INSTRUCTION AND SPARE PARTS MANUAL

CLAUSING

COLCHESTER

13" x 24"
and
13" x 36"

HEAVY DUTY GEARED HEAD PRECISION LATHES

1st EDITION

CLAUSING DIVISION,
ATLAS PRESS COMPANY,
KALAMAZOO, MICH., U.S.A.

Manufactured by
THE COLCHESTER LATHE CO. LTD.
COLCHESTER · ESSEX · ENGLAND

Instruction and Spare Parts Manual

for

CLAUSING—COLCHESTER

13″ Swing Straight Bed & Gap Bed

ALL-GEARED HEAD LATHES

When ordering Spares it is essential to state Size, Style and Serial Number of Machine in addition to Part Number and Description.

Size..... Type..... Serial No.....

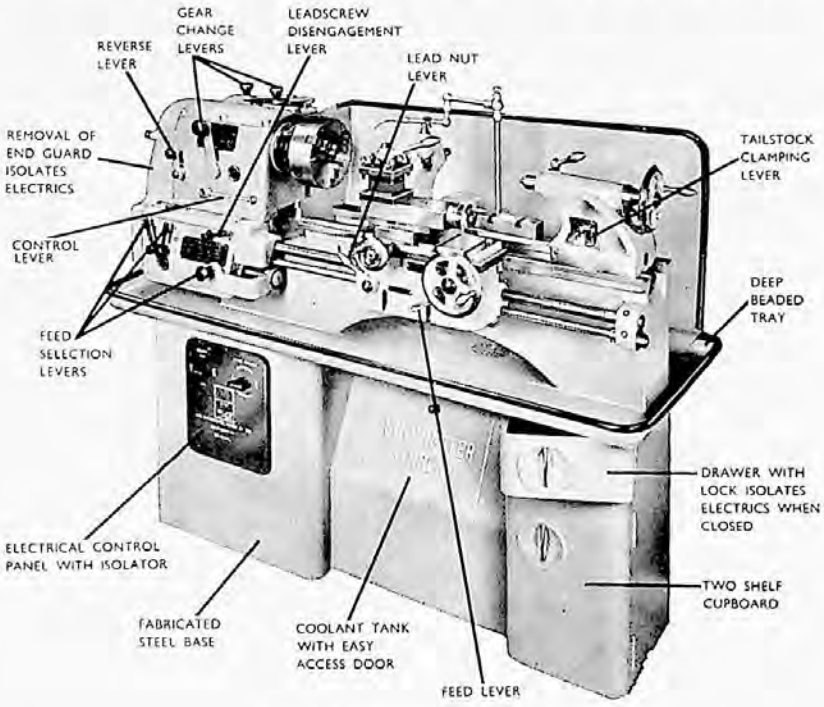
Purchased From: .....

.....

.....

CLAUSING—COLCHESTER

13″ ALL-GEARED LATHES



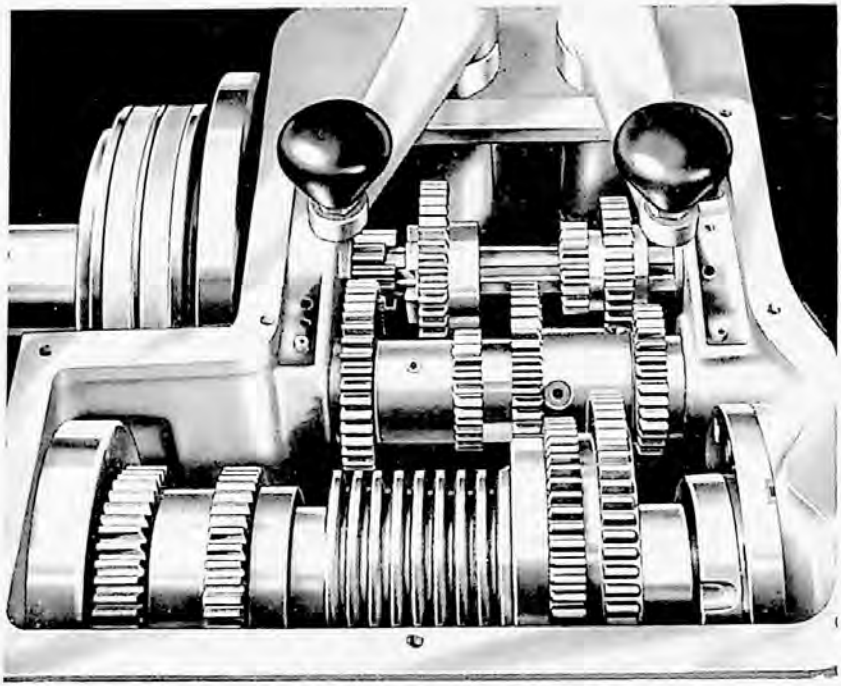
INTRODUCTION

The Clausing-Colchester Machines are the result of almost half-a-century of concentration on the manufacture of lathes. The keynote of Clausing-Colchester machines is efficiency combined with simplicity. Our lathes are to be found working in all corners of the world and while essentially precision tools intended for the production of accurate workpieces, their simple design, robust construction and simplified controls make them very suitable for tooling for production work. All castings are naturally aged for at least six months to avoid any possible future distortion. Jigs and special purpose machines are used extensively in our manufacturing operations to ensure interchangeability of components, and care is taken in all processes in all departments to ensure your satisfaction.

This Manual supplies specific information relative to the Clausing-Colchester 13″ Swing Lathes. A thorough understanding of the information contained in this handbook will aid in securing the most satisfactory operating results from your machine.

At the time of issue, this handbook is completely up-to-date. However, improvements in design are continuously being made and it is possible that some information included in this book may vary from the machine delivered to you. This indicates that design changes have been made so that the machine will better fulfil your needs, and we therefore reserve the right to alter the design or specification at any time without notice.

ONE HANDBOOK IS ISSUED FREE WITH EACH MACHINE
ADDITIONAL COPIES CAN BE SUPPLIED AT 5/– EACH



The Headstock

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DO NOT CHANGE SPEED WHILE RUNNING

SPINDLE SPEEDS — PULLEY 1290 R.P.M.

LEVERS ON TOP					
LEVER AT FRONT		1000	445	192	86
		610	272	118	52

USE SHELL TELLUS OIL 33
OBTAINABLE FROM SHELL OIL COMPANIES THROUGHOUT THE WORLD

THE COLCHESTER LATHE CO LTD ENGLAND

← Speed Chart using Single Speed Motor

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DO NOT CHANGE SPEED WHILE RUNNING

SPINDLE SPEEDS — PULLEY 1935 & 968 R.P.M.

LEVERS ON TOP					
		HIGH SPEED			
LEVER AT FRONT		1500	667	288	129
		915	408	177	78
		LOW SPEED			
		750	334	144	65
		457	204	88	39

USE SHELL TELLUS OIL 33
OBTAINABLE FROM SHELL OIL COMPANIES THROUGHOUT THE WORLD

THE COLCHESTER LATHE CO LTD ENGLAND

Speed Chart with 2 Speed Motor

THE
ALL-GEARED HEADSTOCK

The Headstock forms a totally enclosed oil bath and provides eight spindle speeds (as shown on the Speed Change Chart opposite) from an input drive pulley speed of 1290 R.P.M., or 16 speeds when using a two speed motor. This is accomplished through two high tensile heat treated shafts, carried in phosphor bronze bearings, and carrying gears of similar quality and operated, for speed selection, by means of two hand levers on top and one in front of the Headstock. The mechanism is of simple and robust design and will be readily understood by reference to the Headstock illustration. The main spindle is precision finished, from a heat treated high tensile steel forging and is carried on the latest type anti-friction bearings.

The front end of the spindle is carried on Super Gamet High Precision low angle double row taper roller bearings of exceptional accuracy, specially manufactured to our requirements: the rear end of the spindle being carried on a single row taper roller bearing of similar design.

Another hand lever on the front of the headstock permits the leadscrew and feedshaft direction of rotation to be reversed.

The red control lever on the front of the headstock controls the running of the machine through an air break Starting Switch and a mechanical brake. This starting switch incorporates a no-volt release. In the case of an electrical supply failure, the machine can be re-started only by moving the control lever to the off position and then re-starting in the normal way.

It is necessary from time to time to check that the no-volt release is working correctly. This can be done by switching the motor off from the control panel, moving the red control lever into the starting position and switching the motor on again. If the machine starts up the no-volt release is not working correctly and an adjustment should be made. This is easily accomplished by releasing the lock nut underneath the switch lever at the back of the machine and unscrewing the stud sufficiently to allow it to operate satisfactorily. Finally tighten lock nut.

When this lever is moved upwards the motor starts up, and is cut out when the lever is returned to its horizontal and off position. Pressure applied to the lever in the reverse direction operates an expanding brake in the drive pulley which stops the spindle instantaneously. This arrangement gives very rapid and sensitive control of the machine.

To enable instantaneous braking to be applied, use is made of the American Long Taper Key Drive type spindle nose to L.O. Standard, and the hole through the spindle is $1\frac{9}{16}$" diameter (to pass $1\frac{1}{2}$" dia. bar).

ADJUSTMENTS

Spindle bearings are of such design and accuracy that they are correctly adjusted under cutting conditions before leaving our Works and therefore should give long service before any adjustment becomes necessary. The rear bearing is so designed that no adjustment is necessary, this being provided for by the spring loading of the bearing which gives a constant pressure.

Should the removal of the main spindle or headstock shafts become necessary at any time, the following sequence of operations is recommended:

REMOVAL OF MAIN SPINDLE

1. Drain oil.
2. Remove end guard.
3. Remove top cover (taking care not to damage gasket).
4. Remove three $\frac{1}{4}$" Cap head screws in rear bearing cover.
5. Remove rear bearing cover.
6. Remove grubscrew from collar on end of spindle.
7. Unscrew collar.
8. Remove six $\frac{1}{4}$" Cap head screws from front bearing.
9. Strike rear end of Spindle sharply with a wood or lead mallet or hammer.
10. Remove spindle complete with front bearing assembly, taking care not to damage gasket.
11. Remove main spindle gears, spacer, collar and back bearing inside race.
12. Reassemble in reverse order.

REMOVAL OF REAR END BEARING

1. Remove three $\frac{1}{4}$" Cap screws holding inside bearing cover.
2. Remove cover.
3. Tap out Bearing with usual care and precautions against damage.

REMOVAL OF INTERMEDIATE SHAFT

1. Remove $\frac{1}{4}$" Grub screw holding front Bronze Bush in headstock casting.
2. Remove bearing bush.
3. Remove $\frac{1}{4}$" grub screw in gear.
4. Draw out shaft.
5. Remove Gears and collar.

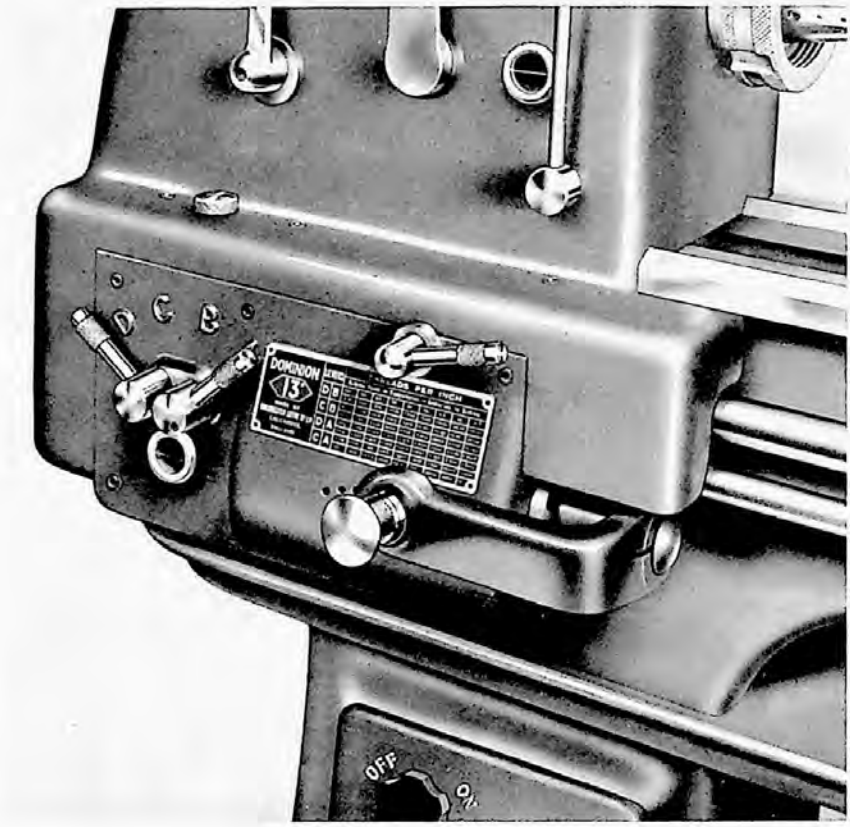
REMOVAL OF CLUTCH SHAFT

1. Remove $\frac{1}{4}$" Cap head screw in rear end collar.
2. Unscrew collar.
3. Slide off driving pulley.
4. Remove Woodruff Key.
5. Remove Brake assembly.
6. Remove three $\frac{1}{4}$" Cap head screws from flanged bearing.
7. Remove flanged bearing.
8. Remove clutch shaft.

REMOVAL OF REAR SHAFT

1. Draw Rear Shaft.
2. Remove Gears.

Reassemble in reverse order, taking care to ensure that the grub screw on the intermediate shaft front bearing bush is correctly re-located.



The Quick Change Feed Box

13"

LEVERS		THREADS PER INCH								
		SLIDING FEEDS IN INCHES- SURFACING							¼	SLIDING
D	B	112	104	96	92	88	80	76	72	64
		·0025	·0025	·003	·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	9½	9	8
		·020	·021	·023	·024	·025	·027	·029	·031	·034
WHEN USING 42' DRIVER GEAR C A		7	6½	6	5¾	5½	5	4¾	4½	4
		·039	·042	·045	·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

Screw Cutting Charts

QUICK CHANGE FEED BOX

The feed box forms a totally enclosed oil bath and provides 45 thread pitches and 45 feeds (as shown on the Screw Cutting and Feed Chart). Changes are accomplished, without any wheel changes being necessary, through a train of heat treated gears carried on high tensile heat treated splined shafts running in phosphor bronze bearings. The feed box, while simple, is very effective and robust, and is controlled by means of three selection levers at the front of the box. A fourth lever operates the leadscrew disengagement.

Change wheels for cutting Metric pitches are only furnished at extra cost.

Should be removal of any part of the feed box become necessary, the dismantling procedure will be clear if the oil is drained, the tumbler arm removed and the front cover taken off, but in case it is necessary to take down the tumbler shaft the following sequence of operations is recommended:

Removal of Tumbler Shaft

1. Drain oil.
2. Remove Tumbler Arm plug.
3. Take out $\frac{1}{4}$" grub screw.
4. Release grip of arm and remove.
5. Remove front cover.
6. Remove tumbler gear.
7. Remove circlip.
8. Remove three $\frac{2}{16}$" Cap screws in flanged bearing.
9. Slide shaft out in direction of tailstock.
10. Withdraw flanged bearing.
11. Remove tumbler bearing.

Formula to obtain Gears for special threads

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

X — 

HOLE IN FEED BOX

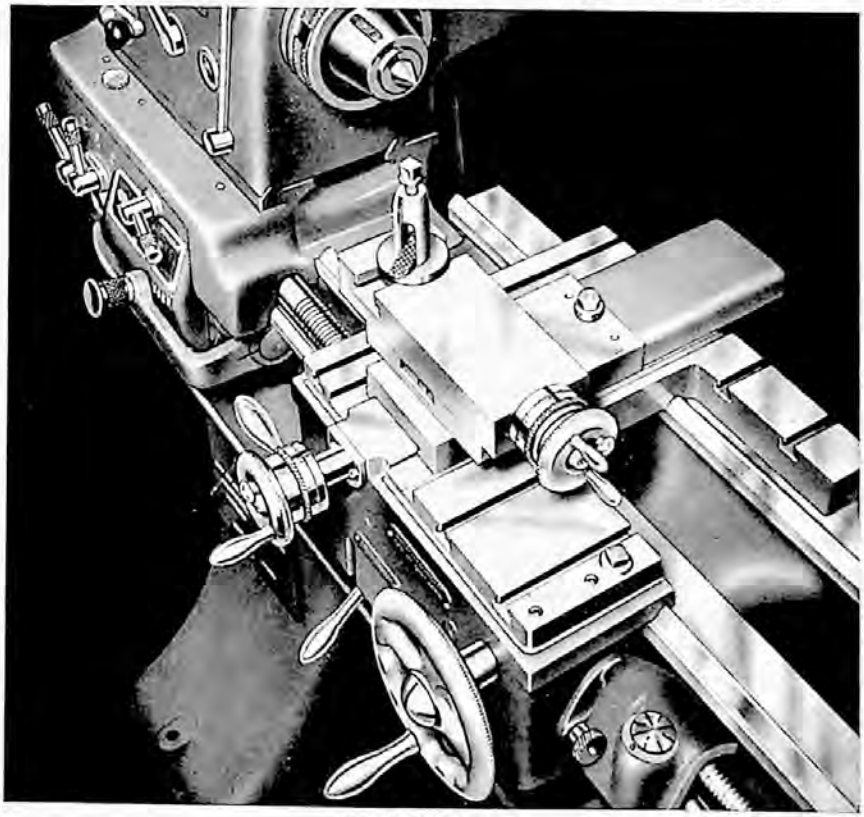
T = THREADS PER INCH TO BE CUT.

Y = 1 = LEVER AC.
2 = LEVER AD.
4 = LEVER BC.
8 = LEVER BD.

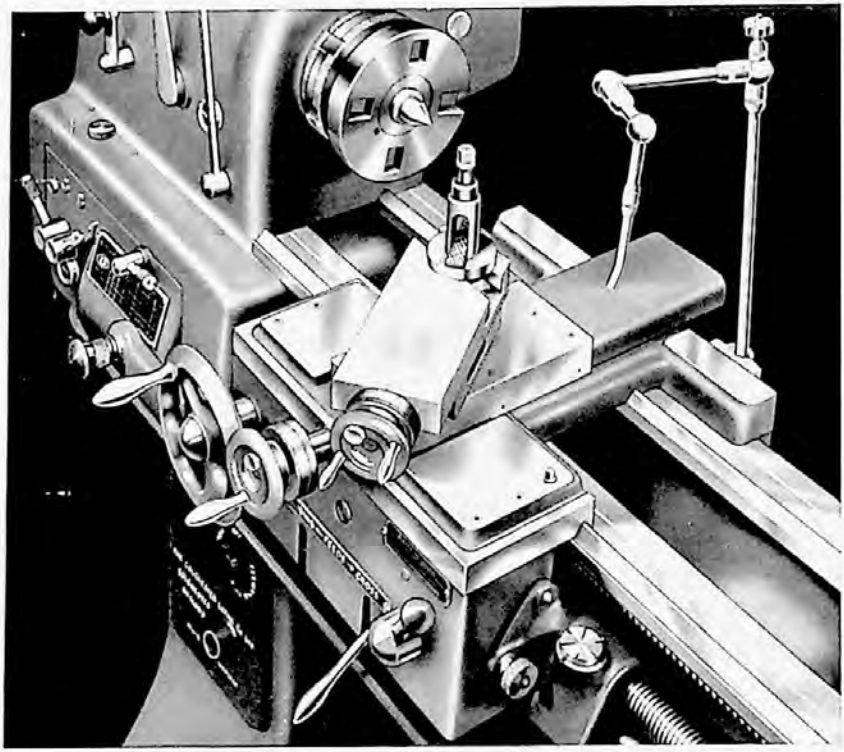
EXAMPLE

21 threads required to be cut

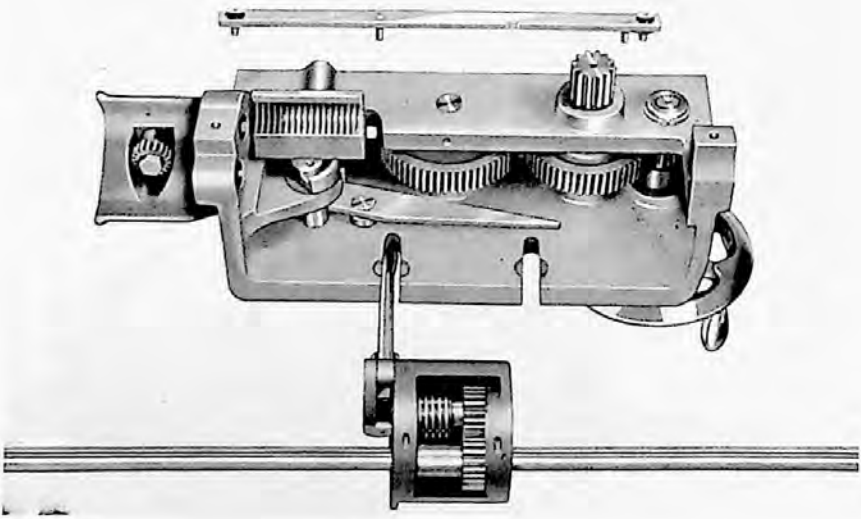
$\frac{3 \times 28 \times 2}{10 \times 21} = \frac{4}{5}$ 28 Driver / 35 Driven



Gap Bed Carriage



Straight Bed Carriage



Carriage Apron

SADDLE

The Saddle, of adequate proportions, mounted on vee and flat surfaces on the bed, is of the American Wing type on the straight bed machines and fitted with a very robust compound slide.

The Saddle is secured to the bed by means of keeps in front and rear and can be locked on the bed at any position. All surfaces are precision machined. Large diameter micrometer dials reading in .001" are fitted to both slides and can be set to zero and clamped for easy operation. Operating screws and slides are covered in all positions.

A standard American pillar toolpost is fitted, but special and automatic indexing square turret toolposts can be accommodated and fitted at extra cost.

When the Clausing-Colchester Coolant unit is ordered, the coolant supply pipe is bolted to the back of the carriage at the tailstock end, and moves along the bed with the carriage. The supply pipe is only furnished with the coolant unit.

The standard tool size for the American Toolpost is $\frac{9}{16}" \times 1\frac{1}{8}"$.

The cross slide is radially graduated 360° for easy and accurate setting of the compound slide. A 24-tooth gear and dial indicator for screwcutting is fitted as standard, and is clearly visible from the natural operating position. The dial has 4 numbered divisions and 4 sub-divisions.

To cut an even number of threads such as 12 T.P.I. the leadscrew may be engaged at any division on the dial, and for an odd number of threads, such as 13 T.P.I., the leadscrew must only be engaged at numbered divisions. To cut fractional threads such as $11\frac{1}{2}$ T.P.I. the leadscrew must be engaged only at division 1 on the dial.

The dial indicator cannot be used for metric threads. For these the nut is closed on the leadscrew, and the machine reversed by means of a finger tip reversing switch, mounted through the main control lever on the headstock, after each cut and tool withdrawal, bringing the tool back to starting point, the nut remaining engaged until the thread is completed. The switch is only supplied as extra equipment.

APRON

The apron is a double-walled casting accurately machined and all shafts are arranged to have two bearing points.

Feed and screwcutting controls are interlocked to prevent simultaneous engagement and longitudinal and cross feeds are engaged by a positive single lever control action.

Power for both longitudinal and cross feeds is taken from a separate shaft incorporating a simple slipping clutch arrangement at the feed box end which effectively guards against possible damage through careless operation and is equally effective in taking care of the heaviest cuts.

Similarly when screwcutting, a shear pin device in the gear train obviates damage, the pin being easily replaced by first removing the gear, and then the serrated sleeve from the shaft. This will allow the broken pin to be tapped out of the sleeve from the opposite side to the serrations, also if the shaft is revolved until the broken pin in it comes opposite the slot in the housing, it can be knocked straight through and will then drop out through the housing slot. The new pin can then be inserted.

Shear Pin device

The precision leadscrew (6TPI ACME) is used for screw cutting only and the whole apron arrangement is effectively guarded to comply with Factory Safety regulations and requirements.

Direction operating instructions are clearly shown on the metal plates on the apron.

TAILSTOCK

The Tailstock is of rigid design with a large diameter spindle and screw, and is mounted on independent vee and flat surfaces on the bed. The hole in which the spindle slides is honed to very close limits of accuracy.

The spindle, bored No. 3 Morse Taper, is graduated in inches of travel and is locked in position by a hand lever.

Provision is made for the ejection of centres when the spindle is wound right back, and set screws are fitted to enable the tailstock to be set over for taper turning. A zero setting line simplifies resetting.

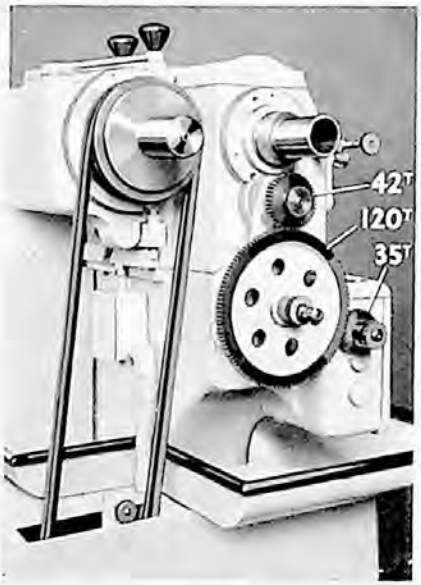
Rapid locking of the tailstock to the bed is by means of a detachable ring spanner.

THE MOTOR DRIVE

The motor drive is totally enclosed within the cabinet base and therefore avoids all possibility of motor failure due to chips or coolant splash.

The drive is taken to the main drive pulley on the headstock by two $\frac{1}{2}$" vee belts enclosed in a light alloy end guard. In order to avoid electrical shocks when adjustments are required to be made to the switch panel, it has been arranged so that the removal of this will completely isolate the supply. To prevent unauthorised use of the machine the locking of the cabinet drawer will also isolate the motor and starting gear controls.

The standard motor is a $1\frac{1}{2}$ H.P. 2-Phase or 3-Phase, but D.C. and Single Phase motors are fitted to order at extra cost, the additional cost being dependent on the type of motor and starting equipment required. Provision for motor belt adjustment is provided by a swinging platform clamped with two bolts which is accessible when the back cover of the cabinet is removed.



Feed Box Drive

COOLANT UNIT

The cabinet base has been designed so as to house the coolant pump and supply. This is situated in the centre of the cabinet and is easily accessible by a door at the front of the machine for cleaning, filling and attention to the pump. There is provision in the chip tray for a return of the coolant through a filter gauze to the supply source. The pump and coolant unit is furnished to order only at extra cost.

The Coolant piping supplied is fully universal, with telescopic piping for feeding the coolant in any position. Spring loaded glands are employed which require no adjustment. A patented ball type shut-off valve permits easy control of the volume of coolant. The whole unit is designed to eliminate the leakages which are usually associated with coolant systems.

The Clausing-Colchester unit has a capacity of $5\frac{1}{2}$ gallons.

THE LATHE BED

The Bed is an exceptionally strong casting of the inverted vee type, with elliptical cross ribbing providing great rigidity.

All bed castings are rough machined and naturally aged before finish grinding of all working surfaces.

Once or twice a week the bed surfaces should be wiped with a rag soaked in paraffin to prevent oil stains, and then thoroughly covered with a good grade machine oil to prevent rust formation.

Never use air lines for cleaning the chips from the lathe bed. Their use causes the chips to lodge under sliding members and in openings around moving parts with possible damage to the machine. A strong air stream will also blow off the protecting oil film and cause rust formation.

On gap bed lathes the removal of the gap block is an easy matter. Simply release and take out four Allen type screws, and the block is then free to be removed. No dowels are fitted.

To replace Gap. *Thoroughly clean both block and gap Location.* This is most important. Replace block and locate screws. Bring saddle up to give rough alignment and tighten screws down lightly.

If the location faces are clean the block can then be re-aligned with a few taps in the required direction with a hide or non-ferrous hammer.

STANDARD EQUIPMENT

One	12" Direct Mounting Face Plate.
One	Direct Mounting Catch Plate.
One	Travelling Steady Rest.
Two	Spanners.
Two	Centres (one hard, one soft).
One	Centre Bush.
One	Splash Guard.
Five	Keys (Hollow Screws).
One	"C" Key (Spindle Nose Collar)

The above standard equipment also applies for the 13" machine supplied without a feed box and in that case 14 loose change wheels are also included.

EXTRA EQUIPMENT

The list below specifies the items of equipment which can be furnished at extra cost. Additional items are included in this list from time to time and we are available to advise you concerning your needs at any time.

Auxiliary coolant supply unit.
Automatic indexing square toolpost.
Additional direct mounting chucks.
Additional sets of hard or soft jaws.
Additional solid centres.
Backplates for special fixtures.
Drill chucks.
Revolving centres.
Fixed steady rest.
Spindle nose collet chuck attachment (1" max. capacity).
Taper turning attachment.
Large faceplate, 18" dia. (for gap bed machines only).

Automatic Indexing Square Toolpost

This is a very strong and rigid toolpost manufactured from a heat treated steel forging. It can be hand indexed into the operating position, and so arranged to carry four tools or toolholders having a height up to $1\frac{1}{16}$".

The hand lever moved in an anti-clockwise direction automatically releases the locating plunger. This enables the turret to be swung to the next indexing position by the clockwise movement of the top handle. A further slight movement of this handle after the turret has reached the indexed position effectively locks the turret block to the topslide. It is also possible to swing the turret block into any position without using the indexing mechanism.

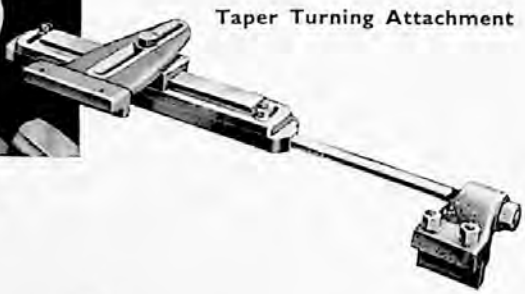
The retracting plunger method of indexing enables the turret block to remain on its bottom face thereby effectively preventing chips from lodging on the location face.

These toolposts are accurately bedded on to a special turret slide which can be supplied in place of, or as an extra to, the standard slide.

Backplates

It may be desired to accommodate special fixtures on the Clausing-Colchester Lathes for turning quantities of parts which can only

Collet Attachment



Taper Turning Attachment

be held in a fixture. Backplates are then necessary and can be supplied made from high grade "Meehanite" castings and machined for direct mounting on the spindle nose of the machine.

Fixed Steady Rest

This attachment is of rigid design and easily opened and set. The maximum bar capacity is 4" dia. and the inserts are of plastic composition and readily replaced.

Spindle Nose Collet Chuck Attachment

This attachment is supplied at extra cost with or without a backplate for direct mounting on the spindle nose of the machine. Its capacity is 1" maximum and any size collet can be supplied up to this diameter.

Chucks

The precision chucks fitted to Clausing-Colchester Lathes are made from high grade "Meehanite" castings with heat treated nickel-chrome steel scrolls and nickel-steel pinions (3-jaw self-centring), and heat treated tough alloy steel jaw operating screws (4-jaw independent), and are all arranged for direct mounting on the lathe spindle nose without the use of backplates. Jaws are dealt with under a separate heading.

When ordering spares it is important to specify the chuck number and size on your order together with the serial number of the machine.

Additional Sets of Hard or Soft Jaws.

The jaws are made from a special grade of case-hardening steel, accurately machined on all surfaces and all hard jaws are heat treated and ground on bearing and gripping surfaces. When ordering it is important to specify the chuck number and size on your order together with the serial number of the machine.

Taper Turning Attachment

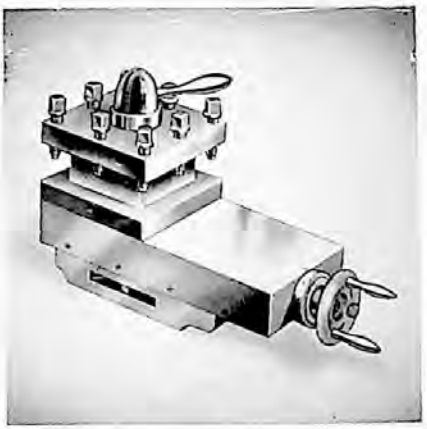
The attachment offers an effective means of producing tapers up to 9° in each direction. It is of simple design, and graduated in both degrees of arc and taper per foot. The length of taper which can be dealt with at one setting is 10".

To operate the attachment, remove fixing screw from cross slide nut and fix in taper turner slide collar. Finally fix and tighten anchor bracket into required position.

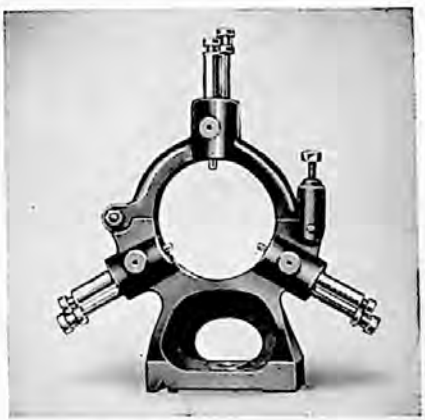
Care must be taken to avoid winding the cross slide nut along the traverse screw when the fixing screw has been removed as it might get into a position where movement of the taper slide can foul against it.

Always check that there is no interference by winding the carriage by hand the full length of the taper turning slide.

To revert to normal cross-slide work, remove fixing screw from taper turner slide collar and return to cross slide nut. Finally remove anchor bracket.



Square Toolpost



Fixed Steady Rest

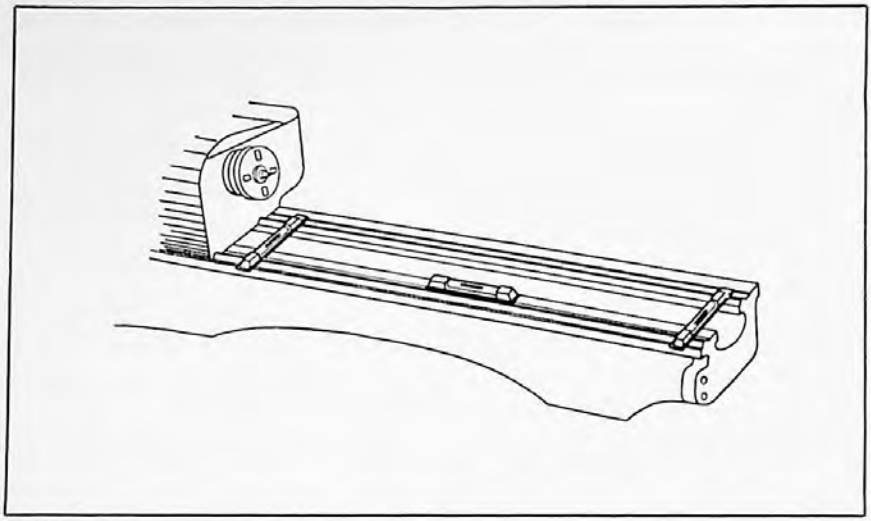
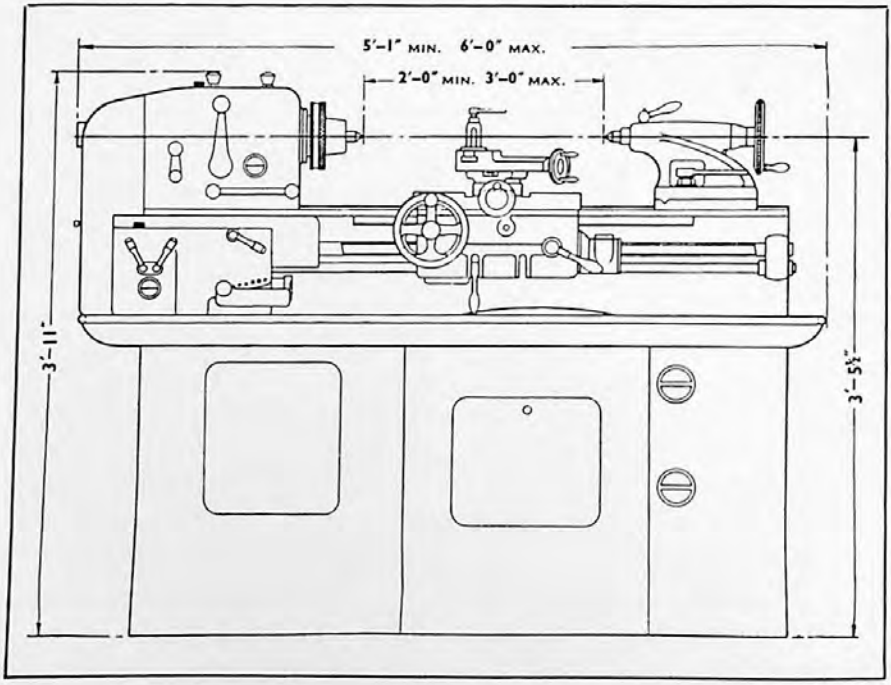


Diagram illustrating method of Levelling



Main Dimensions

INSTALLATION

Installation and Location

To obtain the full accuracy which has been built into the Clausing-Colchester Lathe, it is essential that it should be placed on a solid level foundation which is free from vibration. The best practice is to place the machine on a reinforced concrete base. A wooden floor is not recommended because the swelling and shrinking of the wood, due to atmospheric conditions, causes distortion of the alignment of the machine.

If a wooden floor site cannot be avoided, a section of flooring should be removed, and a concrete base built up to the wooden floor level. It is essential that the machine should be securely bolted down and properly grouted in.

If setting the machine above ground floor level, or on a balcony, cannot be avoided, a reinforced concrete floor is necessary to obtain best results and it is recommended that the Headstock be set as close to supporting walls and pillars as possible.

The machine weighs about 1,400 pounds and proper equipment for handling this weight should be available.

After your machine has been unloaded, it should be left on its shipping skids while it is moved to its location in the machine shop. In certain cases an eye-bolt is supplied ready fixed on the bed of the machine, and this should then be used for lifting purposes.

When the eye-bolt is not supplied, it is recommended that the machine is lifted by means of an adequately strong rope sling inserted through the bed openings. The machine should never be lifted by means of a sling round the outside of the lathe bed, otherwise the lead screw and feed shaft may be distorted.

Cleaning

Before moving any of the slides of your lathe, all machined surfaces should be thoroughly washed with kerosene to clean off the slushing compound used to protect these surfaces, together with any dust or dirt that may have accumulated in transit. This operation is very important as it prevents dirt from working under the sliding members and avoids subsequent undue wear. Care must be taken to ensure that the kerosene is not allowed to remain on the slides and all surfaces must be thoroughly covered with a good grade of machine oil to prevent the formation of rust.

After the machine has been thoroughly cleaned, surfaces lubricated and installed on its foundation, it is ready for levelling and wiring, and for the vee belts to be put on. These are inserted by first removing the End Guard and inserting belts into the pulley vees. The motor platform should then be adjusted sufficiently to tighten the belts enough to drive. The belts must not be too tight.

Before this lathe will run the cabinet drawer at the tail end must be unlocked, as the locking of this drawer isolates the machine.

Technical Department

Our Technical Department is at your disposal, and always pleased to discuss your particular problem. Our aim is to ensure maximum satisfaction with your Clausing-Colchester Lathe.

Chuck Mounting

By the use of the American Long Taper Key Drive spindle nose, the danger of chucks and other work holding fixtures becoming loose whilst rotating has been eliminated, but care must be taken to ensure that chucks, etc., are driven home firmly by means of the special key provided with the standard equipment. Both chuck and spindle tapers must be thoroughly cleaned before mounting. It is most important to avoid damaging any part of the spindle nose or chuck taper, as burrs will prevent the chuck being fully tightened.

Levelling

Levelling is more satisfactorily carried out by means of steel wedges inserted where necessary underneath the leading edge of the cabinet base. Care must be taken not to raise any part of the base unnecessarily high but if this condition is evident due to unevenness of floor surface, wedges should be inserted to ensure complete contact between edge of cabinet base and floor. Following correct levelling, the lathe should then be bolted down and grouted in if necessary.

Turning Tests

The levelling procedure will put the machine into accurate alignment for all normal work, but sometimes turning tests are taken to check alignment and to establish a greater degree of accuracy when the machine is to be employed on Toolroom work.

These turning tests must be taken with keen tools taking a very light cut.

At our plant these tests are taken on two discs held 12" apart in a chuck and as shown in sketch. A very light cut is taken on Disc A and B. Micrometer readings of the two discs should be the same. Similarly a bar can equally well be used for this test.

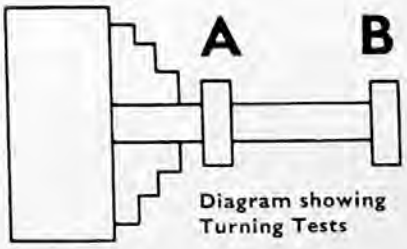
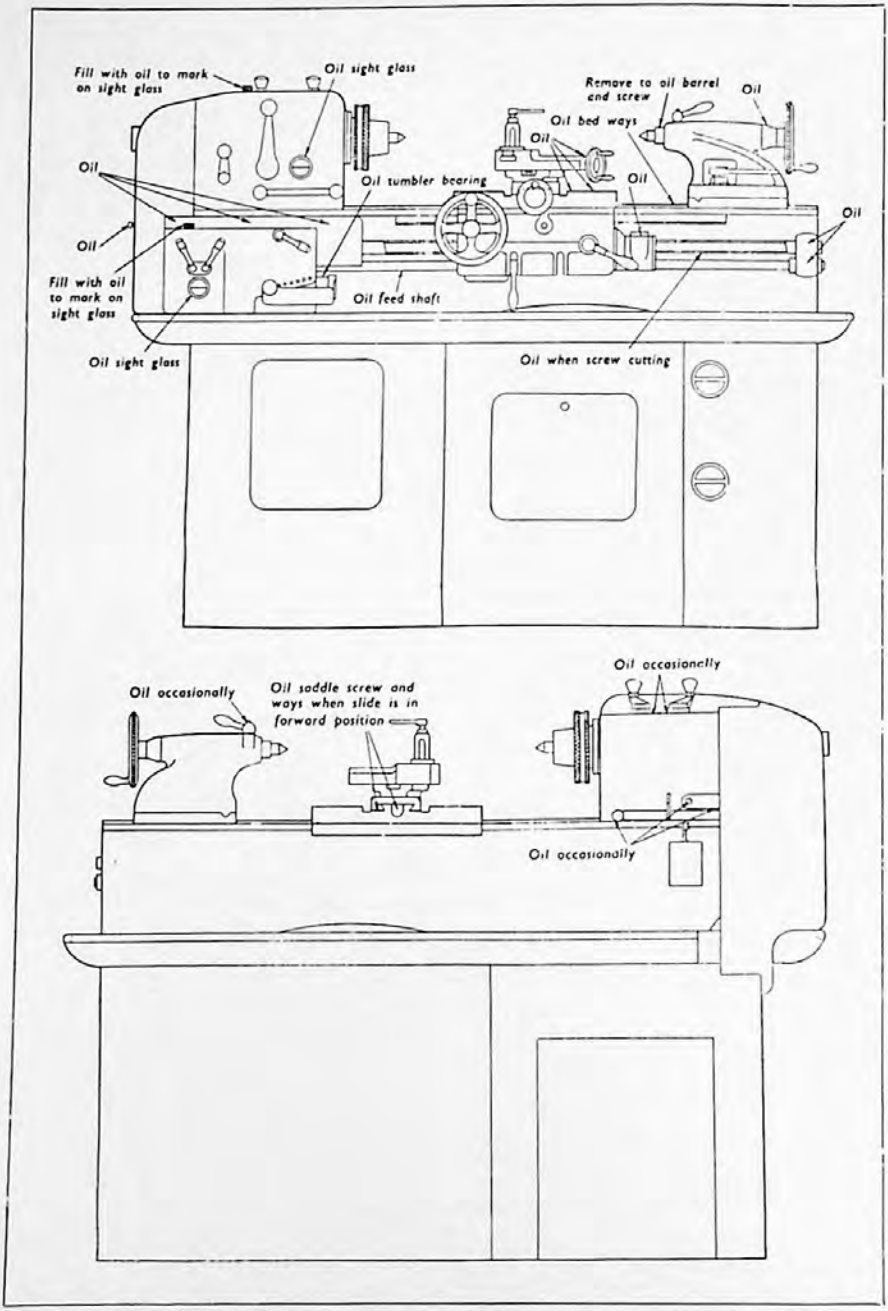


Diagram showing Turning Tests



The above diagrams show Lubrication Points requiring regular attention

LUBRICATION

The accuracy and very life of the machine depend on correct lubrication.

The chart on the opposite page gives information regarding the points which require frequent attention, and it cannot be too strongly stressed to the operator that *daily* attention is necessary at all the points with a red disc to ensure efficient functioning of the machine.

When a machine leaves our plant, the Headstock and Feedbox are filled to the proper oil gauge level with the recommended lubricant, Shell Tellus oil 33, a hydraulic type of lubricant conforming to the following specification:

Gravity 60.F.	.876	
Flash Point Closed	410°F.	
Pour Point	— 20°F.	
Viscosity Red. No. 1	70°	750 Sec.
" " "	140°	112 "
" " "	200°	52 "

and containing inhibitors against oxidation, frothing and corrosion.

Always stop the machine when checking the oil levels to give the oil an opportunity to settle so that a true reading may be taken. If this is not done overfilling may take place resulting in excessive heat and waste of oil by leakage.

Oil levels should be checked weekly.

Thirty days after the machine goes into operation the Headstock and Feedbox should be drained, flushed with clean flushing oil and refilled with the recommended oil to the proper levels.

The motor bearings should be checked periodically to see that they are packed with grease of the grade recommended by the manufacturers of the motor on your machine.

The Coolant Pump motor bearings should be checked periodically to see that they are packed with a water repellant grease.

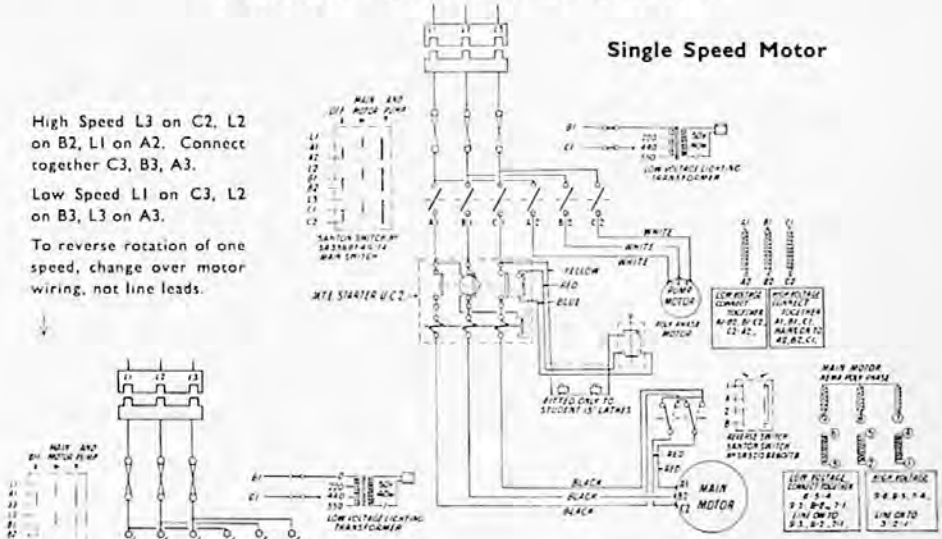
WIRING TO POWER SUPPLY

Single Speed Motor

High Speed L3 on C2, L2 on B2, L1 on A2. Connect together C3, B3, A3.

Low Speed L1 on C3, L2 on B3, L3 on A3.

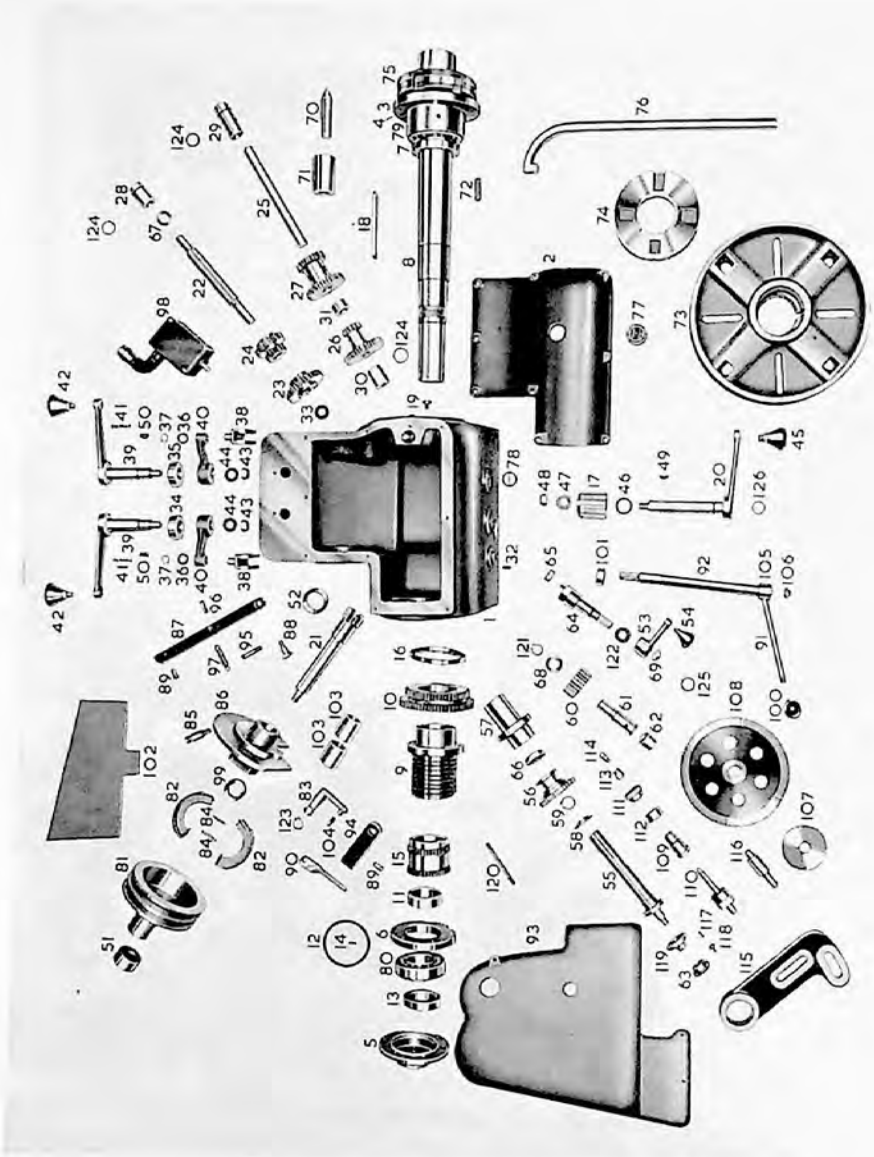
To reverse rotation of one speed, change over motor wiring, not line leads.



Two Speed Motor

The wiring should be done by a competent electrician to standard specifications. It is essential that an efficient means of earthing the machine should be provided.

Should for any reason after a period of time the overloads require re-setting, the front panel will have to be removed and the necessary adjustment done by means of the pointer at the back of the panel.



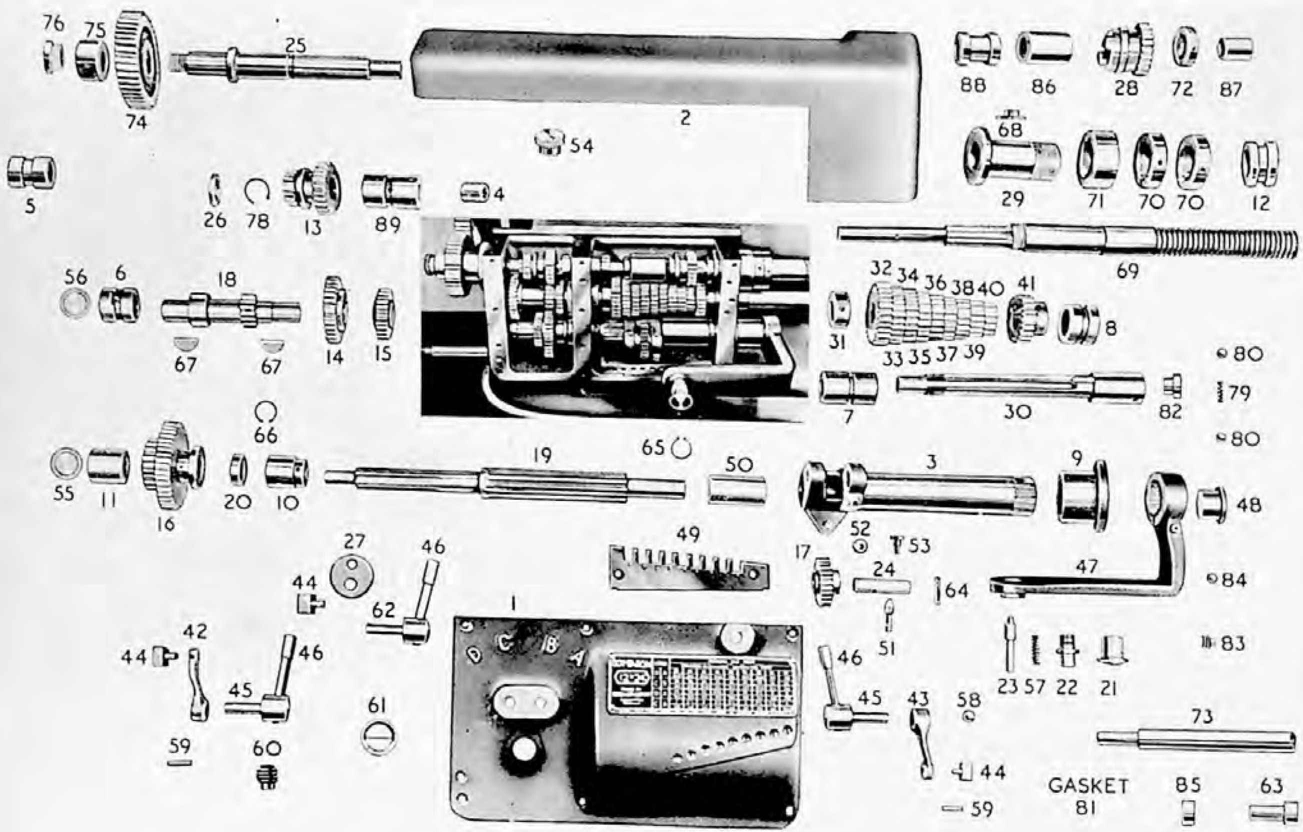
The Headstock

SPARE PARTS

HEADSTOCK

No.	Name of Part
1	Headstock
2	" Cover
3	Front Bearing Outside Cover
4	Front Bearing Outside Cover Gasket
5	Back Bearing Outside Cover
6	Back Bearing Inside Cover
7	Inside Screwed Collar
8	Spindle
9	Sliding Sleeve
10	Double Gear on Spindle 61T/70T/14P
11	Back Bearing Spacer Collar
12	Back Bearing Spring Thrust Ring
13	Screwed Collar on End of Spindle
14	Back Bearing Springs
15	Reverse Gear on Spindle 42T/42T/14P
16	Front Bearing Shield
17	Pinion for Sliding Sleeve 17T/10P
18	Key for Sliding Sleeve
19	Peg for Front Bearing
20	Spindle Gear Shifter Hand Lever
21	Driving Clutch Shaft 18T/14P
22	Driving Shaft
23	Driving Shaft Gear 41T/14P
24	Driving Shaft Gear 21T/33T/14P
25	Second Shaft
26	Second Shaft Gear 41T/18T/14P
27	Second Shaft Gear 40T/28T/14P
28	Driving Shaft Bush
29	Second Shaft Bush
30	" " "
31	" " Spacer
32	Reverse Lever Stop Pins
33	Driving Shaft ThrustWasher
34	Backshaft Hand Lever Collar (L.H.)
35	Backshaft Hand Lever Collar (R.H.)
36	Backshaft Gear Shifter Washer
37	Backshaft Gear Shifter Circlip
38	Backshaft Gear Shifter
39	Backshaft Gear Shifter Hand Levers
40	Backshaft Gear Shifter Levers
41	Backshaft Gear Shifter Levers Springs
42	Backshaft Hand Lever Knob
43	Backshaft Hand Lever Nut
44	Backshaft Hand Lever Washer
45	Spindle Gear Hand Lever Knob
46	Spindle Gear Hand Lever Leather Washer
47	Spindle Gear Hand Lever Washer
48	Spindle Gear Hand Lever Nut
49	Spindle Gear Hand Lever Key
50	Backshaft Hand Lever Key
51	Driving Clutch Shaft Collar
52	Driving Clutch Shaft Thrust Collar
53	Reverse Handle Lever
54	" " Knob
55	Reverse Shaft
56	" " Gear 42T
57	" " Bush
58	Reverse Shaft Washer
59	" " Circlip $\frac{7}{8}$"
60	Intermediate Reverse Shaft Gear 28T/14P
61	Intermediate Reverse Shaft
62	Intermediate Reverse Gear Bush
63	Reverse Shaft Knurled Nut
64	Gear Shifting Ecc. Shaft
65	Gear Shifting Ecc. Shaft Pad
66	Reverse Shaft Oil Seal
67	Driving Shaft Washer
68	Inter Reverse Shaft Washer
69	Domed Washer for Reverse Handle
70	Centre
71	" Bush
72	Spindle Nose Key
73	Faceplate, 12" dia.
74	Catch Plate
75	Spindle Nose Draw Nut
76	" " " " Key
77	Filler Plug
78	Oil Sight
79	Front Roller Bearing 113060X/113101 XH
80	Back Roller Bearing 111050/111090
81	Driving Pulley
82	Clutch Ring
83	" Expanding Lever
84	" Ring Spring
85	Fixing Stud
86	Flanged Bearing
87	Switch Operating Lever
88	Switch Operating Lever Stud
89	Locking Piece
90	Link for Expanding Lever
91	Operating Handle Stem
92	" " Shaft
93	Belt and Change Gear Guard
94	Brake Lever
95	Long Return Spring Pin
96	Short " " "
97	Return Spring
98	Electric Switch
99	Oil Seal for Flanged Bearing
100	Plastic Knob (Red)
101	Collar on Operating Handle Shaft
102	Belt and Change Wheel Guard Plate
103	Bushes for Flanged Bearing
104	Screwed Pin for Link
105	Operating Handle Stem Collar
106	Operating Handle Shaft Plug
107	Change Wheel 42T/16P
108	" " 120T/16P
109	" Gear Sleeve
110	" " " Stud
111	" " " Nut
112	" " Spacer Collar
113	Change Gear Sleeve Stud Nut
114	Change Gear Sleeve Stud Oiler
115	Swing Frame
116	" " Fixing Stud
117	Change Wheel Shear Pin
118	Change Wheel Shear Pin Sleeve
119	Shear Pin Bush
120	Belt & Change Wheel Guard Stud
121	Inter Reverse Shaft Circlip
122	Gear Shifting Ecc. Shaft Washer
123	Expanding Lever Circlip
124	Cord Ring for Shaft Bushes

When ordering spares please give Serial No. of machine, name of unit and Part No.



The Quick Change Feed Box

SPARE PARTS

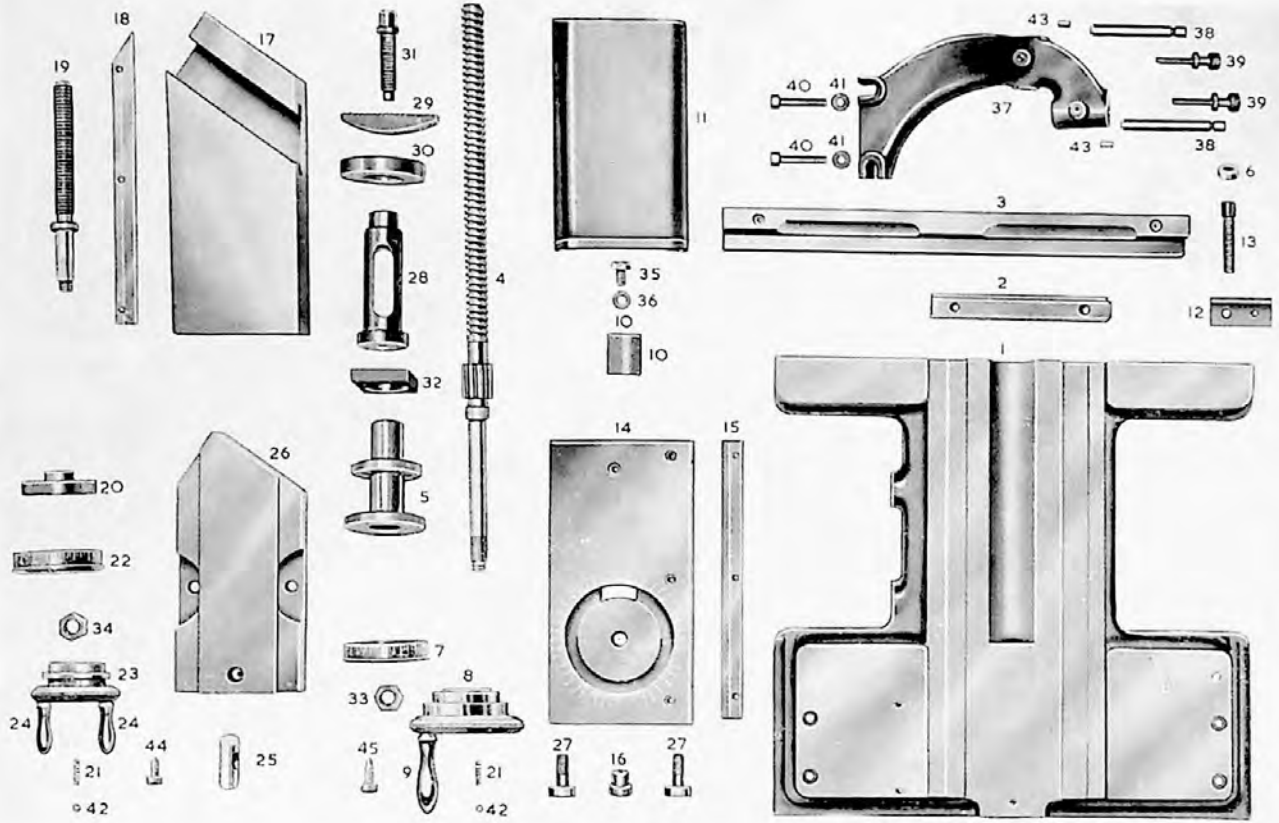
HEADSTOCK—*continued*

No.	Name of Part
125	Cord Ring for Ecc. Reverse Shaft
126	Cord Ring for Spindle Hand Lever Shaft
	Headstock Cover Screws ¼" x 1" Cap Head
	Headstock Cover Screws ¼" x 1¼" Cap Head
	Headstock Cover Screws ¼" x ¾" Cap Head
	Spindle Double Gear Screws 7/16" x 1½" Cap Head
	Headstock Fixing Screws 7/16" x ½" Cap Head
	Headstock Fixing Screws 7/16" x 1¼" Cap Head
	Spindle End Collar Grub Screw 7/16" x 7/16"
	Spindle Inside Collar Grub Screw 7/16" x 7/16"
	Front Housing Outside Cover Screws ¼" x ¾" Cap Head
	Back Housing Outside Cover Screws ¼" x ¾" Cap Head
	Back Housing Inside Cover Screws ¼" x 2" Cap Head
	2nd Shaft Gear Grub Screw ¼" x ¼"
	Headstock Bearing Bush Grub Screw ¼" x ¼"
	2nd Shaft Bush Plug Screw 7/16" x ¾" Cap Head
	Reverse Shaft Domed Washer Screw ¼" x ¾" Cap Head
	Reverse Shaft Inside Collar Grub Screw ¼" x ¼"
	Double Reverse Gear Shaft Grub Screw ¼" x ¼"
	Backshaft Lever Balls ¼"
	Reverse Shaft Bush Screws ¼" x 1" Cap Head
	Hand Lever Key No. 9 Woodruff
	Spindle Nose Key Screws
	Clutch Bearing Screws ¼" x 1¼" Cap Head
	Driving Clutch Shaft Collar Screw ¼" x 1¼" Cap Head
	Locking Piece Fixing Screws 7/16" x ½" Cap Head
	Switch Adjusting Screws 7/16" x 1½" (Hex)
	Brake Lever Adjusting Screw Nut ¼" (Hex) U.N.
	Switch Adjusting Screw Locknut 7/16" (Hex) U.N.
	End Guard Plate Screw 7/16" x ¾" Cap Head
	Electric Switch Screws 7/16" x ½" Cap Head
	Quadrant Fixing Stud Nut 7/16" (Hex)
	Quadrant Fixing Stud Washer 7/16"
	Change Wheel Stud Nut ½" (Hex)
	Change Wheel Stud Washer ½"

QUICK CHANGE FEED BOX

1	Feed Box Cover
2	" " Top Cover
3	Tumbler Bearing
4	Driving Shaft Bush
5	" " "
6	Inter Shaft Bush
7	Cone Shaft Bush
8	" " "
9	Tumbler Bearing Bush
10	" Shaft Bush
11	" " "
12	Leadscrew Bush
13	Driving Shaft Gear 16T & 24T
14	Inter Shaft Gear 32T
15	" " " 24T
16	Tumbler Shaft Gear 24T & 42T
17	Tumbler Gear 27T
18	Intermediate Shaft 14T
19	Tumbler Shaft 15T
20	" " Washer
21	" " Handle
22	" " Socket
23	" " Plunger
24	Tumbler Gear Shaft
25	Driving Shaft
26	" " Washer
27	Leadscrew Gear Lever
28	" " 24T
29	" " Bush
30	Cone Gear Shaft
31	" " " Collar
32	" " 28T
33	" " 26T
34	" " 24T
35	" " 23T
36	" " 22T
37	" " 20T
38	" " 19T
39	" " 18T
40	" " 16T
41	" Shaft Pinion 24T
42	Gear Shifting Lever (Top)
43	Gear Shifting Lever (Bottom)
44	" " Pads
45	" " Shaft
46	" " " Handle
47	Tumbler Shifting Arm
48	" Bearing Plug
49	" Locating Strip
50	" Shaft Brush
51	" Locating Pin
52	" Roller
53	" Roller Pin
54	Oil Filler Plug
55	Plug for Tumbler Shaft Bush
56	" " Inter " "
57	Tumbler Handle Spring
58	Leadscrew Gear Shifting Lever Shaft Spring Washer 7/16"
59	Gear Shifting Lever Pins 7/16" x ¾" Mills
60	Drain Plug
61	Oil Sight
62	Leadscrew Gear Shifting Lever Shaft
63	Feed Shaft Bearing Bush
64	Tumbler Gear Pin 7/16" x ¾" Mills
65	Tumbler Shaft Circlip
66	" " " "
67	Keys for Inter Shaft
68	Key for Leadscrew
69	Leadscrew
70	Leadscrew Locknuts
71	" Plain Collar
72	" Screwed
73	Feed Shaft
74	Change Wheel 35T
75	Spacing Collar on Driving Shaft
76	Knurled Nut
78	Driving Shaft Circlip
79	Feed Shaft Friction Clutch Spring

When ordering spares please give Serial No. of machine, name of unit and Part No.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SPARE PARTS

QUICK CHANGE FEED BOX—*continued*

No.	Name of Part
80	Feed Shaft Friction Clutch Ball $\frac{1}{4}$" dia.
81	Gasket
82	Feed Shaft Friction Clutch Bush
83	Feed Shaft Friction Clutch Peg
84	Feed Shaft Friction Clutch Ball $\frac{3}{8}$" dia.
85	Feed Shaft Collar
86	Leadscrew Spacer Bush
87	Leadscrew Metric Gear Bush
88	Leadscrew Metric Gear Collar
89	Leadscrew Bush
	Locating Pin Nut $\frac{1}{4}$" Std. Hex.
	Leadscrew Gear Lever Pin $\frac{1}{4}$" x 1$\frac{1}{2}$" Mills
	Leadscrew Gear Lever Grub Screw $\frac{1}{4}$" x $\frac{3}{8}$"
	Gear Shifting Lever Balls $\frac{1}{4}$" dia.
	Gear Shifting Lever Springs
	Gear Shifting Lever Grub Screw $\frac{1}{4}$" x $\frac{3}{8}$"
	Top Cover Screws $\frac{1}{4}$" x $\frac{3}{8}$" Cap Hd.
	Front Cover Screws $\frac{1}{4}$" x $\frac{3}{8}$" Cap Hd.
	Front Cover Pins $\frac{1}{4}$" x 1"
	Tumbler Bearing Bush Screw $\frac{1}{4}$" x $\frac{3}{8}$" Cap Hd.
	Tumbler Arm Screw $\frac{1}{2}$" x 1$\frac{1}{2}$" Cap Hd.
	Gear Box Bush Locating Grub Screws $\frac{1}{4}$" x $\frac{3}{8}$" Cap Hd.
	Leadscrew End Collar Grub Screw $\frac{1}{4}$" x $\frac{3}{8}$"
	Locating Strip Fixing Screw $\frac{1}{4}$" x $\frac{3}{8}$" Cap Hd.
	End Plug Grub Screw $\frac{1}{4}$" x $\frac{1}{4}$"
	Feed Shaft Collar and Bush Screws $\frac{1}{4}$" x $\frac{3}{8}$"
	Cone Shaft Collar Grub Screw $\frac{1}{4}$" x $\frac{3}{8}$"
	Locating Strip Adjusting Screws $\frac{1}{4}$" x $\frac{1}{2}$" Dog Point
	Locating Strip Adjusting Screws $\frac{1}{4}$" x $\frac{3}{8}$" Dog Point
	Locating Strip Locking Grub Screw $\frac{1}{4}$" x $\frac{1}{4}$"
	Inter Shaft Gear Grub Screw $\frac{1}{4}$" x $\frac{3}{8}$"
	Tumbler Handle Pin $\frac{1}{4}$" x 1$\frac{1}{4}$" Mills
	Tumbler Bearing Bush Oil Seal Ring
	Oilers

STRAIGHT BED CARRIAGE

1	Carriage
2	,, Front Gib
3	,, Back Gib
4	,, Screw
5	,, ,, Keep
6	Carriage Locking Screw Washer
7	Carriage Screw Index Ring
8	,, ,, Handwheel
9	,, ,, Ball Handle
10	,, ,, Nut
11	,, ,, Guard
12	,, Locking Gib
13	,, ,, ,, Screw
14	Bottom Slide
15	,, ,, Gib
16	Spigot for Swivel Slide
17	Topslide
18	,, Gib
19	,, Screw
20	,, Keep
21	,, Index Ring Springs
22	,, ,, Ring
23	,, Handwheel
24	,, Ball Handle
25	,, Nut
26	Swivel Slide
27	,, ,, Bolts
28	Tool Holder
29	,, ,, Swivel Piece
30	,, ,, Collar
31	,, ,, Screw
32	,, ,, Clamp Plate
33	Carriage Screw Locknut
34	Topslide Screw Locknut
35	Carriage Screw Nut Fixing Screw
36	Carriage Screw Nut Fixing Screw Washer
37	Follow Rest
38	Follow Rest Fingers
39	,, ,, Screws
40	Follow Rest Fixing Screws $\frac{1}{4}$" x 2" Cap Hd.
41	Follow Rest Fixing Screw Washers
42	Balls for Index Rings
43	Follow Rest Finger Inserts
44	Topslide Index Locking Screw
45	Carriage Index Locking Screw
	Topslide Gib set-up Grub Screws $\frac{1}{4}$" x $\frac{3}{8}$"
	Topslide Gib Retaining Screws $\frac{1}{4}$" x $\frac{1}{2}$" Cap Hd.
	Bottom Slide Gib set-up Screws $\frac{1}{4}$" x $\frac{3}{8}$"
	Bottom Slide Gib Retaining Screws $\frac{1}{4}$" x 1" Cap Hd.
	Travelling Steady Finger Fixing Grub Screws $\frac{1}{4}$" x $\frac{3}{8}$"
	Back Carriage Gib Screws $\frac{1}{4}$" x 1$\frac{1}{2}$" Hex.
	Front Carriage Gib Screws $\frac{1}{4}$" x 1$\frac{1}{2}$" Cap Hd.
	Carriage Locking Gib Pin $\frac{1}{4}$" x 1" Mills
	Apron Fixing Screws $\frac{3}{8}$" x 1$\frac{1}{2}$" Cap Hd.
	Carriage Keep Fixing Screws $\frac{1}{4}$" x $\frac{3}{8}$" Cap Hd.
	Carriage Screw Guard Screws $\frac{1}{4}$" x $\frac{3}{8}$" Cap Hd.
	Swivel Bolt Nuts $\frac{1}{4}$" Hex.
	Topslide Nut Fixing Screw $\frac{1}{4}$" x $\frac{3}{8}$" Dog Point
	Topslide Keep Screws $\frac{1}{4}$" x $\frac{3}{8}$" Cap Hd.
	Trav. Steady Finger Locking Pads
	Oilers

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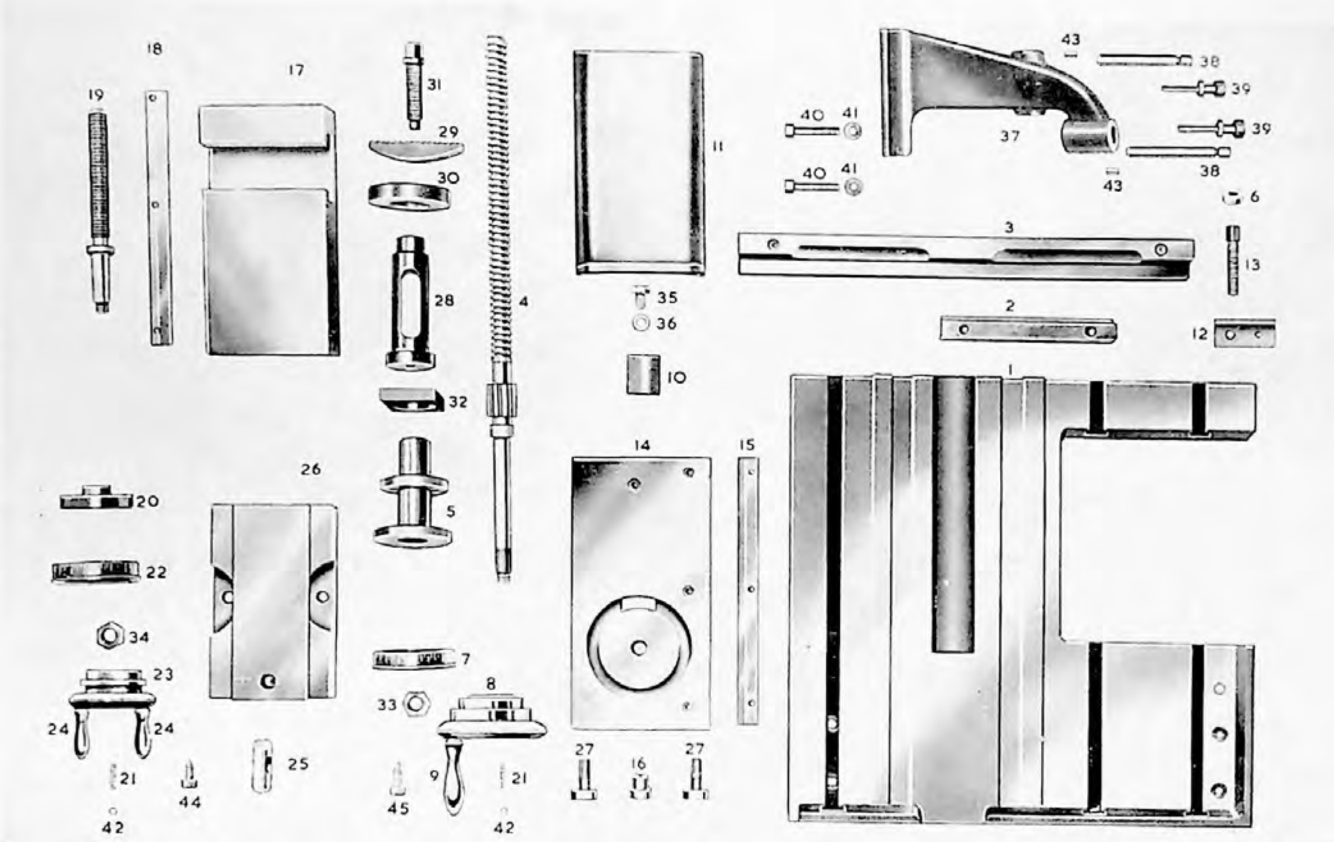

The Gap Bed Carriage

SPARE PARTS

GAP BED CARRIAGE

No.	Name of Part
1	Carriage
2	,, Front Strip
3	,, Back Strip
4	,, Screw
5	,, ,, Keep
6	Carriage Locking Screw Washer
7	Carriage Screw Index Ring
8	,, ,, Handwheel
9	,, ,, Ball Handle
10	,, ,, Nut
11	,, ,, Guard
12	,, Locking Strip
13	,, ,, ,, Screw
14	Bottom Slide
15	,, ,, Strip
16	Spigot for Swivel Slide
17	Topslide
18	Topslide Strip
19	,, Screw
20	,, Keep
21	,, Index Ring Springs
22	,, ,, Ring
23	,, Handwheel
24	,, Ball Handle
25	,, Nut
26	Swivel Slide
27	,, ,, Bolts
28	Tool Holder
29	,, ,, Swivel Piece
30	,, ,, Collar
31	,, ,, Screw
32	,, ,, Clamp Plate
33	Carriage Screw Locknut
34	Topslide Screw Locknut
35	Carriage Screw Nut Fixing Screw
36	Carriage Screw Nut Fixing Screw Washer
37	Follow Rest
38	,, ,, Fingers
39	Follow Rest Screws
40	,, ,, Fixing Bolt
41	,, ,, Fixing Washers $\frac{1}{4}$"
42	Balls for Index Rings
43	Follow Rest Finger Inserts
44	Topslide Index Locking Screw
45	Carriage Index Locking Screw
	Topslide Strip Set-up Grub Screws $\frac{3}{16}$" × $\frac{1}{4}$"
	Topslide Strip Retaining Screws $\frac{3}{16}$" × $\frac{1}{2}$" Cap Hd.
	Bottom Slide Strip Set-up Grub Screws $\frac{3}{16}$" × $\frac{1}{4}$"
	Bottom Slide Retaining Screws $\frac{3}{16}$" × 1" Cap Hd.
	Follow Rest Finger Fixing Grub Screws $\frac{3}{16}$" × $\frac{1}{4}$"
	Back Carriage Strip Screws $\frac{3}{16}$" × $1\frac{1}{2}$" Hex.
	Front Carriage Strip Screws $\frac{1}{4}$" × $1\frac{1}{2}$" Cap Hd.
	Carriage Locking Strip Pin $\frac{3}{16}$" × 1" Mills
	Apron Fixing Screws $\frac{3}{16}$" × $1\frac{1}{2}$" Cap Hd.
	Apron Fixing Screws $\frac{3}{16}$" × 1" Cap Hd.
	Follow Rest Fixing Bolt Nuts $\frac{1}{4}$"
	Carriage Keep Fixing Screws $\frac{3}{16}$" × $\frac{1}{4}$" Cap
	Carriage Screw Guard Screws $\frac{3}{16}$" × $\frac{1}{2}$" Cap Hd.
	Swivel Bolt Nuts $\frac{3}{16}$" Hex.
	Topslide Nut Fixing Screw $\frac{3}{16}$" × $\frac{1}{4}$" Dog Point
	Topslide Keep Screws $\frac{3}{16}$" × $\frac{1}{4}$" Cap Hd.
	Oilers

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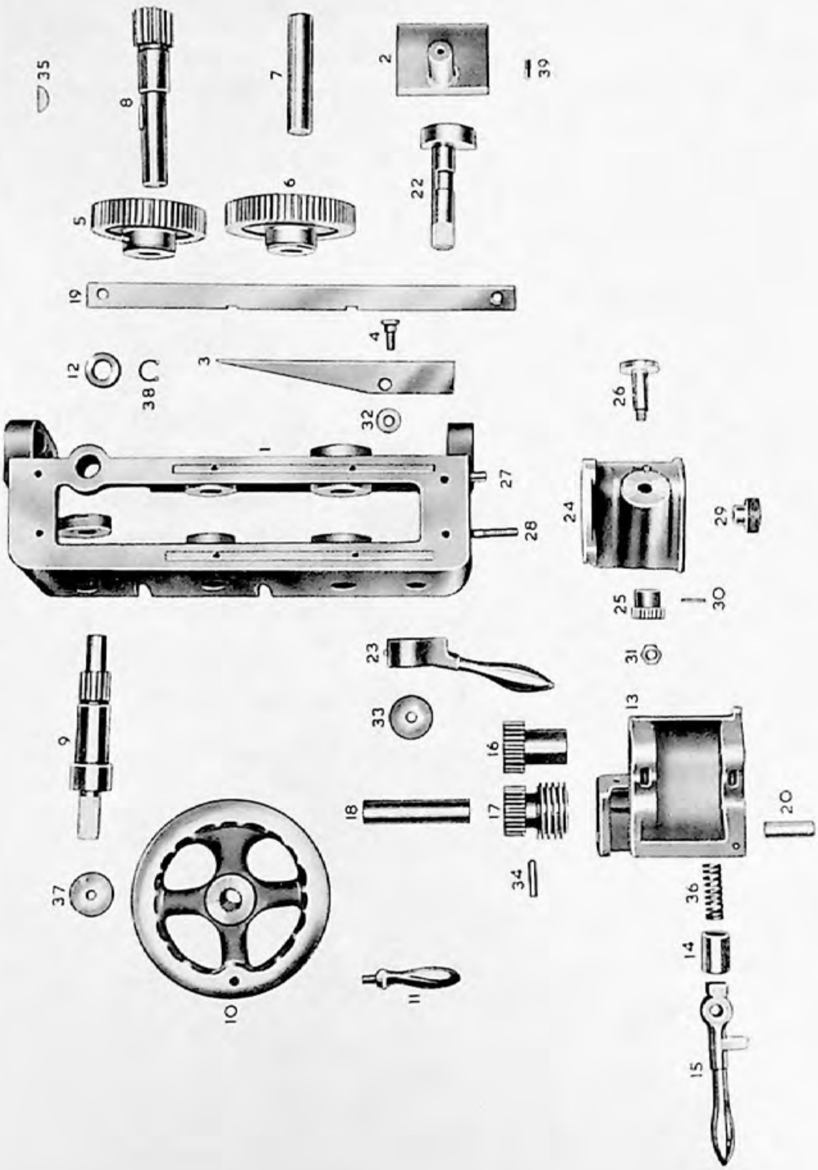
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The Apron

SPARE PARTS

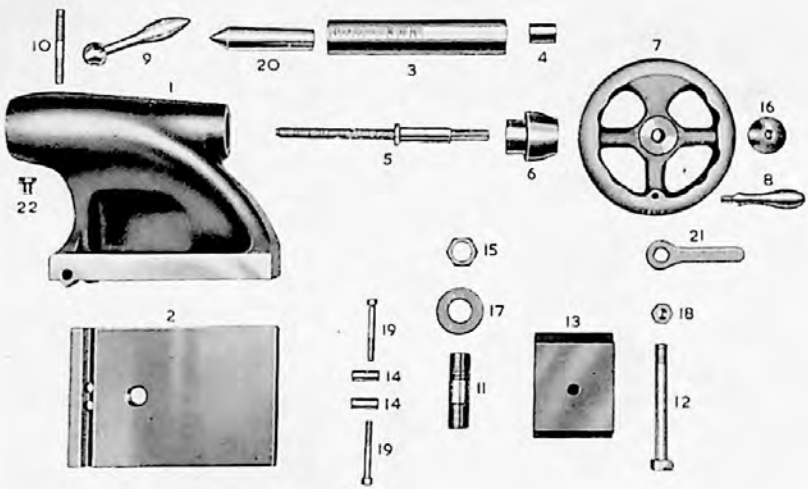
APRON

No.	Name of Part
1	Apron
2	Leadscrew Half Nut
3	Safety Strip
4	,, ,, Stud
5	Sliding Worm Wheel 54T
6	Cross Feed Worm Wheel 63T
7	Cross Feed Worm Wheel Shaft
8	Rack Pinion Shaft 12T
9	Racking Pinion Shaft 13T
10	Handwheel
11	,, Handle
12	Racking Pinion Shaft Washer
13	Worm Box
14	,, ,, Plunger
15	,, ,, Handle
16	,, ,, Pinion 18T
17	,, and Pinion 23T
18	,, ,, ,, Shaft
19	,, Box Stop Bar
20	,, ,, Handle Pin
22	Leadscrew Nut Ecc. Cam
23	Leadscrew Nut Ecc. Cam Handle
24	Chasing Dial Guard
25	,, ,, Gear 24T
26	Chasing Dial
27	,, ,, Guard Pin
28	,, ,, ,, Stud
29	,, ,, ,, Knurled Nut
30	Chasing Dial Gear Pin $\frac{3}{16}$" x $\frac{3}{4}$" Mills
31	Chasing Dial Nut
32	Safety Strip Stud Washer Stand $\frac{3}{16}$"
33	Domed Washer for Leadscrew Nut Handle
34	Pin for Worm and Pinion
35	Rack Pinion Shaft Key No. 9 Woodruff
36	Worm Box Plunger Spring
37	Domed Washer for Handwheel
38	Racking Shaft Circlip
39	Lead Nut Pin
	Lead Nut Handle Ball $\frac{1}{2}$" dia.
	Lead Nut Handle Spring
	Lead Nut Handle Screw $\frac{1}{4}$" x $\frac{3}{4}$" Cap Hd.
	Racking Shaft Domed Washer Screw $\frac{1}{4}$" x $\frac{3}{4}$" Cap Hd.
	Worm Box Handle Pin Grub Screw $\frac{1}{4}$" x $\frac{1}{4}$"
	Worm Box Stop Bar Fixing Screw $\frac{5}{16}$" x $\frac{1}{2}$" C/Sunk
	Worm Box Stop Bar Pin $\frac{1}{4}$" x 1" Mills
	Safety Strip Stop Screw $\frac{1}{4}$" x 1$\frac{1}{4}$" c/sunk
	Sliding Worm Wheel Grub Screw $\frac{1}{4}$" x $\frac{1}{4}$"
	Leadscrew Nut Handle Stop Screws $\frac{1}{4}$" x $\frac{3}{4}$" Cap Hd.
	Surf. Worm Wheel Shaft Grub Screw $\frac{1}{4}$" x $\frac{1}{4}$"

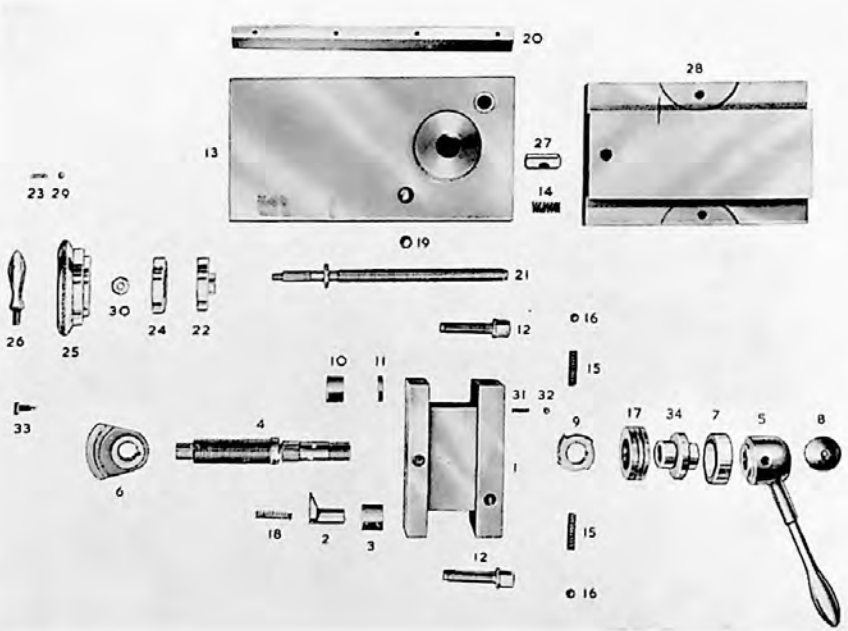
BED

Bed	Screws $\frac{1}{4}$" x $\frac{3}{4}$" Cap Hd.
Cabinet Base	Coolant Delivery Bracket Screws $\frac{1}{4}$" x 1" (Hex.)
Motor Plate	Drain Pipe Filter
Rack (Long)	,, ,, Plug
Rack (Short)	Control Panel
Rack Screws $\frac{3}{16}$" x $\frac{3}{8}$" Cap Hd.	Leadscrew Tail End Bush
Rack Dowel Pins 5/32" x $\frac{1}{2}$"	Spline Shaft Tail End Bush
Cabinet Fixing Bolts $\frac{1}{2}$" x 1$\frac{1}{2}$" Cap Hd.	Splash Guard
Cabinet Fixing Bolt Washers (Rubber)	Motor Anti-vibration Bolts
Electric Control Panel Screws $\frac{1}{4}$" x $\frac{3}{4}$" Cap Hd.	Micro Switches
Jacking Bolts $\frac{1}{2}$" x 1$\frac{1}{2}$" Hex.	Motor
Jacking Bolt Washers	,, Starter & Electrical Controls
Coolant Pump	Motor Pulley
Coolant Delivery Assembly	7$\frac{1}{4}$" 3-Jaw Chuck Long Taper Nose
,, ,, Bracket	10" 4-Jaw Chuck Long Taper Nose
Coolant Delivery Bracket	

When ordering spares please give Serial No. of machine, name of unit and Part No.



The Tailstock



The Square Turret Toolpost

SPARE PARTS

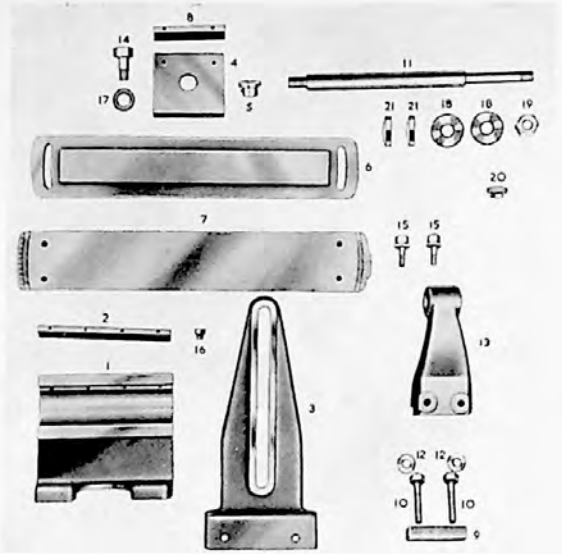
TAILSTOCK

No.	Name of Part
1	Tailstock
2	Base
3	Graduated Spindle
4	Spindle Nut
5	Screw
6	Keep
7	Handwheel
8	,, Handle
9	Spindle Locking Lever
10	,, ,, Stud
11	Hollow Stud
12	Clamping Bolt
13	Clamp Plate
14	Set-over Nuts
15	Hollow Stud Nut
16	Handwheel Domed Washer
17	Hollow Stud Washer
18	Clamping Bolt Nut
19	Set-over Screws $\frac{3}{16}$" x 2$\frac{1}{4}$" Cap Hd.
20	Centre
21	Ring Spanner
22	Spindle Tee Key
	Keep Retaining Grub Screw $\frac{3}{16}$" x $\frac{3}{8}$"
	Set-over Nuts Retaining Grub Screws $\frac{1}{4}$" x $\frac{3}{8}$"
	Domed Washer Screw Cap Hd. $\frac{1}{4}$" x $\frac{1}{2}$"
	Spindle Nut Fixing Pin $\frac{1}{4}$" x 1$\frac{3}{4}$"

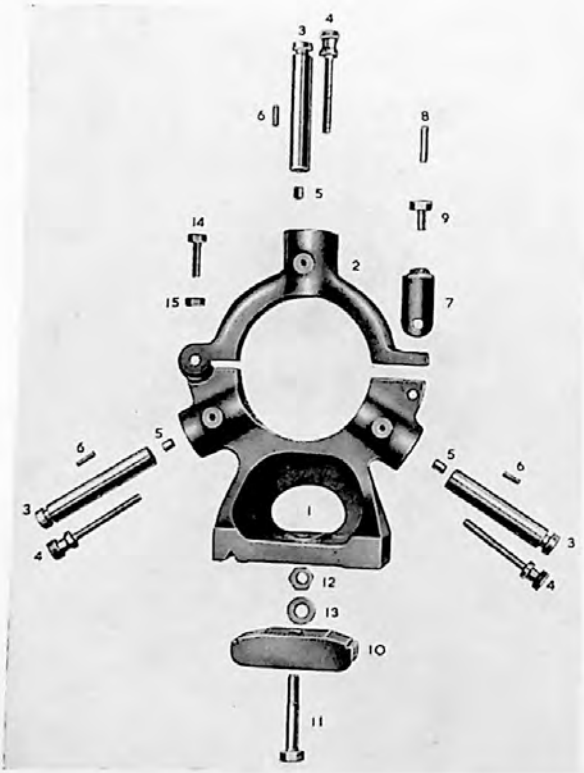
SQUARE TURRET TOOL POST

1	Tool Post
2	Plunger
3	,, Bush
4	Clamping Screw
5	,, Handle
6	Cam
7	Thrust Washer Cover
8	Domed Washer
9	Indexing Cam
10	Plunger Locating Bush
11	Bush Withdrawing Collar
12	Tool Screw
13	Topslide
14	Location Spring
15	Cam Spring
16	,, Ball
17	Thrust Washer
18	Plunger Spring
19	Location Ball
20	Topslide Gib
21	,, Screw
22	,, Keep
23	Index Ring Springs
24	Index Ring
25	Handwheel
26	Handwheel Handle
27	Topslide Nut
28	Swivel Slide
29	Balls for Index Rings
30	Topslide Screw Locknut
31	Preloading Springs
32	Preloading Spring 5/32" Balls
33	Topslide Index Locking Screw
34	Clamp Nut
	Domed Washer Screw $\frac{1}{4}$" x $\frac{3}{8}$" Cap Hd.
	Handle Fixing Pin $\frac{1}{4}$" x 1$\frac{3}{4}$" Mills
	Topslide Strip Set-up Grub Screws $\frac{3}{16}$" x $\frac{3}{8}$"
	Topslide Strip Retaining Screws $\frac{3}{16}$" x $\frac{1}{2}$" Cap Hd.
	Topslide Nut Fixing Screw $\frac{3}{16}$" x $\frac{3}{8}$" Dog Point
	Topslide Keep Screws $\frac{3}{16}$" x $\frac{3}{8}$" Cap Hd.
	Screws for Cam Springs $\frac{3}{16}$" x $\frac{3}{8}$" Grub Screws
	Cam Grub Screw $\frac{1}{4}$" x $\frac{1}{4}$"
	Oiler
	Clamp Nut Grub Screw $\frac{3}{16}$" x $\frac{1}{4}$"
	Ball for Screw

When ordering spares please give Serial No. of machine, name of unit and Part No.



The Taper Turning Attachment



Fixed Steady Rest

SPARE PARTS

TAPER TURNER

No.	Name of Part
1	Bracket
2	,, Strip
3	Connecting Slide
4	Slide
5	Clamping Thimble for Slide
6	Swivelling Plate
7	Plate
8	Slide Strip
9	Anchor Bracket Clamp Plate
10	Anchor Bracket Clamp Plate Bolts (Hex.) $\frac{3}{16}$" x 1$\frac{3}{4}$"
11	Anchor Bracket Clamp Plate Rod
12	Anchor Bracket Clamp Plate Washer (Stand. $\frac{3}{16}$")
13	Anchor Bracket
14	Saddle Screw Nut Fixing Bolt
15	Swivelling Plate Screws
16	,, ,, Spigot
17	Saddle Screw Nut Bolt Washer
18	Anchor Bracket Clamp Plate Rod Washers
19	Anchor Bracket Clamp Plate Rod Nut $\frac{3}{16}$" (Hex.)
20	Dust Cap for Nut Hole
21	Anchor Bracket Spherical Washers
	Bracket Fixing Screws $\frac{3}{8}$" x 1" Cap Hd.
	Bracket Dowel Pins $\frac{1}{4}$" x 1"
	Bracket Set-up Grub Screw $\frac{3}{16}$" x $\frac{3}{4}$"
	Strip Retaining Screw $\frac{3}{16}$" x $\frac{3}{16}$" Cap Hd.
	Slide Set-up Grub Screws $\frac{3}{16}$" x $\frac{3}{8}$"
	Slide Retaining Screw $\frac{3}{16}$" x $\frac{1}{4}$" Cap Hd.
	Connecting Slide Top Fixing Screw $\frac{3}{16}$" x $\frac{3}{8}$" Cap Hd.
	Connecting Slide End Fixing Screw $\frac{3}{16}$" x $\frac{3}{8}$" Cap Hd.

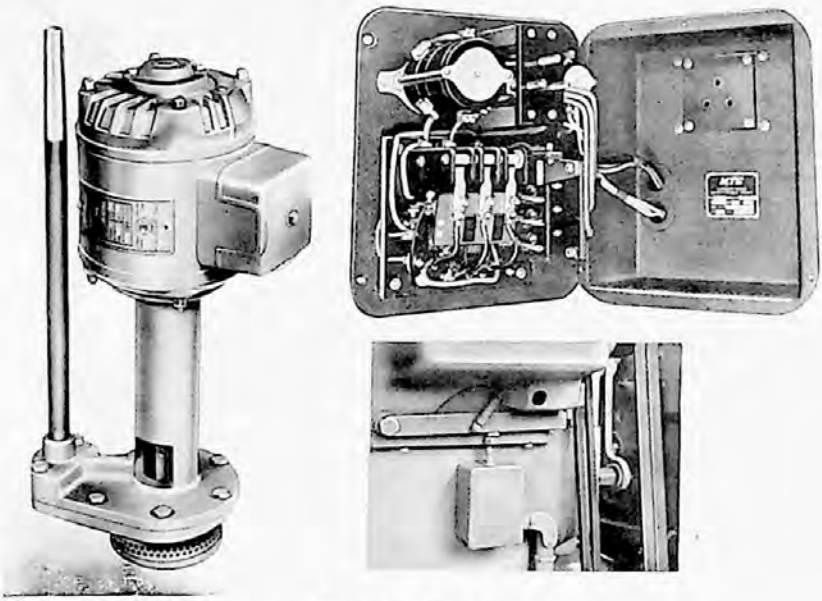
FIXED STEADY REST

1	Steady Rest
2	Top
3	Fingers
4	Screws
5	Finger Tips
6	,, Locking Screws $\frac{3}{16}$" x $\frac{3}{8}$" Grub Screw
7	Loop
8	,, Pin $\frac{3}{16}$" x 2$\frac{3}{8}$"
9	Loop Screw $\frac{3}{8}$" x 1$\frac{1}{4}$" (Hex.)
10	Clamp Plate
11	,, ,, Bolt
12	,, ,, Hex. Nut $\frac{3}{8}$"
13	,, ,, Washer $\frac{3}{8}$"
14	Hinge Bolt $\frac{3}{8}$" x $\frac{3}{4}$" (Hex.)
15	,, ,, Nuts $\frac{3}{8}$" (thin)
	Finger Locking Screw Pads

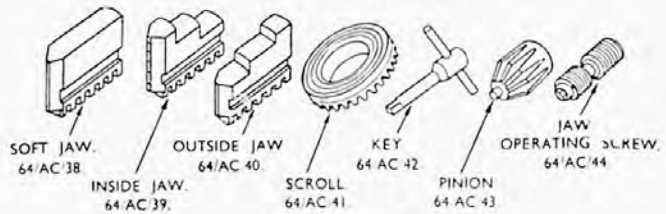
MECHANICAL CLUTCH

1	Clutch Pulley (Vee Belt)
2	,, Driving Plate
3	,, Shifter Bobbin
4	,, Ring
5	,, ,, Springs
6	,, Pulley Bearing
7	,, Pulley Bearing Bushes
8	,, Ring Expanding Stud
9	,, Ring Operating Lever
10	,, Driving Shaft Washer
11	,, Ring Fixing Stud
12	,, Shaft Circlip
13	,, Driving Shaft
14	,, Shifting Fork
15	,, Operating Rod
16	,, Operating Rod Sleeve
17	,, ,, Link
18	Clutch Operating Link Stud
19	,, ,, Lever
20	Clutch Pulley Bearing Spacer
21	Clutch Pulley Bearing Nut
22	Clutch Driving Shaft Oil Seal
23	Clutch Pulley Large Bearing
24	Clutch Pulley Small Bearing
25	Clutch Pulley Bearing Circlip
26	Clutch Ring Adjusting Screw
27	Clutch Ring Adjusting Screw Nut
28	Driving Shaft Thrust Collar
29	Washer on Clutch Shaft

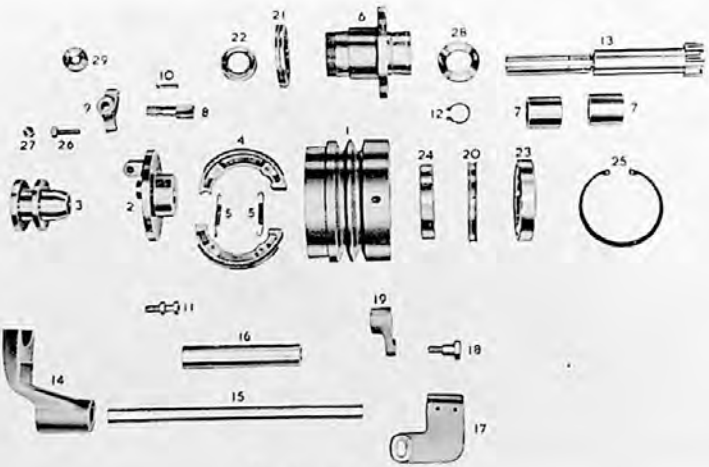
When ordering spares, please give Serial No. of machine, name of unit and Part No.



Electrical Equipment



Chuck Spares



Mechanical Clutch

MINOR TROUBLES

After several years of use it may be necessary to give attention to various mechanisms and parts which have had extra hard wear and thus tend to cause minor troubles.

Should chatter take place the following points should be observed and given the necessary attention:—

1. See that all slide strips are properly adjusted.
2. Check that there is no lift in the saddle by ensuring that the front and back strips are bedding correctly.
3. Make sure that the Chuck is a good fit on the spindle nose and has not worked loose.
4. The tool should have a keen cutting edge and not be allowed to get dull: see that it is set correctly on the centre line.

FEED FAILURE

This may be due to the shearing of the shear pin, which can easily be replaced (see page 9) or through the slipping clutch which is housed at the right hand end of the feed box. To adjust this, first release collar on the inside of the tail end bracket and withdraw feed shaft, which will allow the screw in the end to be adjusted, usually a quarter of a turn will be found sufficient.

LATHE NOT CUTTING PARALLEL

The lathe bed should be tested for level as described on page 15 and if necessary, the adjustments made.

ELECTRIC FAILURE

Points to check:

1. That the Micro Switches are in contact, that is, the tail end cabinet door must be unlocked and the change wheel guard in place.
2. See that the starting switch at the back of the head is working correctly.
3. Panel not holding on, check auxiliary contact on main contactor and any loose connections.
4. Check that the three fixing screws in the front of the panel are firmly screwed and that the three pin plug locates in its socket.

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