MACHINE No. 13
SERIAL No. - 2-46547

COLCHESTER
STUDENT

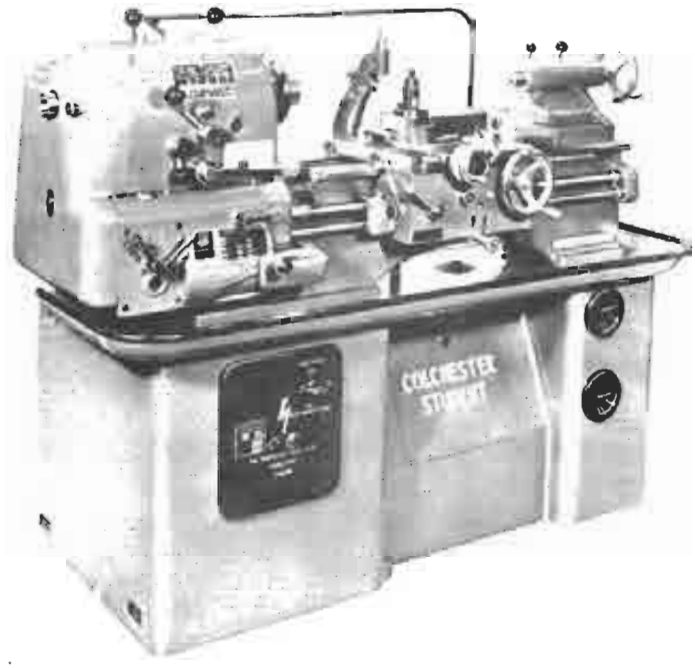
INSTRUCTION AND SPARE PARTS MANUAL

THE COLCHESTER LATHE COMPANY LTD., COLCHESTER, ENGLAND

Jan October, 1967

COLCHESTER HIGH SPEED SAFETY LATHES

6" x 24" STUDENT
&
12" x 24" DOMINION



This Instruction and Spare Parts manual applies to the Colchester 6" Student Safety Lathe and 12" swing Dominion Safti-Lathe. A thorough understanding of its contents will help the user to obtain the best results from his machine.

Our Technical Sales Department is at your disposal and will always be pleased to discuss problems concerning the application of Colchester Lathes and their attachments. Our aim is to ensure that the user obtains the maximum satisfaction from his Colchester Lathe.

The construction number of all Student machines is stamped at the tailstock end of the bed between the vees. All communications regarding a machine must quote the machine construction number. This point is important because due to our policy of continuous improvement designs may be changed so that our machines will better meet the users requirements and therefore this manual should be considered as applying to the particular machine with which it is issued.

ONE COPY OF THIS MANUAL IS SUPPLIED FREE WITH EACH MACHINE. FURTHER COPIES MAY BE OBTAINED AT A COST OF 5/- EACH.

BRIEF SPECIFICATION OF THE MACHINE

This specification applies to all four standard models of Colchester "Student" lathe, as follows:

COLT —gap bed machine with quick change gearbox.
CUB —gap bed machine without quick change gearbox.
DIME —straight bed machine with quick change gearbox.
PENNY—straight bed machine without quick change gearbox.

	English	Metric
Height of centres	6″	152 mm.
Turning diameter		
Over bed	12″	305 mm.
Over carriage	9″	229 mm.
Over cross slide	8″	203 mm.
Distance between centres	24″	610 mm.
Diameter of faceplate	12″	305 mm.
Gap bed models		
Turning diameter in gap	18″	457 mm.
Width in front of faceplate	$4\frac{3}{8}$″	111 mm.
Width of bed	$8\frac{3}{8}$″	213 mm.
Spindle bore (max. bar diameter)	$1\frac{1}{2}$″	38 mm.
Taper in spindle nose bush	No. 3 Morse	
Spindle nose	American Taper L.O.	
Capacity of travelling steady	2″	50 mm.
Number of spindle speeds (standard motor)	8	
Range of spindle speeds (standard motor)	54–1200 r.p.m.	
Number of spindle speeds (2 speed motor)	16	
Range of spindle speeds (2 speed motor)	34–1500 r.p.m.	
Feeds		
No. of sliding feeds	45	45
Range of sliding feeds per rev. of spindle	0.0025″–0.068″	0.06 mm.–1.7 mm.
No. of surfacing feeds	45	45
Range of surfacing feeds per rev. of spindle	0.0006″–0.017″	0.015 mm.–0.43 mm.
Threads		
No. of Whitworth pitches	45	
Range of Whitworth pitches	4–120 t.p.i.	
No. of metric pitches	12	
Range of metric pitches	0.25 mm.–6 mm.	
Pitch of leadscrew	6 t.p.i.	
Total travel of bottom slide	$6\frac{3}{4}$″	171 mm.
Total travel of topslide	$3\frac{5}{8}$″	92 mm.
Height from top of topslide to centre line of spindle	$1\frac{7}{8}$″	48 mm.
Maximum tool shank size (pillar type tool post)	$\frac{9}{16}$″ x $1\frac{1}{8}$″	11 mm. x 29 mm.
Travel of tailstock barrel (Std. No. 3 M.T. centre fitted)	$5\frac{1}{8}$″	130 mm.
Travel of tailstock barrel (Std. tang drill fitted)	$3\frac{3}{4}$″	95 mm.
Taper in tailstock barrel	No. 3 morse	
Overall length	61″	1550 mm.
Overall width	30″	770 mm.
Weight	1372 lb.	625 kg.
Motor (standard single speed)	3 h.p. 50 cycles, 1425 r.p.m.	
Motor (2 speed)	3/$1\frac{1}{2}$ h.p., 50 cycles, 1440/720 r.p.m.	

STANDARD EQUIPMENT SUPPLIED WITH THE MACHINE

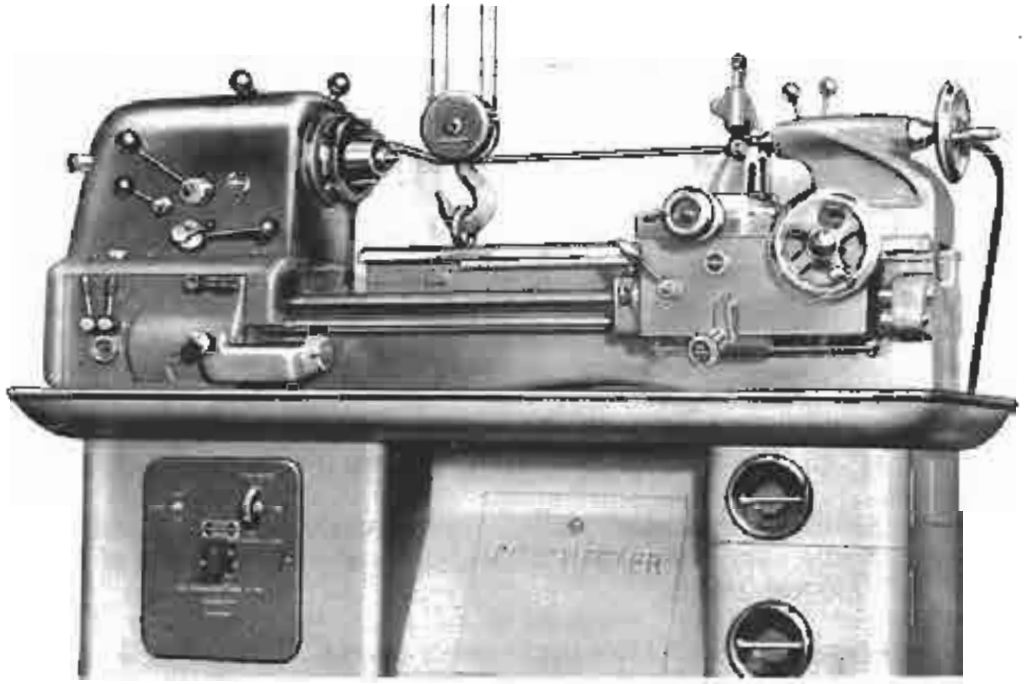
(For details of additional equipment, see pages 24–39)

One 12″ diameter faceplate.
One 6″ diameter slotted driving plate.
Two No. 3 Morse taper centres.
Centre bush.
Travelling steady.
Spanners, Allen keys, etc.

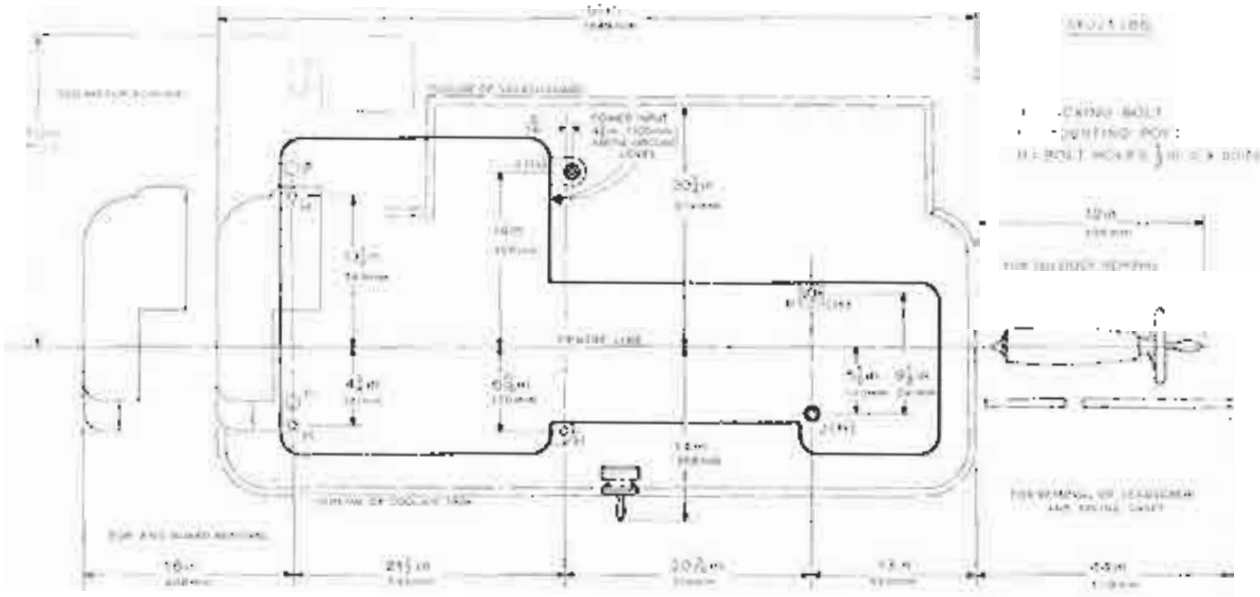
ADDITIONAL EQUIPMENT

A comprehensive range of additional equipment is available for the Colchester " Student " lathe. All items are designed specifically for the " Student " and are engineered for simplicity, robustness, and reliability. A brief list of additional equipment is given below and more detailed information on certain items is given in subsequent pages. All these items can be fitted to the machine after it has left the works.

	Code
High speed threading attachment	234
Hydraulic copying attachment, with 60° slide (Specify electrical supply required)	228
Hydraulic copying attachment with 90° slide (Specify electrical supply required)	233
5-station hand-operated inclined head capstan slide with adjustable stops and maximum working stroke of $4\frac{1}{2}$"	241
Air-operated swing forward type bar feed for use with above with maximum capacity for bars up to $1\frac{1}{2}$" dia. × 10 ft. long, complete with pressure gauge, reducing valve and warning device	242
Burnerd lever-operated " Multisize" collet chuck model LC.15/LO for direct-on mounting on spindle nose, complete with anchor bracket (for details of collets see Code Nos. 227, 245 and 246)	243
$1\frac{1}{2}$" capacity Burnerd " Multisize " collet chuck KC.15/LO (key operated)	226
Flexible round bore collets for " Multisize " collet chucks, each having $\frac{1}{8}$" capacity in steps from $\frac{1}{16}$" to $1\frac{1}{2}$" (12 in full set)	227
Flexible square pattern collets for " Multisize" collet chucks, each having $\frac{1}{8}$" capacity in steps from $\frac{1}{8}$" to 1" A/F. (7 in full set)	245
Hexagon pattern collets for " Multisize " collet chucks, each having $\frac{1}{8}$" capacity in steps from $\frac{1}{8}$" to $1\frac{1}{4}$" A/F. (9 in full set)	246
$7\frac{1}{2}$" diameter Burnerd 3-jaw geared scroll direct-on mounting chuck. (No backplate required)	201
$7\frac{1}{2}$" diameter Pratt 3-jaw ditto	257
10" diameter Burnerd 4-jaw independent direct-on mounting chuck. (No backplate required)	202
10" diameter Pratt 4-jaw ditto	258
Perspex chuck/chip guard for fitting to lathe bed or saddle	244
18" diameter faceplate for gap bed machines	203
4-way automatic indexing turret with top and middle slides	205
Colchester multi-type toolpost complete with universal holder. (For use with standard slotted topslides only)	235
Additional universal holder for above	236
Turning-tool holder for above	237
Boring-bar holder for above	238
Parting-off tool holder for above	239
No. 2 Morse taper sleeve for above	240
Electric coolant pump and fittings	208
Telescopic taper turning attachment	209
3-point stationary steady, 4" diameter capacity	210
Terry Anglepoise 50-volt, 48-watt, low volt machine lighting for 220/440/550 volts, 50/60 cycles A.C. supply only	211
Matrix mechanical clutch for fitting to headstock after lathe has left the works	213
3 M.T. Gamet super-precision rotating centre	215
Machined backplates for fitting to customers own chucks	218
Heavy duty plastic cover to protect the machine to tray level	219
Additional change wheels for special thread pitches (To be specified when ordering)	220
Rear toolpost	230
5-position turret type bed stop	231
Single type bed stop	232



Method of lifting, with eyebolt fitted in the tapped hole provided



Foundation plan

INSTALLATION

LOCATION

To achieve the standards of accuracy to which your Colchester Lathe is capable of working, it is essential that the machine should be placed on a solid concrete base, which should be as level as possible and free from vibration. A wooden floor is not recommended because changes in atmospheric conditions affecting the floor will affect the alignment of the machine. If a wooden floor site is unavoidable a section of the flooring should be removed and a concrete base built up to floor-level.

If the machine has to be placed above ground floor level it is necessary to have a reinforced concrete floor for best results, and to place the machine headstock as close as possible to a supporting wall or pillar.

Careful attention to siting and foundations will greatly add to the accuracy of the work produced and to the life of the machine.

When deciding on a position for the machine, it must be borne in mind that sufficient room must be allowed all round, not only for operation but to permit the end guard to be opened and to give access to the motor compartment at the rear of the cabinet base. In the foundation plan opposite, the main dimensions are given and also a recommended minimum space required for efficient operation and servicing of the machine.

LIFTING

The machine weighs approximately 1,400 lb. and proper equipment for handling this weight should be available. Every bed is drilled and tapped $\frac{7}{8}$" Whitworth between the bedways at the point of balance when both the tailstock and saddle are at the tail end of the bed. It is recommended that a suitable eyebolt is obtained for this tapped hole before attempting to lift the machine. In case of difficulty please contact your local Colchester agent.

POSITIONING

Mounting points are built into the cabinet base, two at the head end and one at the tail end. In addition, a jacking bolt is provided at the head end and tail end pedestal for levelling adjustments. Although bolting-down of the machine is not normally necessary, machine bolts may be used at the positions provided. Do not overtighten holding-down bolts.

THE MACHINE SHOULD NOT BE GROUTED IN.

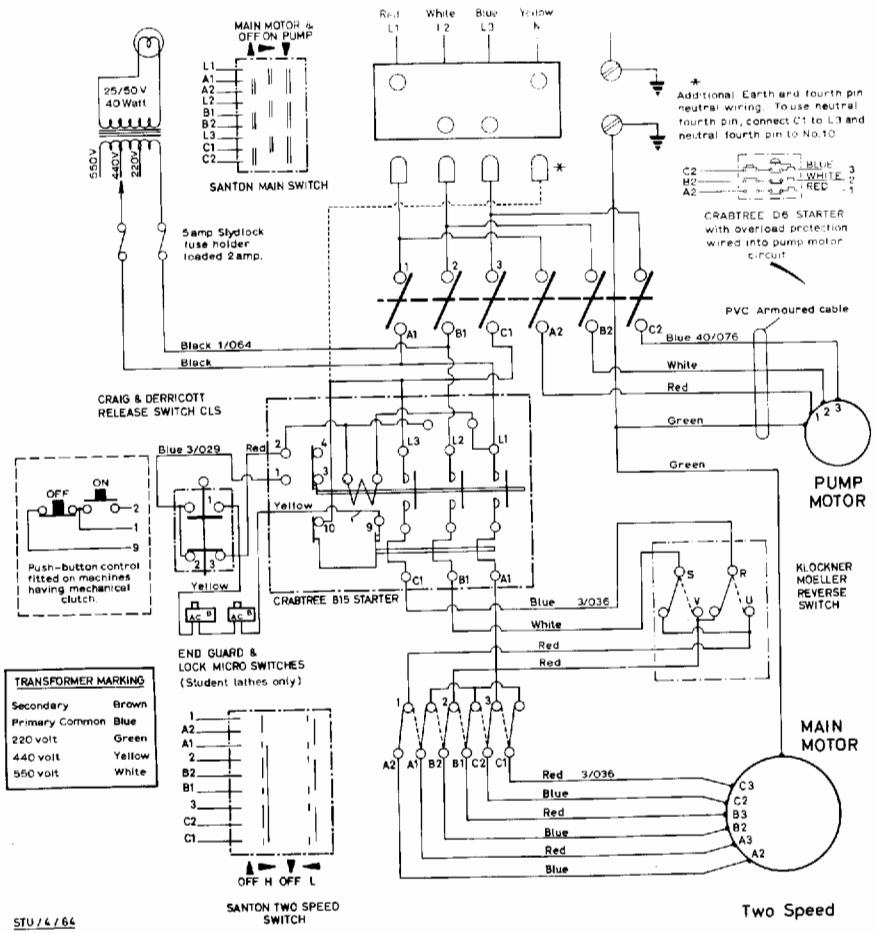
CLEANING

When the machine is delivered all bright machined surfaces are covered by a heavy protective coating. This must be removed with white spirit or paraffin (kerosene) before attempting to use the machine.

DO NOT USE CELLULOSE SOLVENTS AS THESE WILL DAMAGE THE PAINTWORK.

Particular attention should be paid to the slides and spindle nose, and it is essential that the end guard is removed and the end gear train carefully cleaned. All traces of the cleaning agent should then be removed and the bright surfaces given a light coating of Shell Tellus 33 oil.

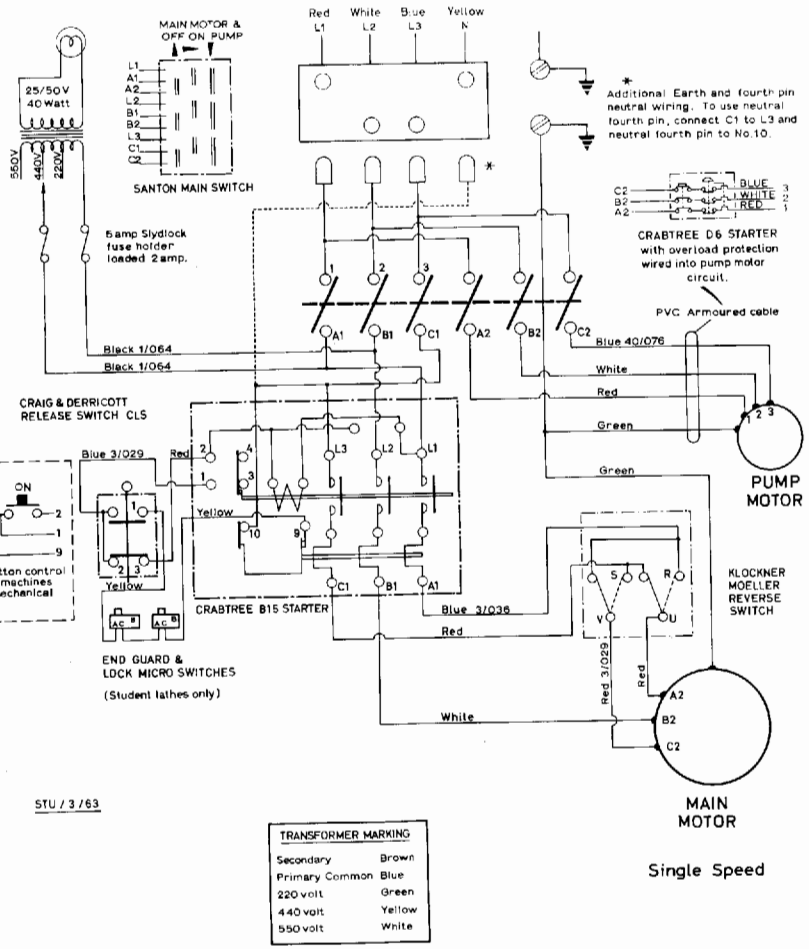
WIRING two-speed



TRANSFORMER MARKING	
Secondary	Brown
Primary Common	Blue
220 volt	Green
440 volt	Yellow
550 volt	White

STU / 4 / 64

WIRING single-speed



TRANSFORMER MARKING	
Secondary	Brown
Primary Common	Blue
220 volt	Green
440 volt	Yellow
550 volt	White

STU / 3 / 63

LEVELLING

A precision engineers level should be used, and readings taken across the bed at the headstock and tailstock ends, and in two positions on the front and rear bed shears in a longitudinal direction. If the floor is not accurate, it may be necessary to place wedges under the edge of the cabinet base, preferably in positions adjacent to the bolt holes.

ELECTRICAL WIRING

The external wiring of the machine to the mains supply should be carried out by a competent electrician, and all wiring should be of a permanent character. All internal wiring is carried within the cabinet base, properly shielded to provide a high degree of safety. It is essential that a really efficient earth is provided in the installation as shown in the wiring diagram opposite.

The lathe may be fitted with either a single speed motor or a two speed motor and appropriate wiring diagrams are shown opposite.

It is important to note that certain electrical safety devices are built into these machines for the protection of the operators, and they should be properly understood before the motor is put into regular use.

1. In the right-hand side of the cabinet base is a lockable drawer which prevents unauthorised use of the machine. In order to start the machine, this drawer must be UNLOCKED.
2. A special safety switch is built into the end guard, so that if the end guard is removed for attention to the change gears or driving belts, the motor is automatically isolated for safety. Replacement of the end guard and tightening of the holding screws resets the electrics ready for use. The starting lever should always be in the " off " position before the end guard is removed (see page 13).
3. A no-volt release is incorporated in the electrical circuit which is correctly set before leaving the works. The adjustment may have been jarred during transit however, and this release should be tested at the first opportunity. The method of test is as follows.

   Switch off the main switch at the panel. Then put the starting lever in the starting position (see page 13) and switch the mains on again. If the machine starts up the no-volt release is NOT working correctly and should be adjusted. This is done as follows. First switch off the main switch on the panel and put the starting lever in the " on " position. Then release the lock-nut under the switch lever at the back of the headstock and screw in the actuating bolt until the switch plunger is fully extended. Then switch on again at the panel and unscrew the actuating bolt so that the plunger is gradually depressed until the electrical circuit is made and the motor starts. Return the lever to the " off " position to ensure that over adjustment has not been made thus preventing the circuit breaking. Re-tighten the locknut.

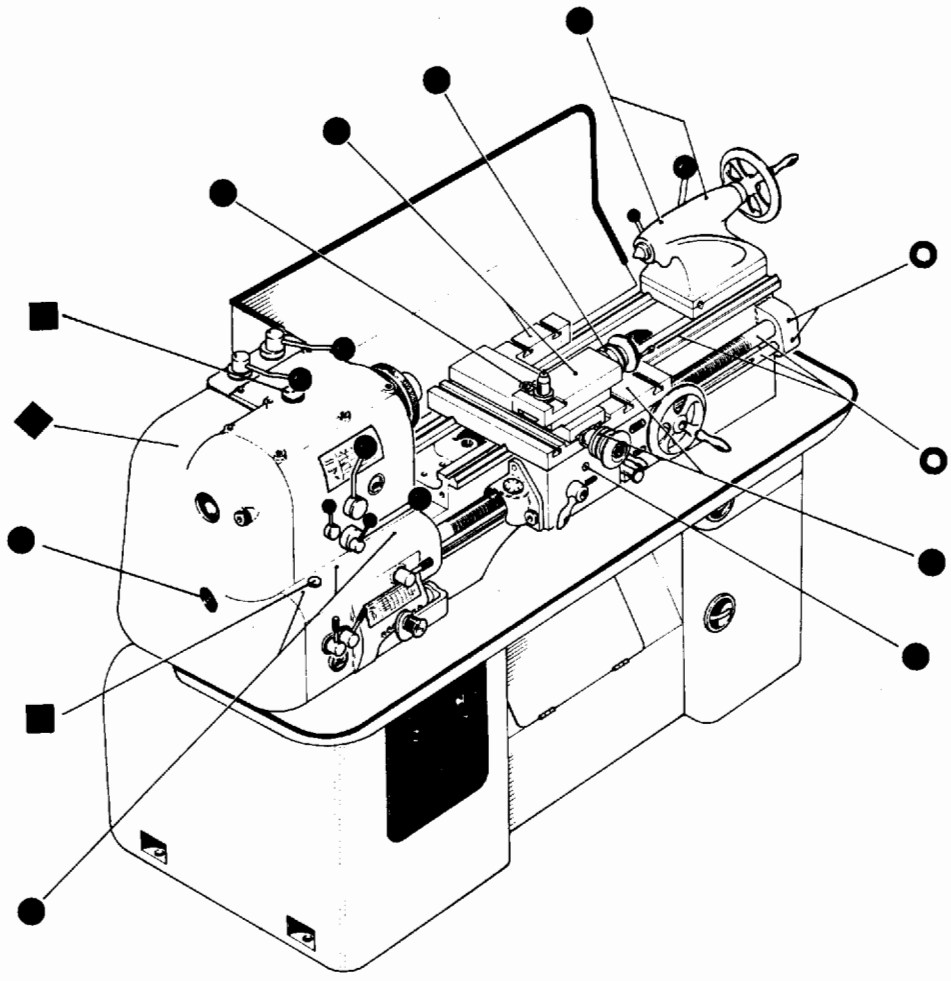
   This adjustment should be checked from time to time to ensure that the safety device is functioning correctly.

Clean and lightly oil daily.

Top up with correct oil each week.

Grease the Matrix clutch monthly.

Oil once every week.



LUBRICATION CHART

LUBRICATION

The accuracy and life of the machine depend on correct lubrication and before the machine is used, all oiling points should be properly lubricated. The lubrication chart opposite gives information on the points which need daily, weekly or monthly attention. It cannot be stressed too strongly that all the points marked with **a black circle** should receive daily attention to ensure the efficient operation of the machine.

When the machine is despatched from the works, the headstock and gearbox are filled to the correct levels with Shell Tellus Oil 27 and Shell Tellus Oil 33 respectively. Tellus oils may be obtained from Shell Oil Companies throughout the world, but in case difficulty is experienced in obtaining these particular grades the physical characteristics of these oils are given below.

	CASTROL HYSPIN 32 **Shell Tellus Oil 27**	CASTROL HYSPIN 68 **Shell Tellus Oil 33**
Specific gravity at 60°F.	0.870	0.876
Flash point closed	390°F.	410°F.
Pour point	—20°F.	—20°F.
Viscosity Redwood No. 1: 70°F.	310 secs.	750 secs.
140°F.	68 secs.	112 secs.
200°F.	41 secs.	52 secs.

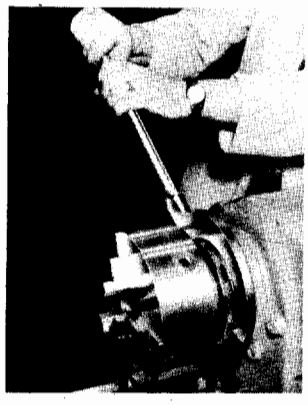
THE USE OF AN INCORRECT GRADE OF OIL IN THE HEADSTOCK IS LIABLE TO CAUSE OVERHEATING AND POSSIBLE DAMAGE.

Oil levels in the headstock and gearbox should be checked weekly. Always stop the machine when checking oil levels to allow the level to settle so that a true reading is obtained. If this precaution is not taken there is a risk of overfilling, which will result in the generation of excessive heat and loss of oil by leakage.

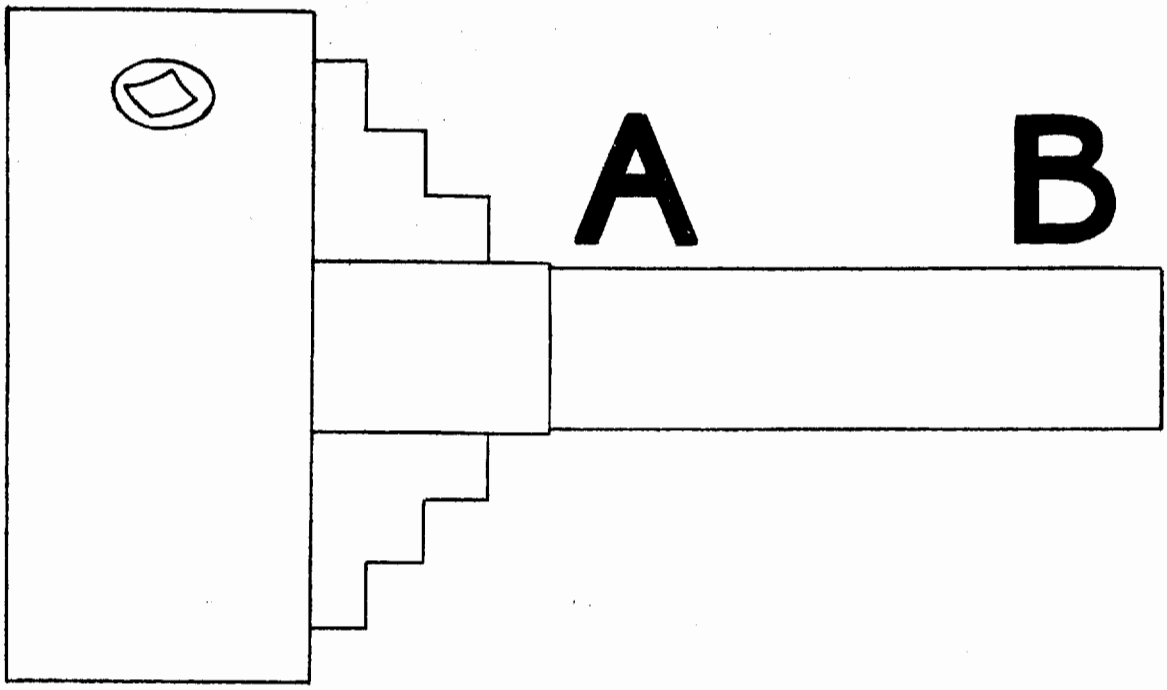
After the machine has been in operation for 150 to 200 hours both the headstock and gearbox should be drained, flushed with clean flushing oil and then refilled with the appropriate grade of oil to the correct level.

The motor bearings should be checked periodically to ensure that they have an adequate supply of the grade of grease recommended by the motor manufacturer.

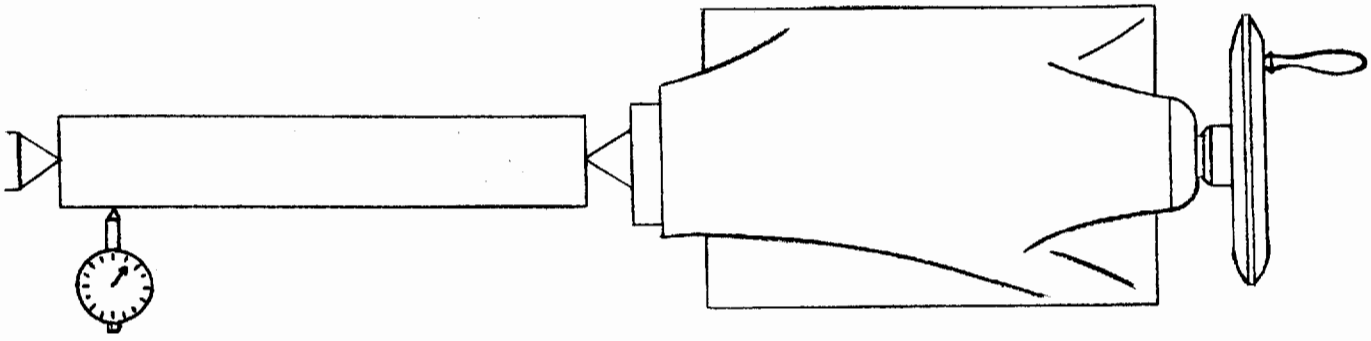
The bearings of the pump motor (where this is supplied) should be lubricated with Shell Alvania 3 grease or a water repellent grease.



Mounting the chuck



Headstock alignment check



Tailstock alignment check

CHUCK MOUNTING

The American long taper key drive spindle nose to LO standard has been selected to overcome the danger of chucks and faceplates becoming detached when the spindle is stopped rapidly or reversed.

When fitting chucks to the spindle nose, care should be taken to see that the centre and centre bush have been removed before attempting to fit the chuck. Care should also be taken to ensure that the taper and key on the spindle nose and the internal taper in the chuck are scrupulously clean, since any dirt or chips lodging on either of these surfaces will upset the accuracy of the machine, cause damage to the mating surfaces, and prevent the chuck locking on the spindle taper.

The spindle nose draw nut engages the thread on the back of the chuck, and when it has been screwed up hand-tight, the special " C " key supplied should be engaged in the slots and the nut tightened. It is advisable to give the " C " key one or two sharp blows with a mallet. Extension tubes should never be used on the key.

When releasing chucks or faceplates from this type of spindle nose, the draw nut will automatically free the chuck from the taper. Care must be taken to ensure that the chuck does not slide off the spindle nose and damage the lathe bed or saddle.

ALIGNMENT CHECKS

When the machine has been completely installed and connected, it is advisable to check the alignment of headstock and tailstock. All machines are accurately aligned before despatch, but transit shocks may render a check necessary.

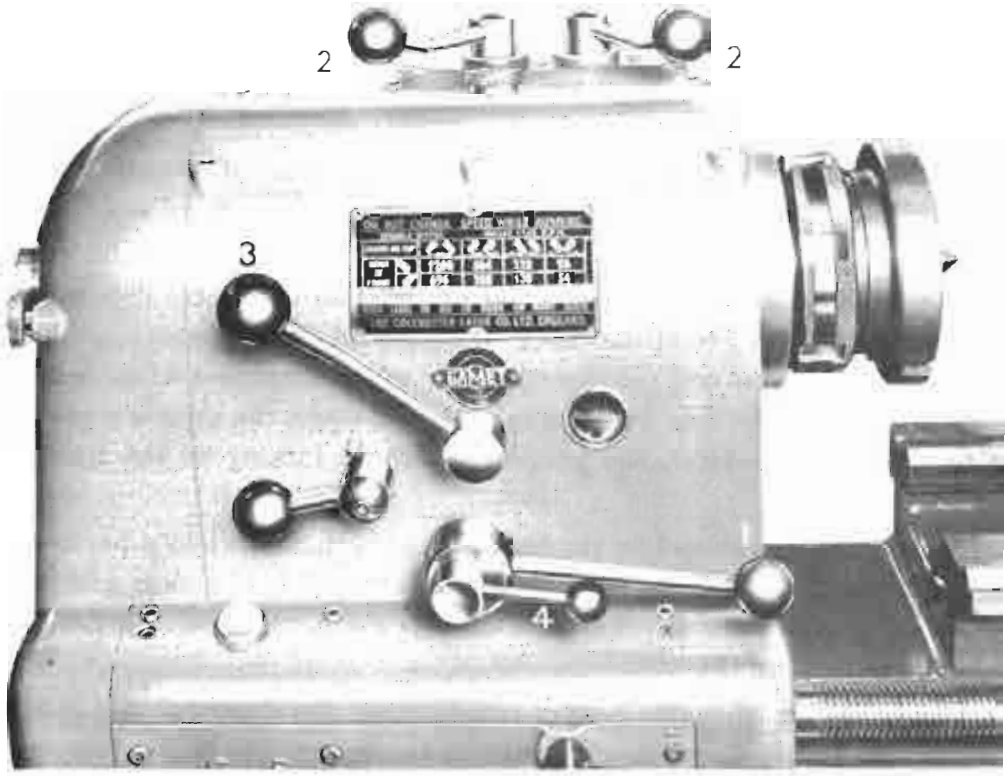
Headstock alignment

Place a length of mild steel bar in the chuck and take a light cut over the O.D. of the bar for about 6" of its length. (Do not use the tailstock centre as a steady during this test). A micrometer reading at the two ends of the turned diameter (A and B in the sketch) should be the same. If the two readings are not the same, the headstock may be easily re-aligned by releasing the headstock holding down bolts and immediately re-tightening them.

Tailstock alignment

Place a 12" long ground steel bar between centres. Fix a dial gauge to the topslide with its anvil running along the horizontal centre line of the bar. By traversing the saddle along the bed an accurate check on alignment may be made. If any error is found it may be rectified by adjustment of the two set-over screws in the base of the tailstock. (See page 23).

It is important to check that all holding-down bolts have been securely tightened after any adjustments have been made.



Headstock control levers

DO NOT CHANGE SPEED WHILE RUNNING					
SPINDLE SPEEDS		PULLEY 1548 R.P.M.			
LEVERS ON TOP					
LEVER AT FRONT		1200	504	228	96
		696	288	138	54
USE SHELL TELLUS OIL 27 OBTAINABLE FROM SHELL OIL COMPANIES THROUGHOUT THE WORLD					
KEEP LEVEL OF OIL TO MARK ON SIGHT GLASS					
THE COLCHESTER LATHE CO. LTD. ENGLAND.					

Spindle speeds using single speed motor

DO NOT CHANGE SPEED WHILE RUNNING					
SPINDLE SPEEDS		PULLEY 1936 & 968 R.P.M.			
LEVERS ON TOP					
		HIGH SPEED			
LEVER AT FRONT		1500	630	282	120
		860	360	160	68
		LOW SPEED			
		750	315	141	60
		430	180	80	34
USE SHELL TELLUS OIL 27 OBTAINABLE FROM SHELL OIL COMPANIES THROUGHOUT THE WORLD					
KEEP LEVEL OF OIL TO MARK ON SIGHT GLASS					
THE COLCHESTER LATHE CO. LTD. ENGLAND					

Spindle speeds using two speed motor

OPERATION

The illustration opposite shows the various controls and a fuller description of these and of the main components of the machine is given in the following pages.

HEADSTOCK

To start the machine CHECK THAT THE DRAWER IS UNLOCKED (see page 7) and switch on at the main panel.

The rotation of the main spindle is controlled from the front of the headstock by means of the "Safti-lok" starting lever, (1) which incorporates a safety device to guard against the machine being started accidently. Pull the starting lever forward against the spring pressure, then lift upwards. This action will start the motor through an air brake starter, and the lever will remain in this position until it is desired to stop the spindle.

The starting mechanism incorporates a no-volt release. In the event of an electrical supply failure, the machine can only be restarted by moving the control lever to the " off " position and then restarting in the normal manner. Correct operation of this safety feature should be checked periodically (see section " Electrical Wiring " page 7).

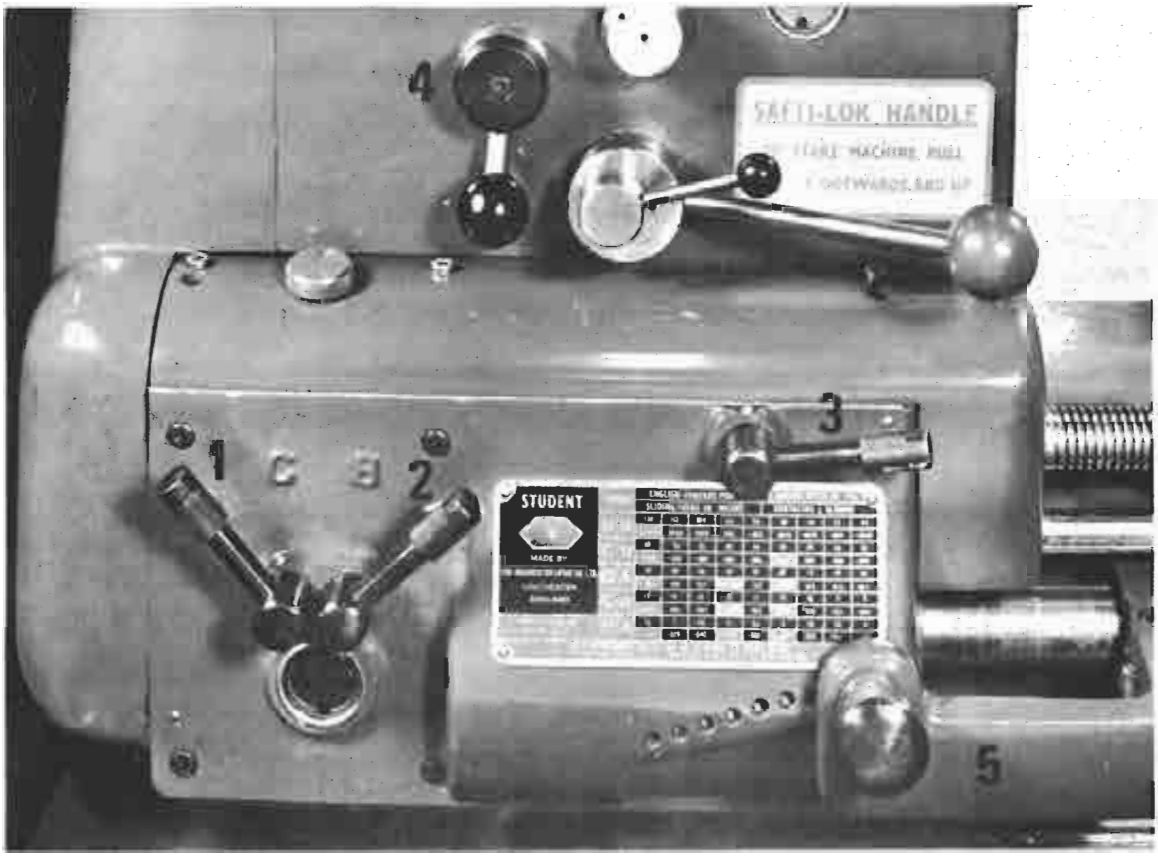
If specially ordered, a Matrix multi-plate machine tool clutch may be incorporated in the drive, in which case the starting lever controls the engagement of this clutch, the motor being left running all the time the main switch is on. (This clutch is supplied as standard on machines constructed for operation on single phase or D.C. supply). Machines fitted with a Matrix clutch do not have the " Safti-lok " device incorporated in the starting handle.

To stop the spindle, return the starting lever to its original position. On direct start machines, downward pressure on the starting lever operates a two-shoe Ferodo lined brake inside the driving pulley causing the spindle to stop instantaneously. This brake cannot be fitted on machines with Matrix clutch.

In the case of 3-phase A.C. machines only, the rotation of the main spindle may be readily reversed by means of the finger-tip reversing switch (4), inset into the starting lever. Because of the use of the American long taper key drive spindle nose there is no possibility of chucks or face-plates " running off " when the spindle is reversed or stopped. (See page 11).

Speed selection is by two levers on the top (2) and one lever in the front of the headstock(3). Each lever has two positions, thus providing eight spindle speeds, but this range may be increased to sixteen by the use of an optional two-speed motor. In the latter case, the two-speed control switch will be found on the right of the main electric panel. Charts of both ranges, giving the lever positions are shown opposite.

THE SPINDLE AND HEADSTOCK GEARING MUST ALWAYS BE STOPPED BEFORE MOVING ANY OF THE CHANGE SPEED LEVERS.



Gearbox control levers

STUDENT

6"

MADE BY
THE COLCHESTER LATHE CO. LTD.
COLCHESTER
ENGLAND

LEVERS		ENGLISH-THREADS PER INCH					METRIC-PITCH IN M/M			
		SLIDING FEEDS IN INCHES - SURFACING ¼ SLIDING								
D	B	120	112	104	96	88	80	76	72	64
		·25 M/M	0025	0025	003	·003	·0035	·0035	·004	·0045
C	B	60	56	52	48	44	40	38	36	32
		5 M/M	·005	·005	·006	·006	·75 M/M	·007	008	·009
D	A	30	28	26	24	22	20	19	18	16
		1 M/M	010	011	1·25 M/M	013	1·5 M/M	015	·016	·017
C	A	15	14	13	12	11	10	9½	9	8
		2 M/M	020	021	2·5 M/M	025	3 M/M	029	·031	·034
WHEN USING 42T DRIVER GEAR.	C	7⅓	7	6½	6	5½	5	4⅔	4½	4
	A	4 M/M	·039	·042	5 M/M	·050	6 M/M	·058	·061	·068

FILL WITH SHELL TELLUS OIL 33 TO MARK ON SIGHT GLASS
OIL OBTAINABLE FROM SHELL COMPANIES THROUGHOUT THE WORLD

Feeds & threads available from standard gearbox

DOMINION

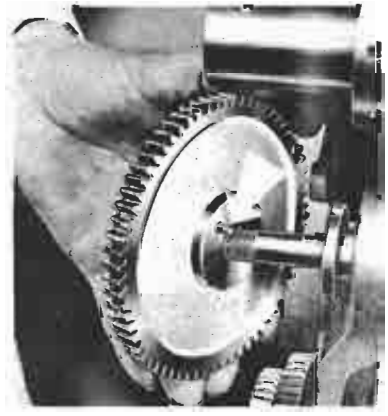
12"

MADE BY
THE COLCHESTER LATHE CO. LTD.
COLCHESTER
ENGLAND

LEVERS		THREADS PER INCH								
		SLIDING FEEDS IN INCHES-SURFACING ¼ SLIDING.								
D	B	112	104	96	92	88	80	76	72	64
		·0025	·0025	·005	·003	·003	·0035	·0035	·004	·0045
C	B	56	52	48	46	44	40	38	36	32
		·005	·005	·006	·006	·006	·007	·007	·008	·009
D	A	28	26	24	23	22	20	19	18	16
		·010	·011	·012	·012	·013	014	·015	·016	·017
C	A	14	13	12	11½	11	10	9⅓	9	8
		·020	·021	·023	·024	·025	·027	·029	·031	·034
WHEN USING 42T DRIVER GEAR	C	7	6½	6	5¾	5½	5	4¾	4½	4
	A	·039	·042	·046	·048	·050	·055	·058	·061	·068

FILL WITH SHELL TELLUS OIL 33 TO MARK ON SIGHT GLASS. OIL
OBTAINABLE FROM SHELL OIL COMPANIES THROUGHOUT THE WORLD.

Feeds & threads available from Dominion gearbox



Shear pin safety device

GEARBOX (ENGLISH & DOMINION)

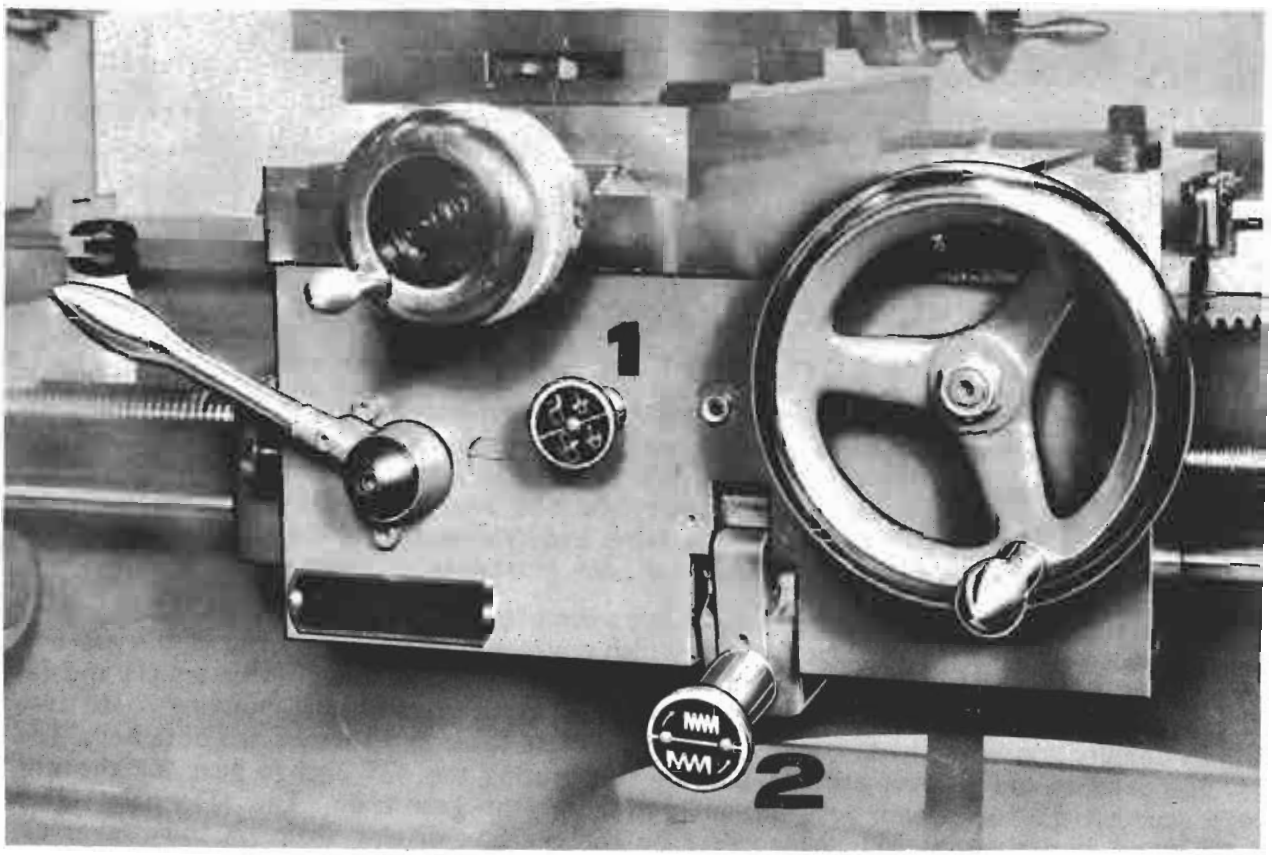
Two alternative types of quick change gearbox may be fitted to the lathe. The standard gearbox (*i.e.*, that normally fitted to gap bed machines) provides a range of 45 longitudinal and cross feeds, 45 threads covering the Whitworth range, and 12 metric thread pitches. The alternative gearbox, (*i.e.*, that normally fitted to straight bed machines) does not provide metric pitches and covers a slightly different range of feeds and Whitworth threads (including 11½ and 23 t.p.i.). The full range of feeds and threads for both gearboxes is shown opposite.

Control of the gearbox is by four levers (1–4) and a tumbler shaft (5) as illustrated. The tumbler shaft is provided with a spring-loaded plunger which engages in holes in the front of the gearbox cover, to provide positive positioning and locking. There are two selection levers (1) and (2) at the left-hand end of the gearbox, each having two positions. By manipulating these two levers in conjunction with the tumbler arm a range of 36 feeds and threads are obtained. The remaining 9 feeds and threads are obtained by substituting the 42T change gear for the 21T change gear on the top driver position, and remeshing the gear train. The 42T change gear will be found alongside the 35T change gear on the gearbox driving shaft. A third lever (3) disengages the leadscrew when this is not actually required for screwcutting, and is also provided with two other positions, one for Whitworth threads, the other for metric threads.

A further lever (4) situated high up on the front of the headstock controls the directions of the feeds, reversing them as necessary. THE SPINDLE AND HEADSTOCK GEARING MUST BE STOPPED BEFORE ANY OF THE LEVERS CONTROLLING THE GEARBOX ARE MOVED.

A shear-pin device is fitted as a precautionary measure to protect the leadscrew against overload. A broken shear-pin may be easily replaced by removing the top gear in the train, then the splined sleeve which carries the gear. The broken portion may then be tapped out of the sleeve from the side opposite to the splines. To remove the other broken portion, the shaft should be rotated until the pin hole is opposite the slot in the housing and swing frame, then the broken pin may be knocked straight through and it will drop out through the slot. The new pin may then be inserted and the top gear and sleeve re-assembled.

The leadscrew should never be allowed to revolve except when screwcutting, and before use should always be cleaned between the threads and lightly oiled.



APRON (knock-off type)

Longitudinal and cross-feeds are selected by means of a plunger (1) shown in the illustration. Longitudinal feeds are obtained with the plunger fully extended; cross-feeds with the plunger fully depressed. A central or neutral position is also provided which is selected when neither longitudinal nor cross-feed is required.

The feeds are engaged by lever (2) which incorporates a safety device to prevent overloading. This mechanism is pre-set at the Works to trip out at 350 lb end pressure. It should give long, trouble-free service. Screwing the handgrip anti-clockwise decreases the tension and lightens the tripping pressure. When screwcutting, the leadnut is controlled by depressing the lever (3).

THREAD CUTTING

1. Threads available from the gearbox

The screwcutting dial has four numbered divisions and four subdivisions marked on its surface, and is clearly visible from the operating position. The housing carrying this dial may be pivoted and is retained in position by a knurled thumbscrew; when not required for use it may be swung out of contact with the leadscrew, only being used when screwcutting is actually carried out.

To cut an even number of threads per inch, e.g., 12 t.p.i., the leadnut may be engaged at any division on the dial. For cutting an odd number of threads per inch, e.g., 13 t.p.i., the leadnut must only be engaged on the numbered divisions, whilst to cut fractional threads, e.g., $4\frac{3}{4}$ t.p.i., the leadnut must only be engaged at the division marked 1 on the dial.

When engaging the leadnut, care should be taken to ensure that the appropriate dial division coincides exactly with the fixed point on each pass.

THREAD CUTTING (*contd.*)

For metric threads the screwcutting dial cannot be used. The nut must be closed over the leadscrew and the machine reversed by means of the reversing switch after each pass and tool withdrawal. The nut must not be released until the thread is completed.

The setting of the gearbox levers for threads available from the gearbox is shown on page 14.

2. Threads not available from the gearbox

To cut threads which are not available from the gearbox, it is necessary to use special change gears which are available as extra equipment. To obtain the number of teeth in these gears the following formula should be used.

$$\text{Thread to be cut} = \frac{3 \times X \times Y}{10 \times T} = \frac{\text{Driver gear}}{\text{Driven gear}}$$

Where X = hole in feed box (see sketch below).

Y = 1 with selection levers on AC
2 with selection levers on AD
4 with selection levers on BC
8 with selection levers on BD

and T = No. of threads per inch to be cut.

Values for X are as follows.

METRIC GEARBOX

30	28	26	24	22	20	19	18	16

DOMINION GEARBOX

28	26	24	23	22	20	19	18	16

Example

It is required to cut 21 t.p.i.

The values of X and Y may be chosen from any of the relevant numbers given above, and there is no rule about the choice. If the values selected give impossible numbers of teeth try other values of X and Y and continue doing so until a suitable result is obtained.

In the case of 21 t.p.i. ... ... $\frac{3 \times 28 \times 2}{10 \times 21} = \frac{28}{35}$ Driver / Driven

To use this formula for metric pitches it is necessary to convert the pitch in millimeters to threads per inch. To do this the following formula is used:—

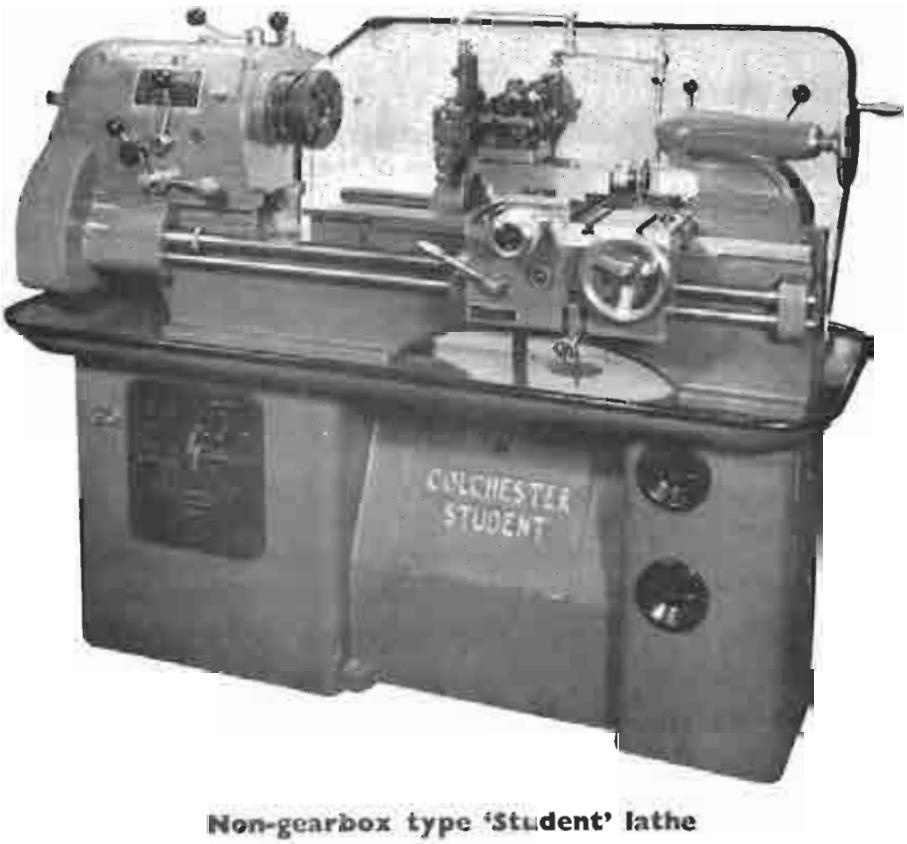
$$\text{t.p.i.} = \frac{25.4}{\text{pitch in m.m.}}$$

Note.—The largest gear that can be accommodated on the driver position with the standard 120T/16d.p. idler gear is 60T, and on the driven position, 64T.

3. Multi-start threads

Multi-start threads may be cut in any one of three ways:—

1. By repositioning the compound slide one pitch forward for each start. It will be realised, however, that the accuracy of this method depends upon the operator.
2. By using an accurately-divided driver plate and turning the workpiece one division forward for each start.



Non-gearbox type 'Student' lathe

THE STUDENT 6 INCH LATHE

THREADS PER INCH

THREADS	4	4½	5	6	7	8	9	10	11	12	13	14	15	16	18	19	20	22	24	26	28	30	32	40	44	48	56	60
DRIVER	45	40	30	40	45	30	30	30	45	30	30	30	40	30	30	40	30	45	25	30	30	20	45	40	45	40	30	40
DRIVEN	100	100	100	80	70	80	80	80	100	80	80	80	50	70	60	100	60	66	60	65	70	60	60	80	66	80	70	80
DRIVER				90	80				80							60		40		50	50		25	30	20	25	25	20
DRIVEN	30	30	25	45	60	40	45	50	66	60	65	70	100	80	90	76	100	100	100	100	100	100	100	100	100	100	100	100

PITCH IN MILLIMETRES

PITCH	4	3·5	3	2·5	2	1·75	1·5	1·25	1	·9	·8	·75	·7	·6	·5
DRIVER	45	45	45	45	45	45	45	45	45	30	45	45	45	45	45
DRIVEN	76	76	76	60	100	100	76	76	76	70	60	76	76	70	76
DRIVER	80	70	60		80	70	60	50	40	50	25	30	25	20	20
DRIVEN	50	50	50	76	76	76	100	100	100	100	100	100	90	90	100

OIL CHANGE GEARS AND SLEEVE WITH SHELL TELLUS 33 OIL

OIL OBTAINABLE FROM SHELL COMPANIES THROUGHOUT THE WORLD

Threads available on non-gearbox machine

The end gear train of the non-gearbox machine

THREAD CUTTING (*contd.*)

3. By advancing the driver gear a calculated number of teeth to advance the spindle by one pitch of the thread to be cut. The accuracy of this method is that of the machine. In order to use this method a driver wheel should be used in which the number of teeth is a factor of the number of starts, to be cut, e.g., to cut a 6 start thread use the 42T driver gear; dividing 6 into 42 gives 7 which is the number of teeth to move the driver gear to obtain each start.

To use method 3 cut one start. Mark the meshing tooth on all gears, then remove the idler gear. Turn the idler gear through the calculated number of teeth and replace the idler gear, making sure that the meshing marks correspond exactly. Cut the next start and repeat for each remaining start.

FEEDS AND THREADS FOR NON-GEARBOX MACHINES

In machines where a gearbox is not fitted a special two-speed feed arrangement is incorporated. The two feeds are selected by sliding the double gear on the feed shaft into one of the two positions provided by means of the knurled collar, engaging either the fast or slow feed rate as required. A full set of change gears is supplied as standard, covering all the more useful threads.

Illustrated opposite is the screwcutting chart for these machines, from which the combination of gears for all normal threads may be read at a glance. The method is simple and is as follows:—

The number of threads per inch is read off along the top line and immediately beneath may be read off the gear train required to obtain this value. Information is also given as to whether the gears need compounding or not. The same remarks apply to the metric pitches which are available. In order to obtain Whitworth pitches between those listed the necessary information may be calculated as follows:—

Formula to obtain change gears for special threads.

$$\frac{\text{No. of threads per inch in leadscrew}}{\text{No. of threads to be cut}} = \frac{\text{Driver}}{\text{Driven}}$$

EXAMPLE

To cut 26 t.p.i.

Since these machines are fitted with 6 t.p.i. leadscrews, the following is obtained:—

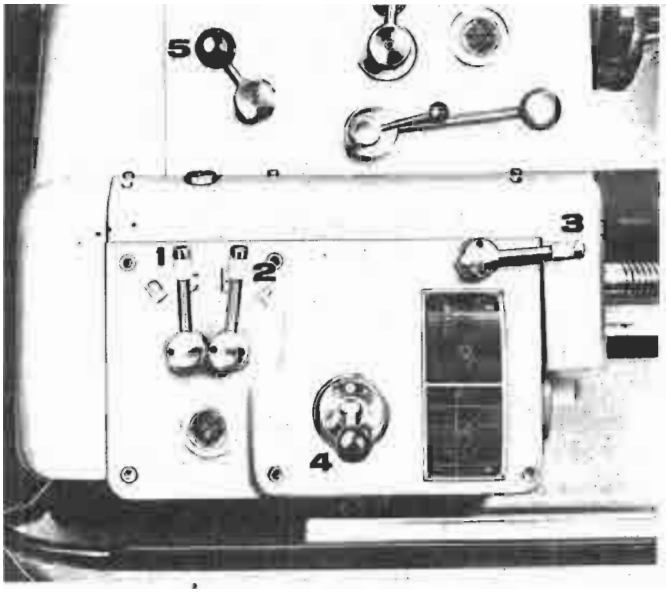
$$\frac{6}{26} = \frac{\text{Driver}}{\text{Driven}}$$

As there is no 6T gear each figure should be multiplied by a common factor so that the value of at least one of the figures corresponds with one of the available change wheels. For example:—

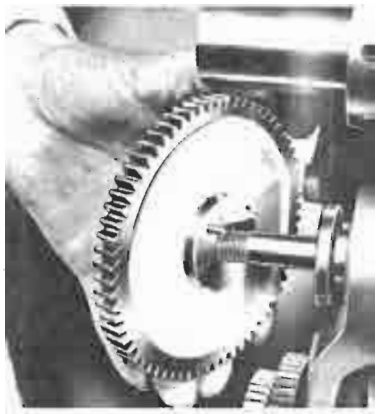
$$\frac{6\times5}{26\times5} = \frac{30}{130} = \frac{\text{Driver}}{\text{Driven}}$$

As there is no 130T gear in the set, the gears must be compounded to give the same ratio.

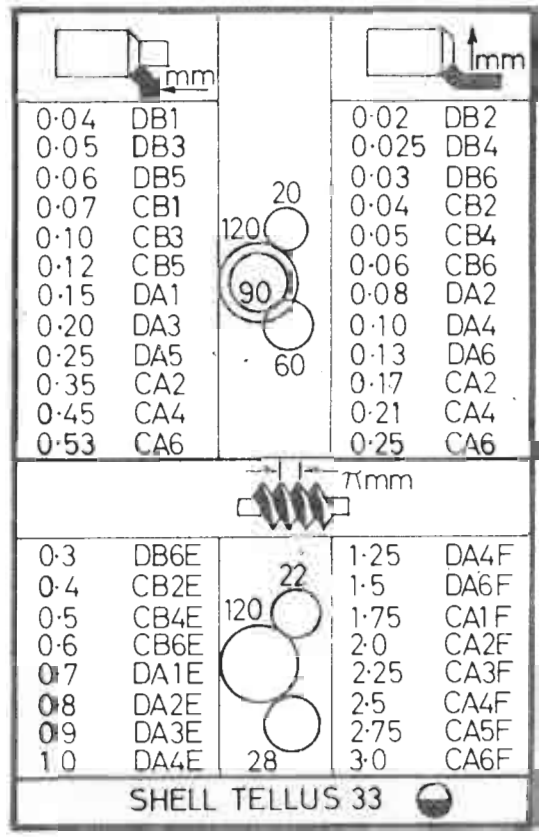
$$\frac{30}{130} = \frac{30\times50}{65\times100} = \frac{\text{Drivers}}{\text{Driven}}$$



Gearbox control levers



Shear pin

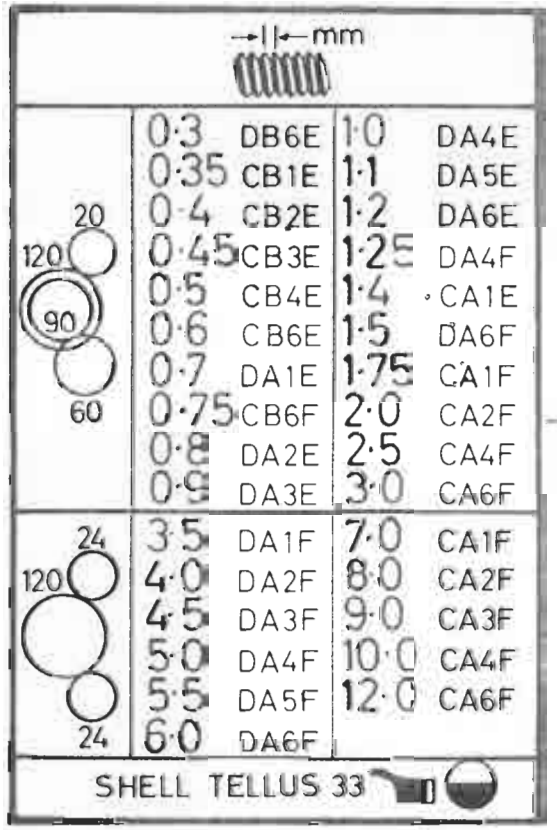


METRIC FEEDS & THREADS

ENGLISH

1in	127 X 120 Y			1in	127 X 120 Y		
	X	Y			X	Y	
2·5	24	24	CA6E	16	24	24	DB6F
3	24	24	CA2F	18	24	36	CB2F
3·5	48	49	CA1F	19	24	19	DB2F
4	24	24	DA6F	20	24	24	DB6E
4·5	24	36	CA2F	22	24	22	DB2F
5	24	24	DA6E	23	24	23	DB2F
6	24	24	DA2F	24	24	24	DB2F
7	24	49	CA1F	26	24	26	DB2F
8	24	24	CB6F	27	24	27	DB2F
9	24	36	DA2F	28	24	49	CB1F
10	24	24	CB6E	32	24	48	DB6F
11	24	22	CB2F	36	24	36	DB2F
11·5	24	23	CB2F	40	24	48	DB6E
12	24	24	CB2F	48	24	48	DB2F
13	24	26	CB2F	56	24	49	DB1F
14	24	49	DA1F	60	24	48	DB2E

SHELL TELLUS 33



GEARBOX (CONTINENTAL)

The Continental gearbox has been designed to give a full coverage of standard metric and module pitches. The brief specification below shows the range of feeds and thread pitches available.

FEEDS

Number of Feeds	12
Range per rev. of spindle:	
Longitudinal	0.04 mm — 0.53 mm
Cross	0.02 mm — 0.25 mm

THREADS

Number of threads—Metric	31
Range	0.3 mm — 12 mm
Number of threads — Module	16
Range	0.3 — 3.00
Number of threads—English (using addition change gears)	32
Range	2.5 — 60 threads per inch
Pitch of leadscrew	6 mm pitch

GEARBOX

Control of the gearbox is by four levers, two of them (No. 1 and 2) situated at the left hand end of the gearbox having two positions each, one situated at the top of the gearbox (No. 3) having three positions, and a fourth located in the centre of the front cover (No. 4) having six positions. By fitting the correct change gears for the required feed or thread, and manipulating these four levers, a range of 12 longitudinal and cross feeds, 31 metric thread pitches and 16 pitches covering the module range may be obtained.

When placed in the central position, the lever No. 3 disengages the leadscrew when this is not actually required for screwcutting.

A further lever No. 5 situated high up on the front of the headstock controls the directions of the feeds, reversing them as necessary. THE SPINDLE AND HEADSTOCK GEARING MUST BE STOPPED BEFORE ANY OF THE LEVERS CONTROLLING THE GEARBOX ARE MOVED.

THREAD CUTTING

1. Threads available from the gearbox

When cutting metric, module and English thread pitches, the nut must be closed over the leadscrew and not released until the thread is completed. After each pass and tool withdrawal, the machine should be reversed by means of the reversing switch until the tool has returned to the correct position for commencing the next pass.

Setting the machine for thread cutting is accomplished by fitting the appropriate change wheels and selecting the correct positions for the gearbox levers. The correct settings may be readily ascertained by referring to the nameplates shown opposite.

Multi-Start Threads

Multi-start threads may be cut in any one of three ways.

1. By re-positioning the compound slide one pitch forward for each start. It will be realised however, that the accuracy of this method depends upon the operator.
2. By using an accurately divided driver plate and turning the workpiece one division forward for each start.
3. By advancing the driver gear a calculated number of teeth to advance the spindle by one pitch of the thread to be cut. The accuracy of this method is that of the machine. To use this method the number of teeth on the driver wheel should be a factor of the number of starts to be cut: e.g. when cutting a 12 mm pitch 4 start thread the 24T. driver gear is used; dividing 4 into 24 gives 6 which is the number of teeth to move the driver gear to obtain each start. To use this method, cut one start. Mark the meshing tooth on all gears then remove the idler gear. Turn the driver gear through the calculated number of teeth and replace the idler gear making sure that the meshing marks correspond exactly. Cut the next start and repeat for each remaining start.

Whichever method is used, the leadnut should be engaged to cut the first start and not released until all the starts have been completed.

English Threads

By fitting a number of additional change wheels in place of those supplied as standard with the machine a full range of English threads from 2.5 to 60 threads per inch may be cut. These threads are cut in the normal manner by fitting the appropriate change gears and manipulating the four gearbox levers to the correct positions for the thread required. The required change gears and lever positions are given on the nameplate shown on page 20. These extra gears may be obtained as additional equipment.

THREAD CUTTING

2. Threads not available from the gearbox

To cut threads which are not available from the gearbox it may be necessary to use special change gears which are available as extra equipment. To obtain the number of teeth in these gears, the following formulae should be used:

Metric Pitches

$$\frac{\text{DRIVER}}{\text{DRIVEN}} = \frac{40P}{VZ}$$

Where P = Pitch required to be cut.

V = 7 for centre lever position 1
8 for centre lever position 2
9 for centre lever position 3
10 for centre lever position 4
11 for centre lever position 5
12 for centre lever position 6

Z = 4 for lever settings DBE
5 for lever settings DBF
8 for lever settings CBE
10 for lever settings CBF
16 for lever settings DAE
20 for lever settings DAF
32 for lever settings CAE
40 for lever settings CAF

Example:

It is required to cut 0.65 mm pitch.

The values of V and Z may be chosen from any of the relevant numbers given above, and there is no rule about the choice. If the values selected give impossible numbers of teeth try other values of V and Z and continue doing so until a suitable result is obtained.

In the case of 0·65 mm pitch:

$$0.65 \text{ mm pitch} = \frac{65}{100} \text{ mm pitch}$$

$$\frac{\text{DRIVER}}{\text{DRIVEN}} = \frac{40P}{VZ} = \frac{40 \times 65}{10 \times 8 \times 100} = \frac{13}{40}$$

This must be compounded on the swing frame, thus: $\frac{13}{40} = \frac{26}{60} \times \frac{90}{120}$

This is fitted to the swing frame: $\frac{26}{120} \times \frac{90}{60}$

Module Pitches:

$$\frac{\text{DRIVER}}{\text{DRIVEN}} = \frac{880M}{7VZ}$$

Where M = Module required to be cut and V and Z have the same values as for metric pitches.

Example:

It is required to cut 1.4 Module: 1.4 Module $= \frac{14}{10}$ thus:

$$\frac{\text{DRIVER}}{\text{DRIVEN}} = \frac{880M}{7VZ} = \frac{880 \times 14}{7 \times 7 \times 32 \times 10} = \frac{11}{14} = \frac{22}{28}$$

English threads per inch

$$\frac{\text{DRIVER}}{\text{DRIVEN}} \times \frac{960}{VZT}$$

Where T = threads per inch required to be cut and V and Z have the same values as for the metric pitches.

The result will be compounded with the $\frac{127}{120}$ change gears thus:

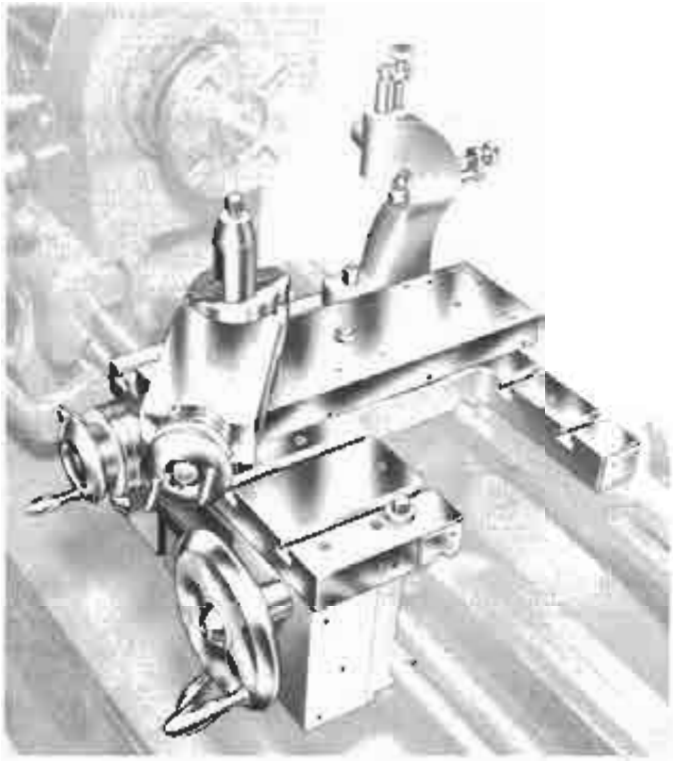
$$\frac{\text{DRIVER}}{\text{DRIVEN}} \times \frac{127}{120}$$

Example:

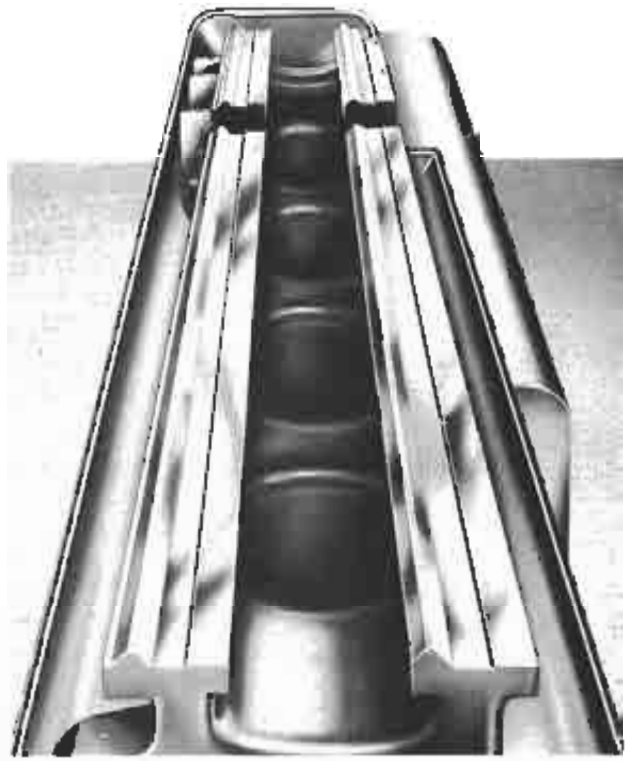
It is required to cut 15 threads per inch

$$\frac{\text{DRIVER}}{\text{DRIVEN}} \times \frac{127}{120} = \frac{960}{VZT} \times \frac{172}{120} = \frac{960}{8 \times 10 \times 15} \times \frac{127}{120} = \frac{24}{30} \times \frac{127}{120}$$

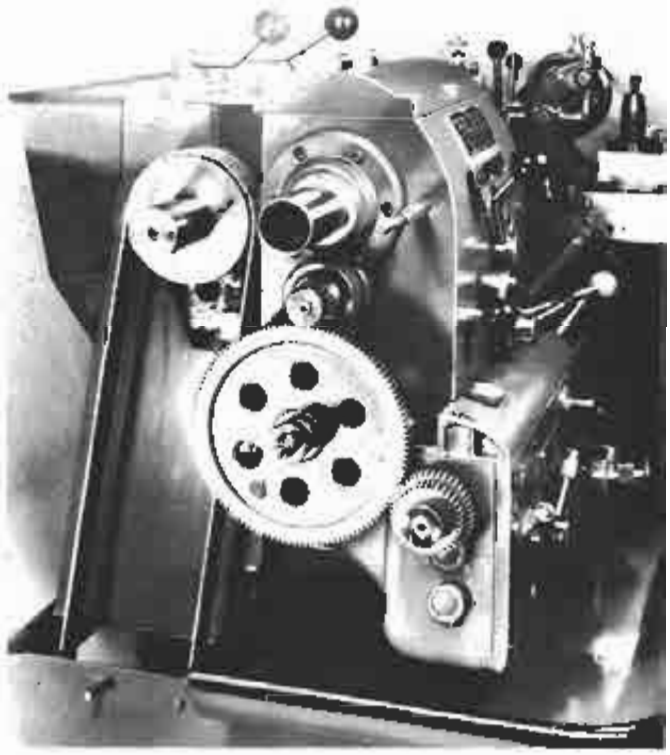
This is fitted to the swing frame thus: $\frac{24}{120} \times \frac{127}{30}$



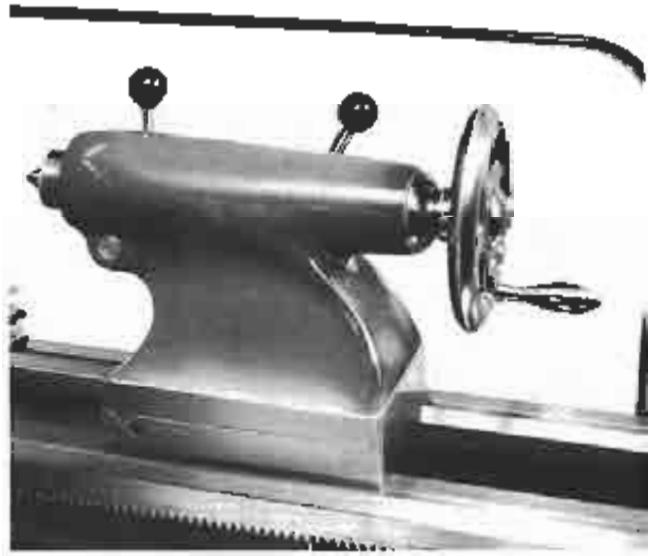
The saddle and slides



The machine bed



The drive and end gear train



The tailstock

THE SADDLE AND SLIDES

The saddle is of the boring type on gap bed machines, and of American winged type on straight bed machines. It is secured to the bed by adjustable gibs at front and rear, and can be locked at any position on the bed by means of a locking clamp. The cross slide is radially graduated 90°–0°–90° each side for accurate setting of the compound slide. Large diameter micrometer dials are graduated in 0.001″ on both slides, or, in the case of metric machines, in 0.01 mm. on cross slide and 0.02 mm. on top slide.

An American pillar type tool post is fitted as standard, intended for $\frac{9}{16}'' \times 1\frac{1}{8}''$ tools. Alternative tool posts are available as additional equipment—either a four-way automatic indexing turret or the Colchester multi-type tool post.

THE BED

The lathe bed should be cleaned down as often as possible by brushing to keep it free from cuttings. Do not use an air line, which will drive chips under the sliding surfaces and blow away the protecting oil film. After each cleaning, the bed should be coated with Shell Tellus 33 Oil to prevent rust formation.

To remove the gap piece on gap bed machines, unscrew the four Allen screws. No dowels are fitted.

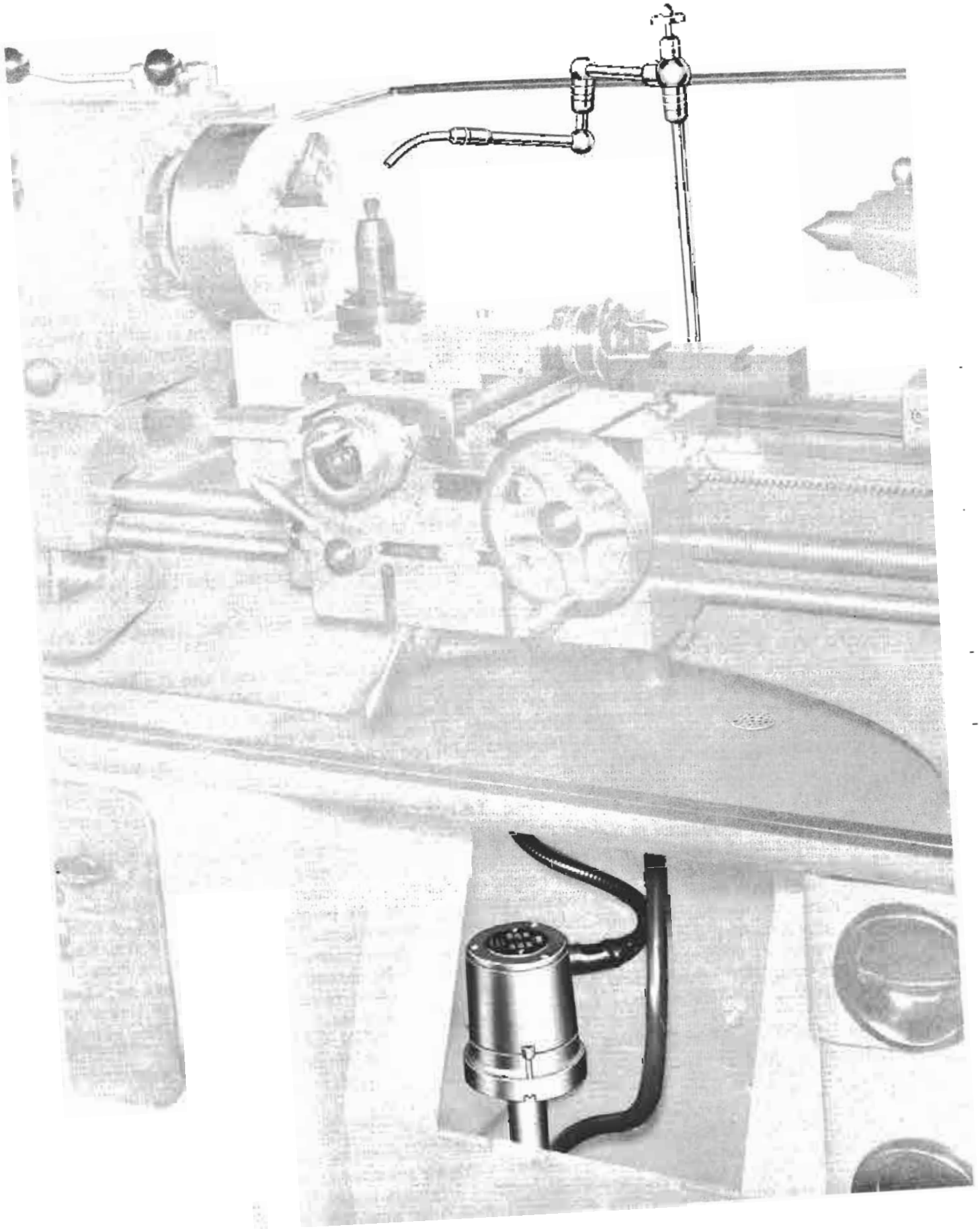
To replace the gap piece, it is important first to clean both the block and the locating faces thoroughly. Then replace the gap piece, and locate the four screws, two vertically from the top and two horizontally, one in each outer edge of the gap piece. Bring the saddle up to give rough alignment and tighten the screws down lightly. Then, if the locating faces are properly clean the gap piece may be aligned with a few taps in the required direction with a hide mallet. Finally tighten the four Allen screws.

THE TAILSTOCK

The barrel is graduated in inch and metric divisions and induction hardened both in the No. 3 morse taper bore and on the outside diameter. All standard tang drills are driven by the tang and eject at zero graduation. A tool height indicator line is stamped onto the front face of the nose chamfer to assist in setting tools to the correct centre height when a workpiece is being held between centres. There are two parts to the tailstock casting, the base proper which slides along the bedways and the tailstock body, which may be moved laterally on the base. This movement or " setting over " allows shallow tapers to be turned without the need of a special taper-turning attachment. The tailstock is set over by first releasing the bedway clamp lever and adjusting the two set-over screws fitted for this purpose. THE TWO SPRING-LOADED SHOULDER BOLTS HOLDING THE BASE TO THE MAIN CASTING DO NOT REQUIRE SLACKING OFF AT ANY TIME. Quick lever clamping is employed to lock the assembly in position on the bedways. The tailstock barrel is locked by a lever operated clamp.

DRIVE

Drive to the headstock from the motor is by belt. The motor platform is adjustable to allow for the correct tensioning of the belts. When correctly tensioned, a flat belt should have approximately $\frac{1}{2}''$ (12 mm.) free side movement in either direction under finger pressure. In the case of vee-belts the corresponding free movement should be approximately $\frac{3}{4}''$ (19 mm.).



The suds unit

ADDITIONAL EQUIPMENT

THE SUDS UNIT

The cabinet base has a built-in storage tank in the centre with a pump fitting position already provided. A return pipe from the centre of the tray takes coolant back to the tank, and a gauze strainer is fitted to the pipe at tray level to ensure that no chips are returned to the sump. The flexible piping supplied with this unit is fully universal and will feed the coolant to any required position. The supply of coolant is easily controlled by the ball-type shut-off valve which is leak-proof. The whole unit has been designed to eliminate the leaks which are usually inherent in coolant systems. The capacity of the unit is 5½ gallons.

Soluble oil emulsions

For most work a soluble oil emulsion will be chosen, since this will almost always be adequate for the work in hand, and will be preferred by the machine operator.

When screwing with a die-head, tapping, or reaming, some extra coolant applied locally may be required. If much work of this type is contemplated, it may be better to use an emulsion of an extreme pressure soluble oil in the machine sump. A good quality oil of this type will give results equal to neat cutting oil whilst retaining the cleanliness of soluble oil.

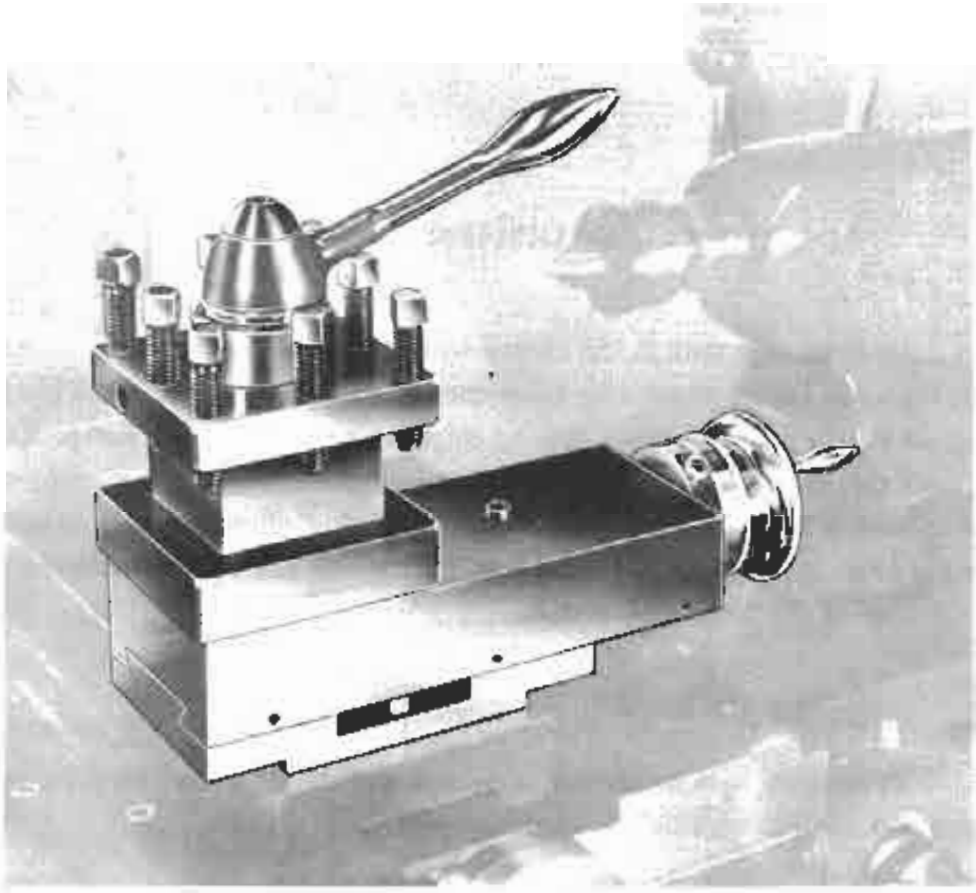
Good quality soluble oils should always be chosen and mixed in accordance with the suppliers' recommendations. The following grades have been tested and used in our own works with complete satisfaction:—

Shell Dromus Oil B—conventional milky soluble oil mixed with water in the ratio 25/30 : 1.
Shell Dromus Oil D—translucent soluble oil mixed with water in the ratio 40 : 1.
Shell Dromus Oil 908—extreme pressure oil mixed with water in the ratio 10/15 : 1.

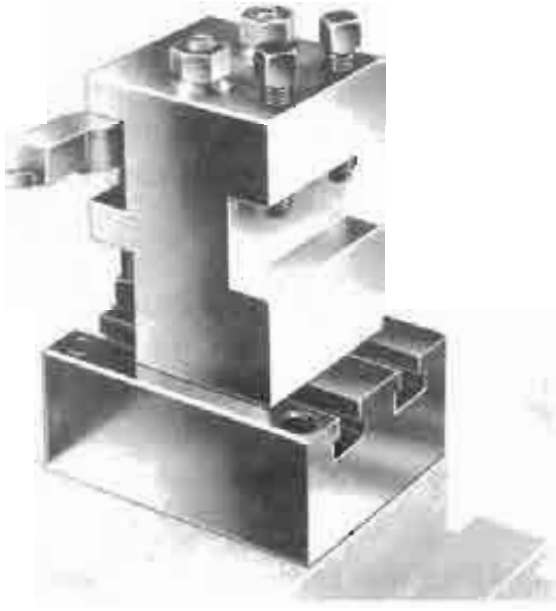
Soluble oils and machine maintenance

No soluble oil emulsion, however good, can completely prevent rust without help from the operator. The machine should therefore be cleaned down regularly and the bright parts wiped over with machine oil. It should never be left, especially over weekends or holidays with wet swarf on the bed or slides. When the work in hand requires the saddle or tailstock to be clamped in one position for long periods it is advisable to spread a little machine oil on the bed beforehand to ensure a film of oil between the surfaces.

The sump should be emptied, cleaned out and re-filled with newly mixed soluble oil at regular intervals.



Square turret toolpost



Rear toolpost

Stationary steady

SQUARE TURRET TOOLPOST

To index the toolpost into any of the four operating positions, the central hand lever is moved in an anti-clockwise direction until two distinct detents have been felt. This indicates that the plunger mechanism has released the locating plunger and that the indexing mechanism is engaged. When the central hand lever is returned in a clockwise direction the turret will index into the next position. A further short movement of the lever in the same direction will lock the turret block to the topslide.

By using the retracting plunger method of indexing, the turret block is able to remain on its bottom face whilst being indexed, which effectively prevents the entry of swarf between the locating faces. The turret block can also be swung into any position without the use of the indexing mechanism.

The turret block will accommodate up to four tools or toolholders having a height up to $\frac{13}{16}$".

STATIONARY STEADY

Of extremely rigid design, this attachment is very easily opened and set. Three adjustable fingers are provided, and the maximum capacity is 4" bar diameter.

The inserts are of sintered bronze and are quickly replaced, being a press fit into the ends of the fingers.

The whole attachment is readily attached to the bed by a clamp bolt, and can be removed very rapidly when not required for use.

REAR TOOLPOST

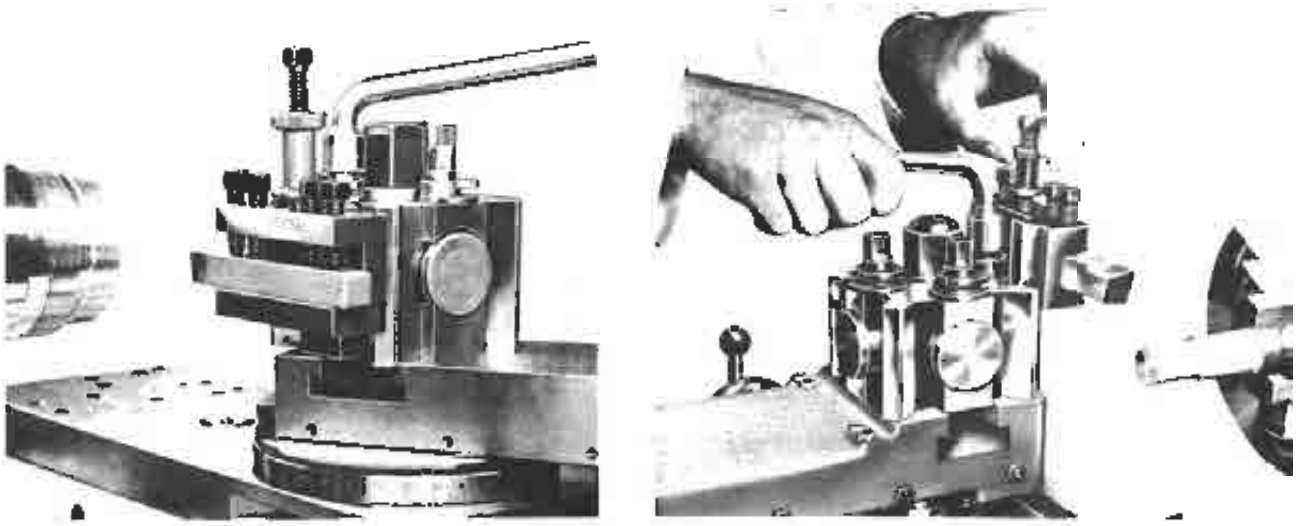
As an aid to production, a rear toolpost is available for fitting direct to the cross slide, which is drilled and tapped ready to receive it.

Two tool positions are provided so that the tool may be fitted either in the conventional manner, or in the inverted position.

Using this tool post (with the tool fitted in the conventional manner) left hand threads can be very easily cut.

Supplied complete with all the necessary fixing screws, the only fitting required is the physical bolting of the base pad to the cross slide. Tee slots are provided in the base pad so that the toolpost may be adjusted in position on the base. Maximum tool depths that can be accommodated in either position are $\frac{5}{8}$".

The standard spanners and Allen keys supplied with the machine will fit all the nuts and screws in this assembly.



QUICK - CHANGE TOOLPOST

LOW VOLT LIGHT UNIT

COLCHESTER QUICK-CHANGE TOOLPOST

This type of toolpost may be fitted to existing standard topslides without modification. Designed to cut down time on repetition work, it enables any number of toolholders to be used.

The toolpost unit comprises a basic clamping block to which a variety of toolholders may be fitted. Each toolholder has a vertical adjusting screw and when a tool in its holder has once been set to centre-height it may be removed and replaced any number of times in sure knowledge that the tool will be at exact centre height each time it is clamped back into the block.

Four types of toolholder are available:

The standard toolholder will accommodate all normal types of tool up to a maximum size of $\frac{3}{4}'' \times 1''$ (19 × 25·4 mm).

The vee toolholder accommodates boring tools with parallel shanks up to $\frac{5}{8}''$ (16 mm) diameter.

The morse taper holder is suitable for all tools having a No. 1 M.T. shank.

A parting-off toolholder, complete with spare tools, is now available.

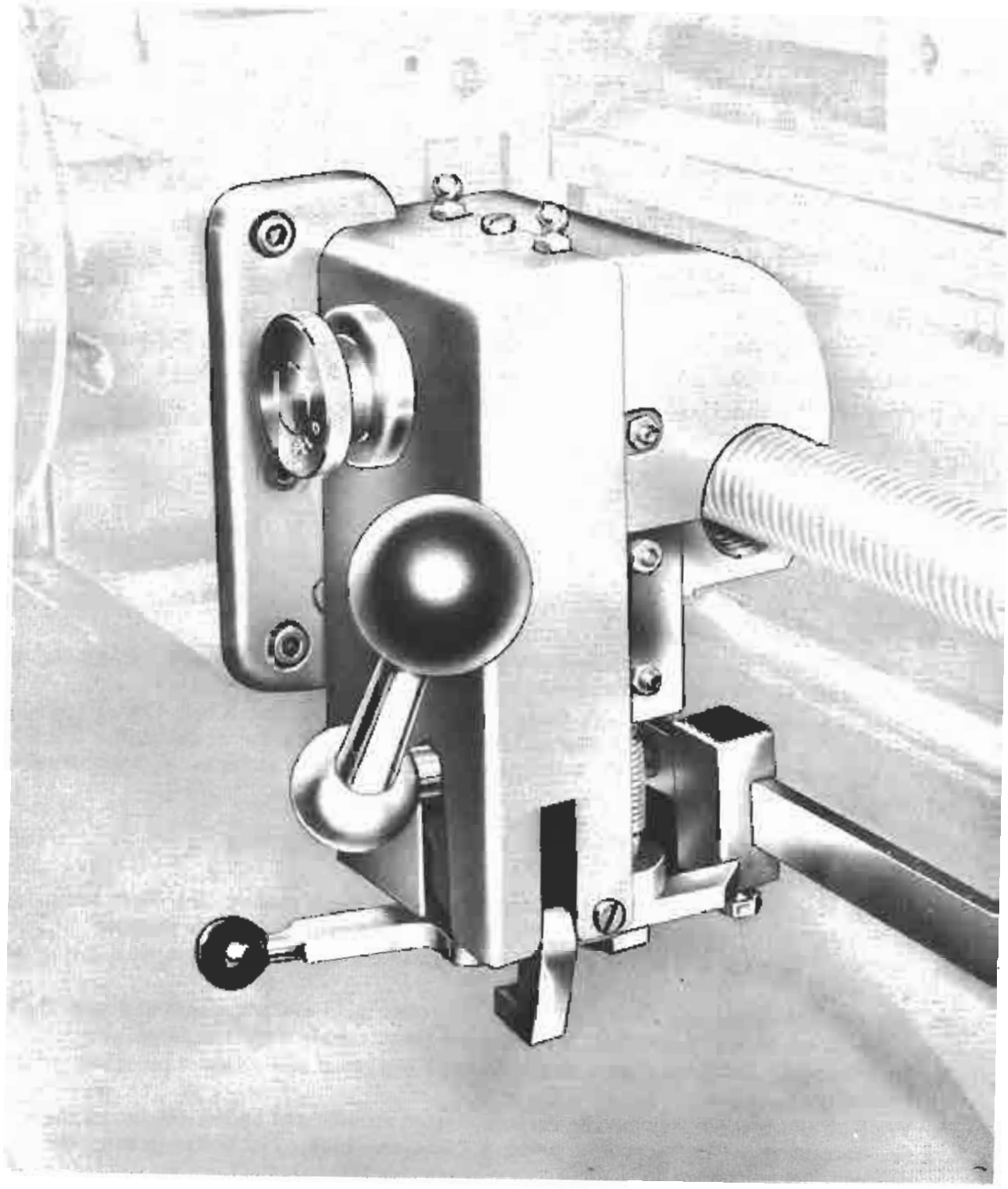
LOW VOLT LIGHTING

The " Anglepose " lighting unit offers the positive virtue that it will really " stay put " in any position through all normal speed and cutting ranges.

The unit is supplied complete with transformer, bulb, switch, and fuses. Fitting instructions are given below. If the unit is supplied as initial equipment with the machine, the transformer and fuses are already fitted in the electrical panel and items 4 to 7 inclusive of the fitting instructions can be omitted.

Instructions for fitting low-volt lighting

1. Switch off the main switch.
2. Mount the carrying block on the rear of the headstock casting after first removing the grub screws from the two drilled and tapped holes provided for this purpose.
3. Insert the screwed end of the supporting screw in the block and secure with spring washer and nuts.
4. Remove the three cap head screws securing the main electric panel and pull the panel forward, which will automatically isolate the mains supply from the panel.
5. Fit the toggle switch provided to the front of the panel and connect up. (See wiring diagram page 6).
6. Wire up the transformer for the correct voltage as indicated by the colours of the wires *i.e.*, secondary wiring—brown; primary common—blue; 220 volts—green; 440 volts—yellow; 550 volts—white.
7. Screw transformer to panel using pads provided.
8. Run cable from lamp through the hole provided in the top of the motor casing.
9. Pass the end of the cable through one of the conduit holes in the panel casing, and connect to the secondary (output) winding of the transformer via the switch.
10. Replace the panel and secure with the three screws.



RAPID THREADING UNIT (ENGLISH)

RAPID THREADING UNIT (ENGLISH)

This revolutionary feature enables standard Colchester Lathes to cut threads at up to five times faster than by normal methods. Threads may be cut right up to a shoulder at maximum speeds, blind bores may be threaded without an undercut and full advantage may thus be taken of modern cutting tools.

The unit contains its own half nut and engagement mechanism and so eliminates the possibility of threads being picked up incorrectly. An adjustable stop disengages the half nut automatically at the end of a thread. The unit may only be used on Whitworth threads and it is not suitable for metric, module, D.P. threads, or threads per inch ending in any fractions other than $\frac{1}{2}$ or $\frac{1}{4}$, e.g., $5\frac{1}{8}$ t.p.i.

A graduated dial may be set in any one of four positions for cutting the following threads.

0—Safe. It is impossible to engage the lead nut.

1—Quarter threads per inch—e.g., $4\frac{3}{4}$.

2—Half threads per inch—e.g., $4\frac{1}{2}$.

4—Whole threads per inch, either even or odd Nos.—e.g., 8 t.p.i.

Mounted below the saddle is a stop bar attached to the lathe bed, which carries an adjustable stop. By setting this stop, the cut may be disengaged automatically in any desired position.

The lead nut lever operates a half nut below the leadscrew with a steady pad situated above the leadscrew giving adequate support when cutting threads at high speeds. The knock-off lever may be swivelled out of position so that the lathe may be used normally, without disturbing the setting off the knock-off stop.

The necessary holes for mounting this unit to the apron at a later date are pre-drilled and tapped during manufacture, and all necessary holding screws and locating dowels are supplied with the unit. The only operations which must be carried out on site are the drilling and tapping of the bed to accept the stop bar, and the fitting of a small lock plate to the normal lead nut handle to prevent the apron half nut being accidently engaged.

RAPID THREADING UNIT (METRIC)

RAPID THREADING UNIT (METRIC)

Introduction of the Metric Rapid Threader Attachment reduces machining time for what is normally regarded as the slowest operation and in so doing eliminates bottle-necks. It enables you to take full advantage of the speed and capacity of your Colchester Lathe. Screw-threads 3mm pitch 50mm diameter can be cut at 1200 rpm. and is typical of the production rates you can achieve.

Designed as a self-contained unit, it contains its own leadscrew nut and engagement mechanism.

There are no revolving dials to watch or need for manual co-ordination when cutting screw-threads on a machine fitted with this unit. After setting the tumbler gear in the correct position in the quick change gearbox for the required pitch all you have to do is set a control knob on the unit to one of two positions and the selector lever on the front of the unit to one of five positions according to the pitch to be cut. The leadscrew nut housed in the unit can then be engaged in the predetermined positions with complete accuracy and infallibility.

An adjustable stop disengages the leadscrew nut automatically at the end of each cut; thus preventing the tool over-running either into the work or chuck.

The tool is then withdrawn from the workpiece manually and the saddle returned to the starting point. The tool is then fed in for the next cut and the handle depressed to re-commence the cycle. This sequence is repeated until full depth of pitch is attained.

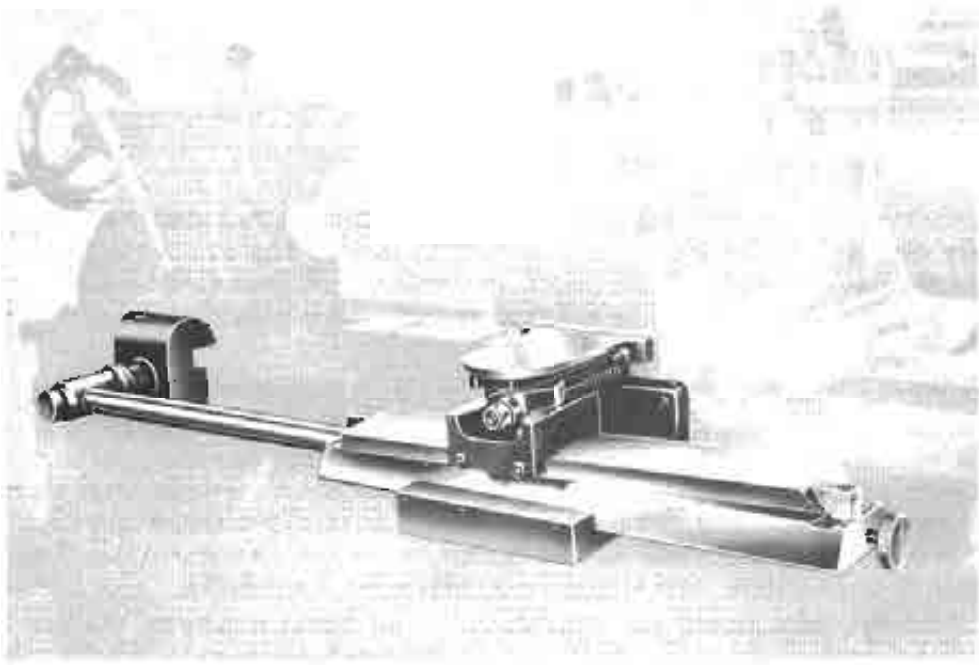
METRIC THREADS - settings

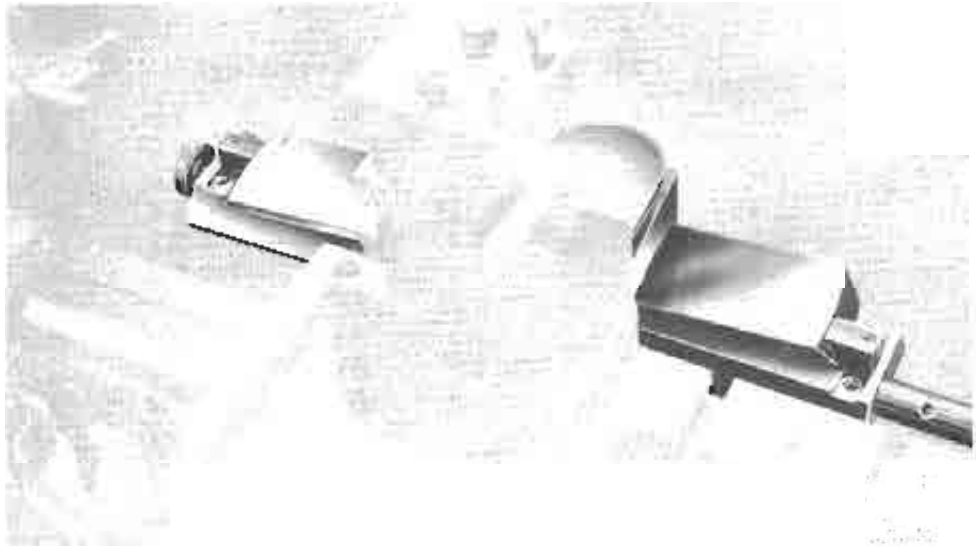
0·3	A4	1·0	A4	3·5	E4
0·35	A4	1·1	C2	4·0	A4
0·4	A4	1·2	A4	4·5	D4
0·45	D4	1·25	B4	5·0	B4
0·5	A4	1·4	E4	5·5	C2
0·6	A4	1·5	A4	6·0	A4
0·7	E4	1·75	E4	7·0	E4
0·75	A4	2·0	A4	8·0	A4
0·8	A4	2·5	B4	9·0	D4
0·9	D4	3·0	A4	10·0	B4
				12·0	A4

On repetition work, cycle times for screwcutting can be considerably reduced as it now becomes possible to perform this operation at the high turning speed applicable to Tungsten Carbide Tooling. It is not necessary to machine undercuts prior to commencing screwcutting as the tool produces its own annular groove at the end of the thread. Instantaneous cut-out of the saddle motion makes it possible to repeatedly cut tight up to a shoulder without risk of over-run.

The special adjustable bed stop does not prevent the machine being used as a normal lathe because the knock-off lever can be swivelled out of position to permit normal sliding feeds to be used.

The High Speed Metric Screwcutting Attachment is intended for the production of metric pitches—either right or left hand—only. It cannot be used for Module, inch pitch or D.P. Threads.





Telescopic taper attachment

TELESCOPIC TAPER TURNER

This attachment can be used for producing tapers up to 10° in either direction.

It can be mounted directly onto the rear of the saddle without any modification other than the fitting of a new saddle screw and nut which is supplied with the unit.

The swivel slide is graduated in $\frac{1}{4}$° of arc and in $\frac{1}{8}$" taper per foot, and great sensitivity of control is obtained when setting a taper by the use of the micro adjustment screw.

The cross slide handwheel is always used to control the tool and the base slide can be adjusted along the bed so that the taper may be cut in any position.

The attachment will deal with a length of 12" of taper at any one setting.

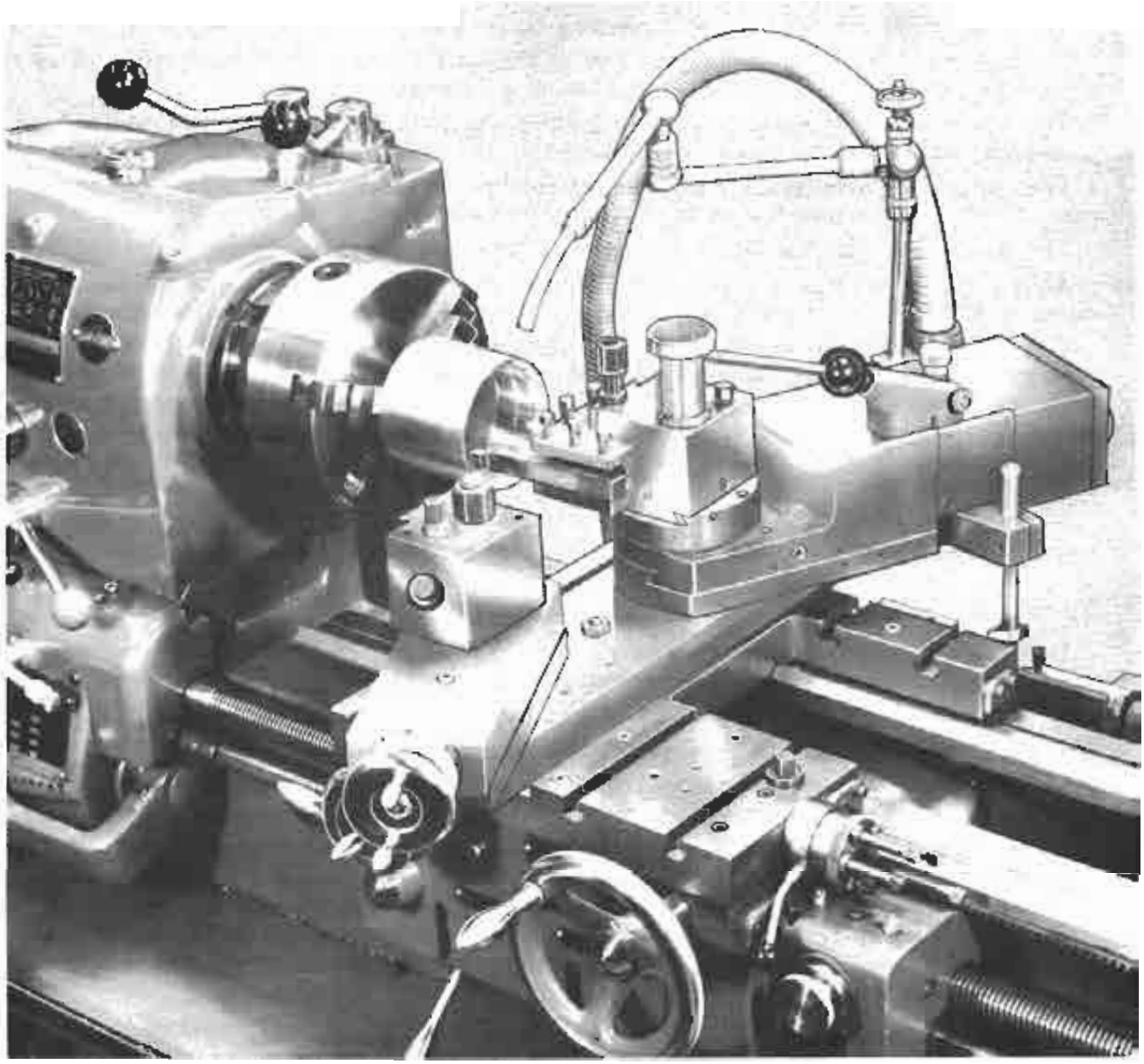
After attaching to the machine, all that is required to prepare the taper turner for use is the clamping of the connecting rod in the anchor bracket by means of the knurled thumb screw.

The fitting of this attachment in no way detracts from the use of the machine as a normal centre lathe. Change-over can be simply accomplished by loosening the connecting rod clamping screw and traversing the saddle towards the headstock to disengage the connecting rod from the clamp. Then remove the anchor bracket from the bed so that there is no obstruction to foul the connecting rod. By replacing the bracket and engaging the connecting rod the taper turner is rapidly reset for use.

Great care should be taken when readjusting or altering the fit of the base slide in the taper turner bracket, as any slackness will result in incorrect tapers.

To fit the taper turner

1. The saddle and cross slide are ready drilled to receive the attachment, the necessary holes being drilled and tapped during manufacture.
2. Clean down the rear end of the saddle to receive the taper turner bracket.
3. Release the locknut in the centre of the cross slide handwheel.
4. Remove the two securing screws from the saddle screw keep and by turning the handwheel in a clockwise direction withdraw the saddle screw.
5. Slide the cross slide to the rear of the saddle, remove the saddle screw nut and replace it with that provided with the taper turner.
6. Insert the taper turner saddle screw from the rear of the machine into the saddle screw nut, turning in an anti-clockwise direction until the splined end of the screw protrudes about $1\frac{1}{2}$" from the front of the saddle, making the engagement of the splines in the pinion and the taper turner saddle screw an easy operation.
7. Replace the saddle screw keep and secure. (*Note:* The lock nut from the original saddle screw is not replaced, but should be retained in case it is needed when refitting the original screw.)
8. The slide block assembly can now be fitted to the thrust block on the rear of the saddle screw assembly. Engage the slides in the bracket and the slide block assembly on the slides, which will enable the bracket to be bolted to the rear of the saddle using the pre-tapped holes provided.
9. Finally, bolt the bottom slide extension piece to the rear of the bottom slide and affix the connecting rod and slideway clamp to the bed.



Hydraulic Profiling Attachment

THE COLCHESTER SERIES 300 HYDRAULIC PROFILING UNIT

Designed for faster and more accurate profiling the standard equipment comprises a profile slide assembly, a rear beam assembly for round or flat masters, a free standing hydraulic power unit and a set of connecting hoses housed in a single flexible armoured conduit.

The Profile Slide Assembly

Mounted on the cross slide of the lathe, this is an integral unit consisting of the operating cylinder, cartridge type servo valve, stylus lever mechanism and a swivelling Colchester Multi-type Toolpost complete with one turning toolholder.

The cylinder has a 3 in. (76 mm) stroke and a maximum approach retraction speed of 110 ins. (279 cm.) per minute. The low stylus pressure of 6 oz. (170 g.) allows soft masters to be used if necessary, and the in-feed rate is lever controlled.

A swivelling Colchester Multi-type Toolpost allows tooling to be pre-set and enables tool changes to be made without re-setting the slide assembly. Sufficient height adjustment is provided to allow the tool to be set for forward or reverse cutting.

The assembly can be set at five alternative angles to the axis of the machine—either 90°, 60°, 30°, 0°, depending on the work to be produced and a copying accuracy of ± ·0005 ins. can be achieved. The change in copy diameter at 90° is 5½ in. and at 60° 5 in.

The Rear Beam Assembly

The beam fixes directly to the rear face of the lathe bed and provides a rigid datum surface for carrying the master parallel to the axis of the machine.

Two beam brackets slide on the rear beam and provide a locating surface for the tailstocks which accommodate round masters or flat templates. The tailstocks are adjustable for the micrometer setting of the master or template.

The Hydraulic Power Unit

A free standing unit, designed to fit neatly at the rear of the lathe, has a ½ H.P. pump producing a working pressure of 300 lbs/sq. in. A pressure gauge is fitted and independent switch gear is also incorporated.

The pump and oil filter can be removed as an assembly for inspection.

Turret Stop

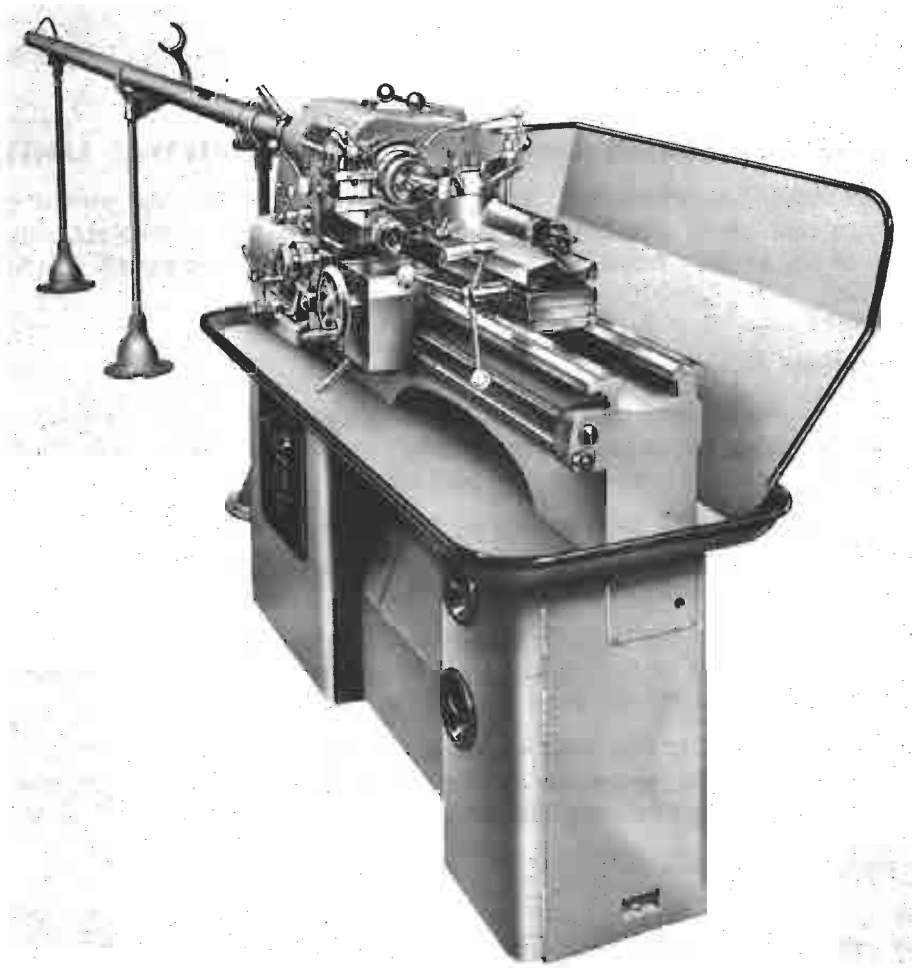
An indexing turret stop is available as an optional extra to enable progressive in-feed to be applied between roughing cuts. Six stops provide for five roughing cuts and one finishing cut to be pre-set. Progressive settings of the turret stop enable roughing cuts to be taken at uniform depth. The final cut follows the full form of the copy master.

Facing Beam

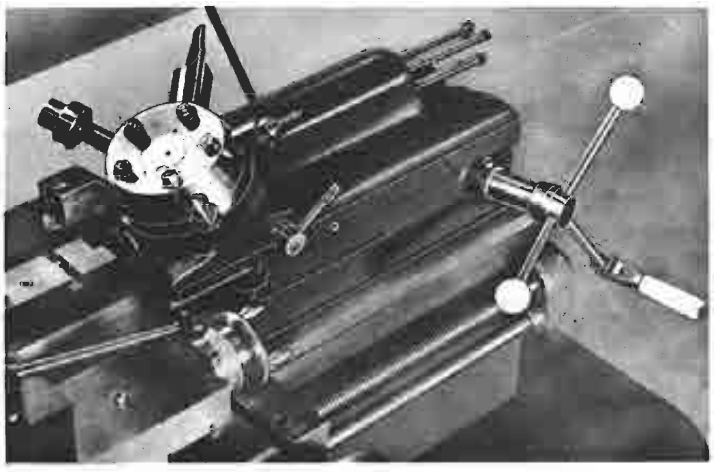
A facing beam is also available as an optional extra. Designed for flat templates, it is secured to the saddle of the machine and incorporates micrometer laterial adjustment.

BRIEF SPECIFICATION OF COLCHESTER SERIES 300 PROFILER

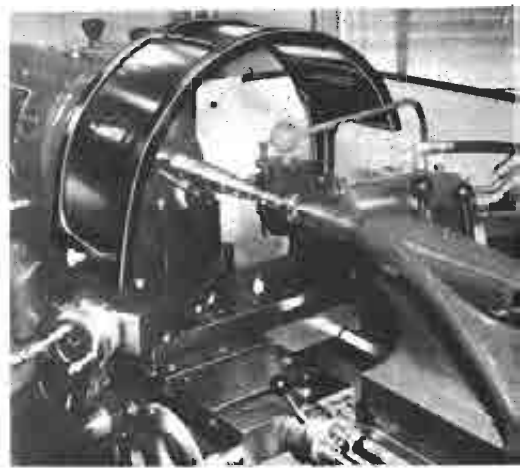
Cylinder stroke	3 in	Stylus load	6 oz.
Max. approach/retraction speed	110 in/min	Change in copy diameter at 90°	5½ in
Velocity characteristic	12 in/min/0·001 in stylus deflection	Change in copy diameter at 60°	5 in
		Working pressure	300 lb/in²
Hydraulic reproduction accuracy	± 0·0005 in	Pump motor ½ h.p. at	1500 r.p.m.



'Student' lathe complete with capstan unit, lever operated collet chuck and air-operated bar feed



Close up view of capstan unit



Perspex chuck/chip guard

COLCHESTER CAPSTAN UNIT WITH BAR FEED AND LEVER-OPERATED COLLET CHUCK

Designed to give capstan facilities on the Student lathe, the five station manually-operated capstan head is fitted in place of the tailstock. No alteration or fitting is required other than the final boring of the tool-holder holes from a boring bar held in the spindle nose.

The capstan unit is of the inclined-head type, with $\frac{3}{4}$" tool-holder holes having single clamping bolts, suitable for accommodating standard single-spindle auto tooling. Five separately adjustable stops control the forward feed of each tool and these stops are automatically rotated as the capstan head is indexed.

A retractable spring-loaded plunger provides positive location and locking of the capstan head, and provision has been made for rotating the capstan by hand where necessary. An accuracy of indexing of 0.0004" at a point 3" from the turret face is guaranteed.

The bar feed is of the air-operated swing forward type, and will accommodate standard 10 ft. bars up to $1\frac{1}{2}$" diameter. A warning device is incorporated to signal the passing of the end of the bar, and a reducing valve and pressure gauge are included in the equipment.

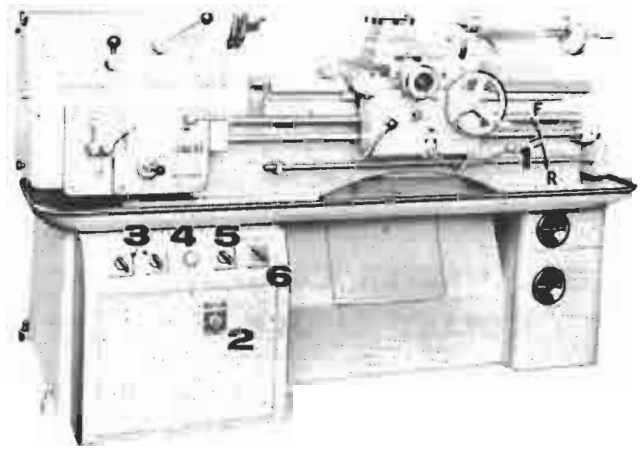
The lever-operated collet chuck is of the Burnerd " Multisize " pattern in which each collet has a capacity of $\frac{1}{8}$" and only 12 collets are needed to cater for all sizes between $\frac{1}{16}$" and $1\frac{1}{2}$".

THE COLCHESTER CHUCK/CHIP GUARD

This perspex and alloy guard can be used either as a chuck guard or a travelling chip guard, and is supplied complete with mounting block. The necessary holes for fitting are pre-drilled and tapped before machines are despatched from the works. When used as a travelling chip guard, it is mounted on the rear face of the saddle, and when used as a chuck guard it is clamped either to the bedways in the case of straight bed machines, or to the rear face of the headstock in the case of gap bed machines.

The use of this guard eliminates the risk of injury to operators when using high speeds, and also prevents the splashing of coolant over adjacent machines.

THIRD SHAFT CONTROL UNIT



Introduction
Of proven design and application, this integral electro-mechanical unit affords a significantly effective arrangement for localising the control of a lathe. Its outstanding advantages centre around the single lever operating control and the means for pre-selection of speeds and feeds. Efficient and effortless operation of the lathe is from the hand lever at the apron which controls starting or stopping and forward or reverse rotation of the spindle with the leadscrew nut engaged.
This equipment and the facilities thus available can be built into the machine as an optional extra. By incorporating and controlling a two-speed motor, 16 spindle speeds are available for each machine.

Panel controls
On each lathe, the control panel is built into the front of the cabinet before despatch. On the top, sloping face of the panel is carried a switch panel having the five operating switches used during working. On the front face of the panel is located the main supply ON/OFF switch. (2).
The two operating switches (3) at left of the panel are marked clearly FORWARD and REVERSE respectively and are used to pre-set the motor speed range at either HIGH or LOW for both the forward and reverse directions of spindle rotation. The use of these two switches makes the third shaft control system specially suitable for cutting metric pitches, where the half-nut must be left in engagement with the leadscrew until thread cutting is completed.

Motor
A two-speed motor is employed, giving the same range of sixteen spindle speeds as for standard centre lathes.
Each motor so fitted includes an electro-magnetic brake device, providing an instantaneous braking of the main motor and drive when the apron control lever is moved to the OFF position. This facility is also extended with the inclusion of an EMERGENCY STOP button.

Apron controls
The control lever (1) is situated at the right of the apron assembly, as shown, and has two functions;
(a) To start and stop the machine for normal requirements.
(b) To select forward or reverse rotation of the spindle.

A safety feature is incorporated to prevent accidental starting of the machine. Before the control lever is raised or lowered into the operating positions, it must first be moved to the right in order to disengage the locking mechanism which retains the lever in the OFF position. Raising the lever then sets the spindle in forward rotation, depressing the lever stops the motor instantly then reverses the direction of rotation.

Application
The electrical control panel, built into the cabinet houses the pre-select switches providing high or low spindle speeds in either forward or reverse direction of rotation. The switches can be pre-selected to give a slow feed and fast return with subsequent reduction in production time when screwcutting. For example, forward speed of rotation can be set at the correct rate for metric thread cutting using the low range whilst the reverse spindle rotation carrying the tool back for the next pass can be set at the high range.
The centre switch button (4) serves a dual purpose; light pressure on the button whilst the machine is running operates the emergency stop brake, heavy pressure on the switch button when the machine is stopped actuates the circuit for 'inching' the spindle in forward rotation. When the lathe is stopped by pressing the STOP button, it is necessary first to move the apron control lever back to the OFF position before restarting in the prescribed manner. The switch (5) controls the magnetic brake. It may be set to operate automatically in conjunction with the apron control lever in normal start, stop and reverse sequence, or it may be set to allow the release mechanism to become energised whilst the spindle is stopped. In this condition, the spindle is free to be rotated by hand. Note, however, that the brake release should not be left energised for any length of time or damage may result.
The switch at the extreme right (6) is marked ON/OFF and is for control of the coolant pump motor.
The complete control circuit operates at low voltage (50 volts only). No ill effects will result should it be required to switch from fast to slow feed in either forward or reverse travel.