathe arranged for treadle and direct electric motor drive

ATTACHMENTS AND ACCESSORIES.

In addition to having in themselves a very wide and varied scope of usefulness, all Drummond Lathes can be equipped with a **complete series of special attachments** which extend their capabilities to embrace operations not usually considered as normal lathe work. This peculiar comprehensive adaptability renders DRUMMOND Lathes particularly suited for Motor and General Repair work and for overseas use.

The following attachments are supplied for the 3½-in. lathe, and are fully described and illustrated in the Special Attachment Lists:—

Indexing, Milling and Gear-Cutting Attachment.
Tool Grinding Attachment.
Turret Attachment.
Internal and External Grinding Attachment.
Saw Table Attachment.
Fixed and Travelling Steadies.
Connecting Rod Boring Fixture (for Garages, etc.).

It would be almost impossible to catalogue completely all the various special arrangements built to suit this lathe. An enquiry for any special arrangement required other than those listed can usually be answered by a definite quotation for a special fitting.

Direct Electric Drive (for self-contained motor), as in illustration above, supplied. Quotations on receipt of particulars of current supply (state A.C. or D.C., volts, phase, cycles).

Chucks, tool equipment, and special accessories are separately listed. Catalogues sent on request.

Extra Long Bed Lathes.

Long slender work sometimes calls for a lathe having a greater between-centre distance than the standard lathe gives. To meet these conditions the Drummond 3½-in. lathe can be supplied with a bed one foot longer than that of the standard model. The use of the longer bed machine will be found to be an excellent means of obtaining increased capacity while still retaining the many valuable features of the cantilever bed lathe. Distance between centres 2ft. 4ins.

PRICES.

STANDARD LENGTH MODELS	Price. F.O.R. Guildford Carriage Forward	Code.
3½in. Lathe on stand with treadle motion	Prices on application	Tri
3½in. Lathe on stand with roof type countershaft instead of treadle		Trico
Countershaft only, roof type		add Co
wall type		add Cow
electric motor type		add Coe
(if ordered separately, prefix "Em" to Countershaft code word)		
3½in. Lathe on stand with both treadle and countershaft		Tricot
3½in. Bench Lathe without stand or driving arrangement		Trib
3½in. Bench Lathe with countershaft		Tribco
Extra for **1ft. longer bed models**		add lb.

GUARANTEE AND CONDITIONS OF SALE.

DRUMMOND BROTHERS, LIMITED, guarantee that they will replace any portions of any machines made by them which can (within 12 months from date of delivery) be shewn to have failed through defective material, workmanship or design, provided such parts are returned to their works, carriage paid. In no case will they pay, or be responsible for, repairs made without their knowledge or sanction, or for indirect damage, or any consequential loss or expense incurred by purchasers. This guarantee is to take the place of, and exclude any implied by law or arising at the common law, and no further liability is accepted by DRUMMOND BROTHERS, LIMITED.

In the case of the occurrence of any strike or lock-out of workmen, fire, breakdown of machinery, defective casting or any unforeseen cause of delay, the time fixed for the completion of the order or contract shall be extended accordingly.

The terms of payment agreed upon shall be strictly adhered to. No minor defect which may be discovered after the plant is set to work is to interfere with the payments by the purchasers at the proper time, full provision being made for dealing with possible defects under the makers' guarantee.

The weights, sizes, etc., given, are approximate, and not binding in detail, although the illustrations and specifications may as a rule be taken as a correct representation of the machines. It will, however, be understood that alterations in patterns are necessary to keep the machines up to date, and all alterations are made with a view to effecting the more perfect efficiency of the machine.

Prices are subject to alteration without notice.

Prices in lists are for goods delivered free on rail, Guildford Station, carriage forward. Cases are not charged for if returned in good condition within 14 days, carriage paid.

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