

**Dean Smith & Grace**  
LIMITED

**KEIGHLEY ENGLAND**

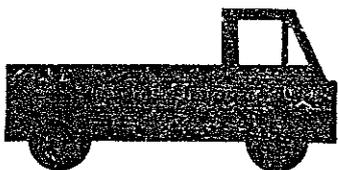
# **OPERATOR'S INSTRUCTIONS**

TYPE 13 - 1  
EIGHTH INSTRUCTION BOOK  
ALL MACHINES DELIVERED AFTER 10<sup>TH</sup> MARCH 1969

IMPORTANT

THIS MACHINE MUST NOT BE CLEANED DOWN BY USING AN AIRLINE. CONTRAVENTION OF THIS INSTRUCTION MAY PREJUDICE THE MACHINE WARRANTY.

## 1.1 TEMPORARY PREVENTION OF CORROSION



### LATHES FOR HOME ORDERS.

All external mechanisms, working surfaces and bright parts of the lathe are protected with SHELL ENSIS FLUID 260.

It is essential that the preserving fluid be removed from the bedways and slideways and that they be wiped perfectly clean and oiled with the specified lubricating oil before attempting to move the saddle, tailstock, cross or copying slides.

Use only white spirits or turpentine to remove preserving fluid.

The headstock and gearbox are full of oil when the lathe is delivered. Remove the sealing tape from the breather hole on the oil sight at the rear of the headstock.



### LATHES FOR EXPORT ORDERS.

All external mechanisms, working surfaces and bright parts of the lathe are protected with SHELL ENSIS FLUID 260.

It is essential that the preserving fluid be removed from the bedways and slideways and that they be wiped perfectly clean and oiled with the specified lubricating oil before attempting to move the saddle, tailstock, cross or copying slides.

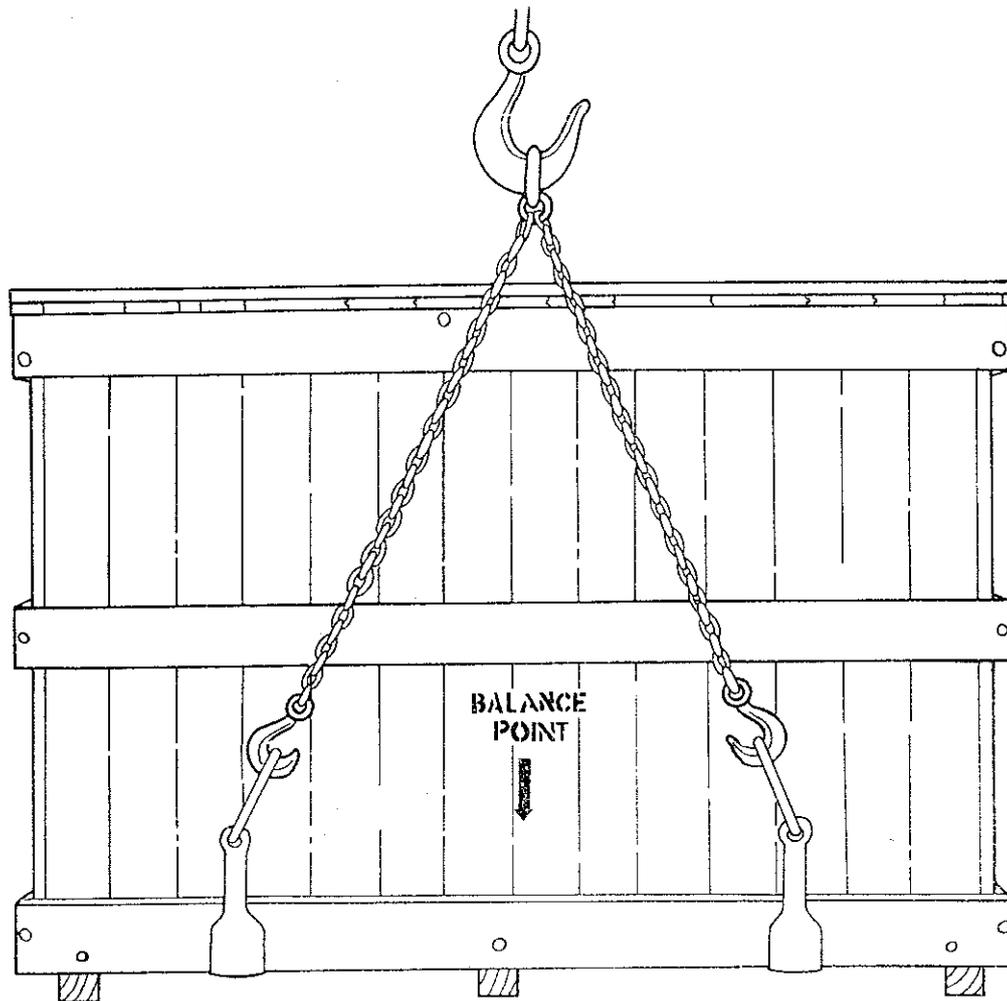
Use only white spirits or turpentine to remove preserving fluid.

All internal mechanisms and working surfaces of the lathe are protected with ALEXANDER DUCKHAMS' PRESERVING FLUID D. F. 2. It is unnecessary to remove this before filling up with the specified lubricating oils.

Remove the linen bags of SILICA GEL granules from under the headstock and gearbox lids.

Before putting electrical equipment into operation remove protective paper from behind control panel door.

## 1.2 OVERSEAS SHIPMENT



Lathes for transportation by sea are securely crated to prevent damage. The headstock end and the point of balance are marked on the crate to facilitate lifting.

Lowering the crate on to three wood blocks as shown above will assist easy removal of the lifting slings and dismantling of the crate.

Release the top by removing coach screws along each edge. The sides can then be separated by again removing the coach screws along each edge.

The lathe is bolted to the base of the crate through some of the normal fixing holes. These bolts are clearly indicated by arrows and letter 'B' painted on the crate base.

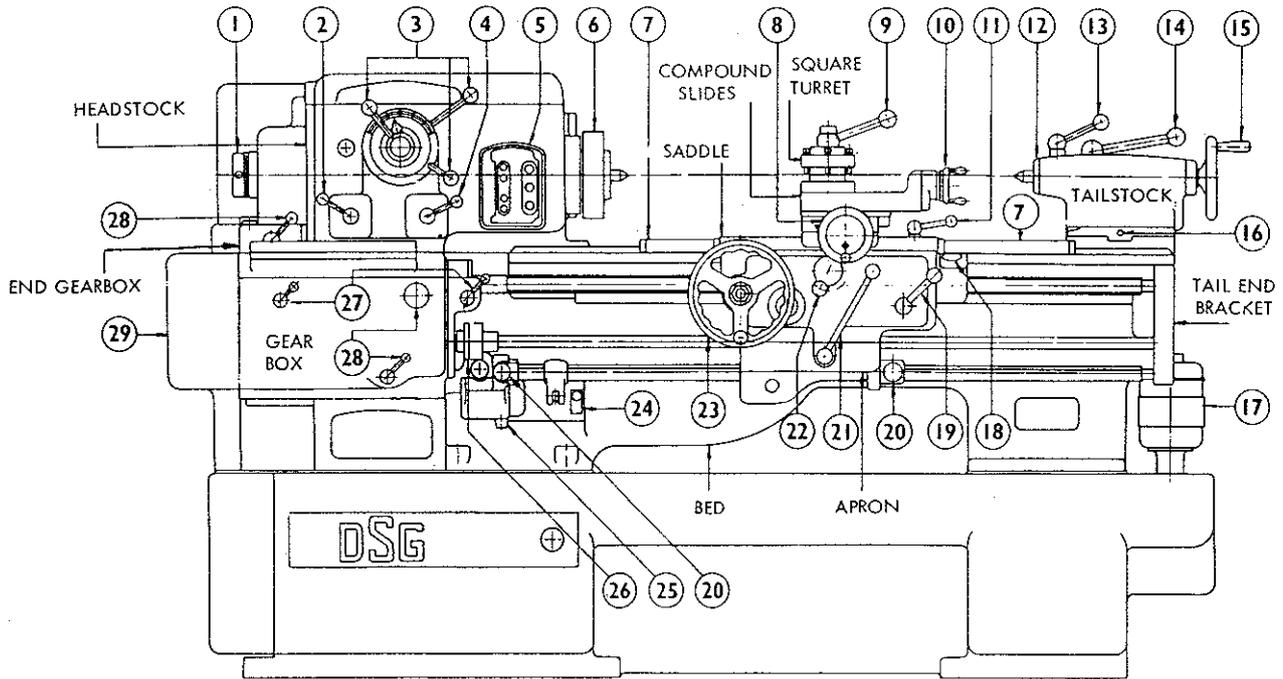
### IMPORTANT.

Do not attempt to lift the lathe before reading sections 1 and 2 of the Instruction Book.

ALL TYPES.

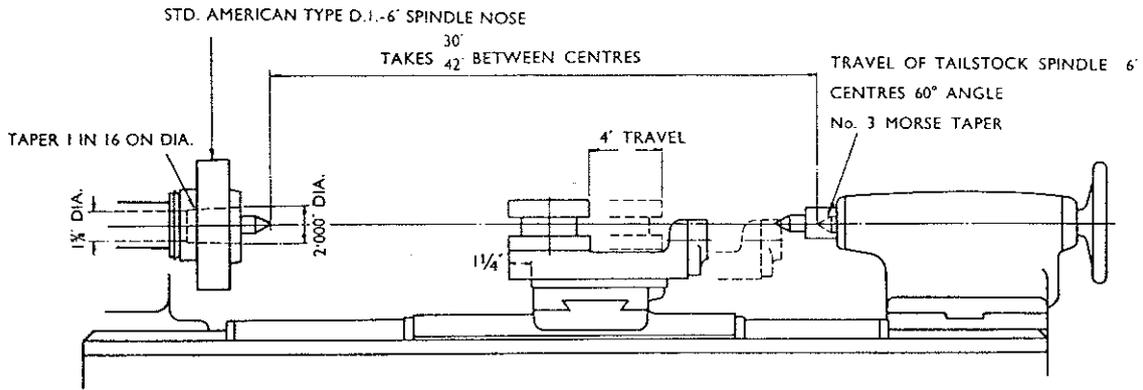
## 1.3 GENERAL DESCRIPTION

PLEASE DO NOT USE THIS SECTION WHEN ORDERING SPARES. SEE SECTION 11

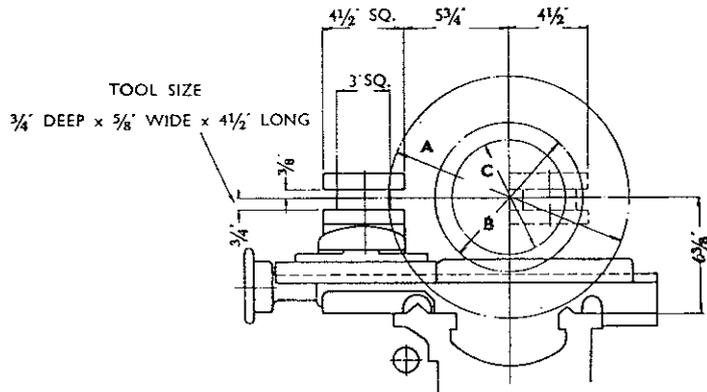


1. Combined work steady for bar work and multi-start indexing dial.
2. Feed reverse and R.H. or L.H. thread selecting lever.
3. Spindle speed change levers.
4. Coarse pitch and fine feed lever.
5. Push button unit.
6. American D1-6" Camlock spindle nose.
7. Bed covers and wipers.
8. Cross slide handwheel.
9. Square turret locking handle.
10. Tool slide handwheel.
11. Saddle locking lever.
12. Tailstock spindle wiper.
13. Spindle locking lever.
14. Tailstock locking lever.
15. Tailstock handwheel.
16. Setting screws for taper work.
17. Coolant pump.
18. Screwcutting dial.
19. Leadscrew nut operating lever.
20. Clutch, brake and reverse levers.
21. Feed engage and trip lever.
22. Cross feed or longitudinal feed selecting lever
23. Apron handwheel.
24. Clutch centre position stop.
25. Oil drain and support bracket.
26. Slip coupling for feed shaft.
27. Thread change levers.
28. Feed change levers and knob.
29. Change gear cover.

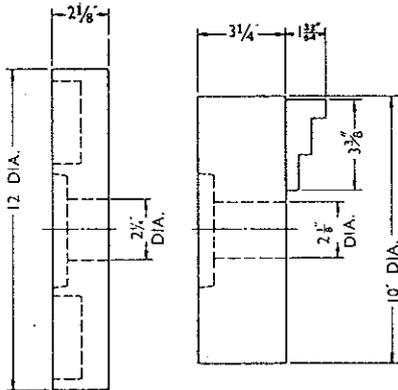
# 1.4 CAPACITY CHART



STATIONARY STAY 5" MAX. DIA.  
 TRAVELLING STAY 3" MAX. DIA.  
 TAPER TURNING MAX. LENGTH 12"  
 TAPER TURNING MAX. ANGLE 20° INCLUDED



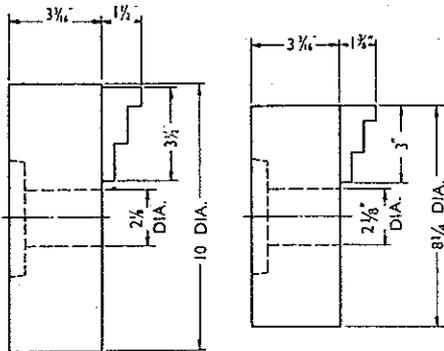
"A" SWING OVER BED 13 1/2" DIA.  
 "B" SWING OVER SADDLE (GUARD REMOVED) 8 1/4" DIA.  
 "C" SWING OVER SADDLE GUARD 6 1/2" DIA.



10" DIA. 4-JAW INDEPENDENT  
 STEEL CHUCK

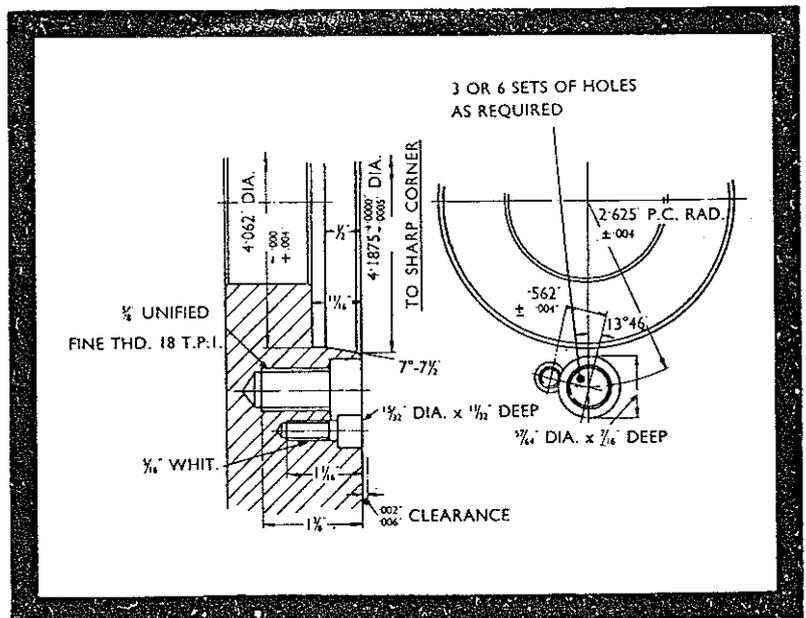
12 DIA. FACEPLATE

DIMENSIONS FOR TAPER, STUD POSITIONS,  
 ETC, TO SUIT D.1 - 6" SPINDLE NOSE. ▼



10 DIA. 3-JAW STEEL  
 SCROLL CHUCK

8 1/4" DIA. 3 JAW STEEL  
 SCROLL CHUCK



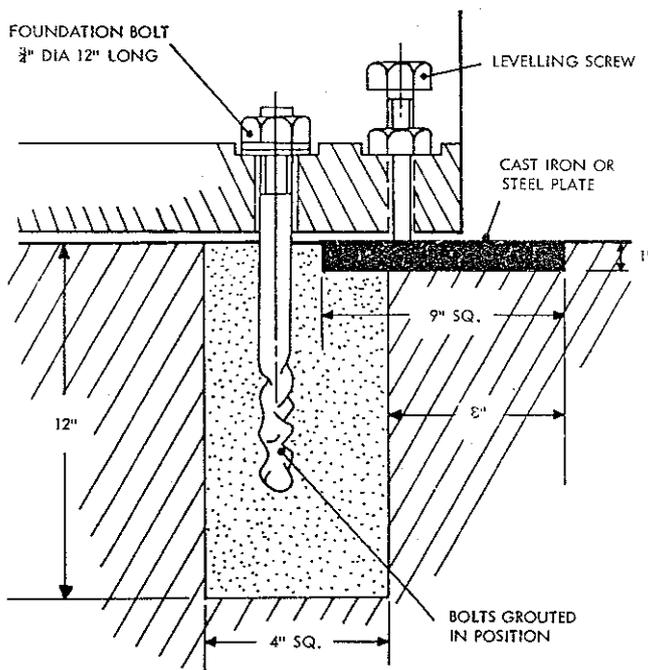
## 2.1 FOUNDATIONS

### LIGHT DUTY CONDITIONS

If the machine is only intended for light duty and out of balance workpieces are not anticipated, the rigid construction of the base eliminates the need for bolting down. The floor must however be firm and preferably of concrete. Cast iron or steel plates should be provided under each levelling screw as shown below.

### HEAVY DUTY

For heavy duty, or when out of balance components are anticipated, the machine should be firmly bolted to a substantial foundation as shown on the foundation plan. An appropriate copy of this plan is forwarded prior to delivery of the lathe.



The position of the machine should ensure adequate space for access to electrical equipment, end covers, etc., as indicated on the foundation plan.

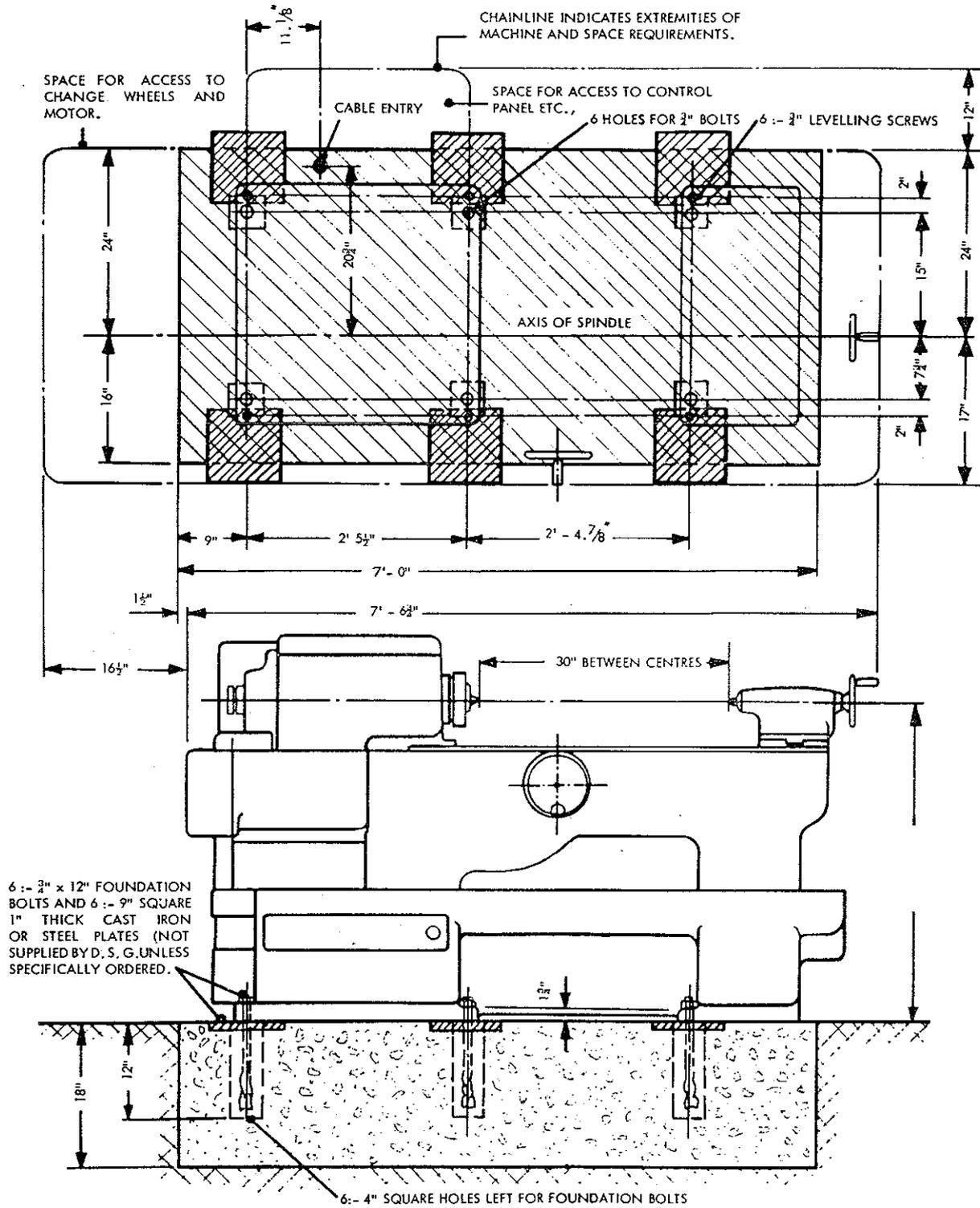
Ensure that concrete foundations have aged before placing the lathe in position. Never grout round the base of the machine as this prevents subsequent re-levelling.

Foundation bolts and plates are not supplied with the machine unless specifically ordered. Do not attempt to cement the bolts into the foundation prior to placing the lathe in position.

The foundation should be arranged to include the cast iron or steel plates and 4" sq. bolt holes as shown above and positioned as shown in the foundation plan. When positioning lift the lathe and suspend a foundation bolt in each of the six bolt holes. To do this it is necessary to remove the bottom cover from the headstock end of the lathe. Lower the machine carefully and grout the foundation bolts with concrete. Make sure bolts are free in each hole. When the grouting has aged the levelling screws should be jacked on to the cast iron plates.

## 2.2 TYPE 13-1 x 30 FOUNDATION PLAN

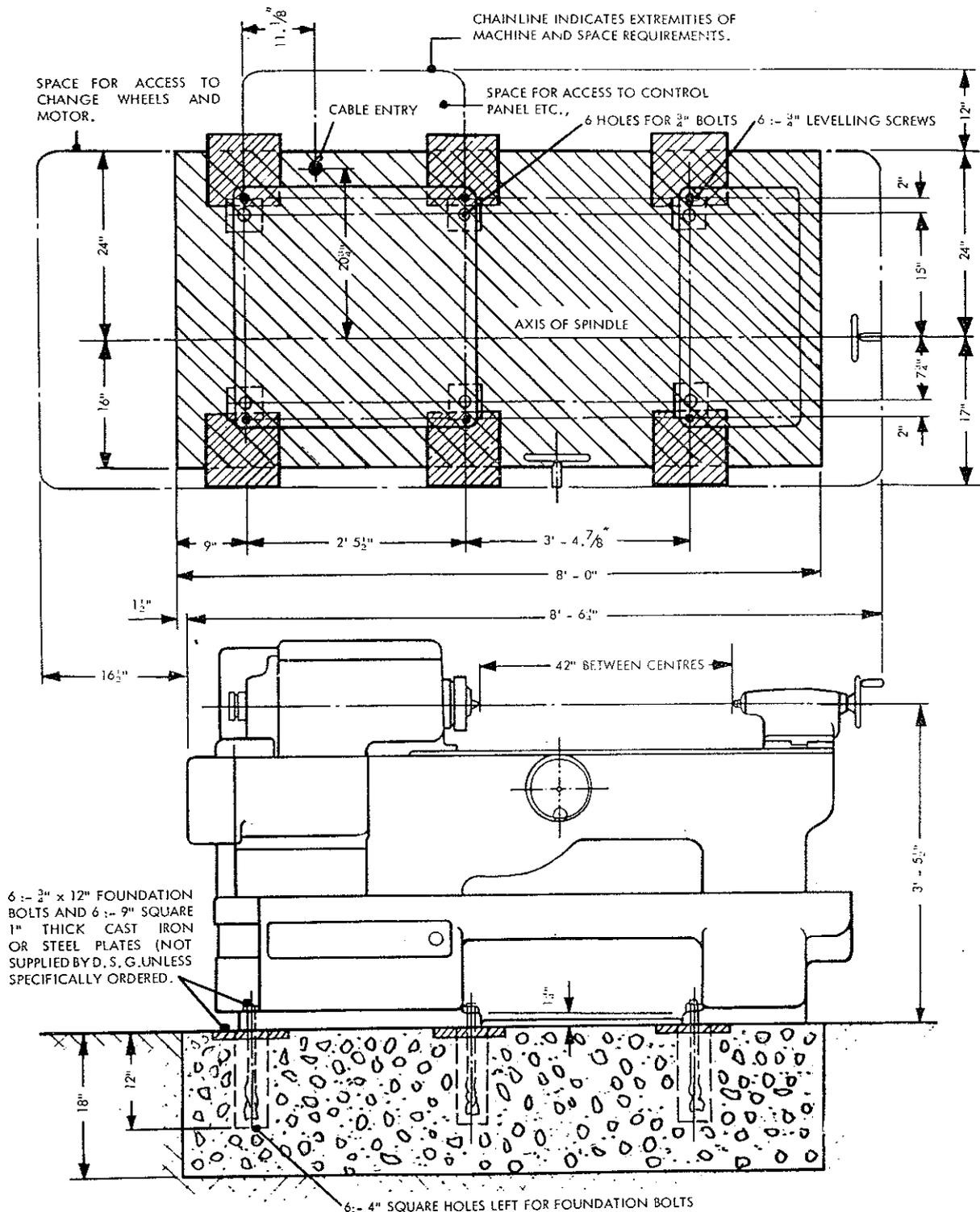
TYPE 13-1 LATHES 30" BETWEEN CENTRES.



For further information on foundation, lifting and levelling see Instruction Book. Dimensions for bolt centres are theoretical and may vary slightly for each machine.

## 2.21 TYPE 13-1 x 42 FOUNDATION PLAN

TYPE 13-1 LATHES 42" BETWEEN CENTRES.

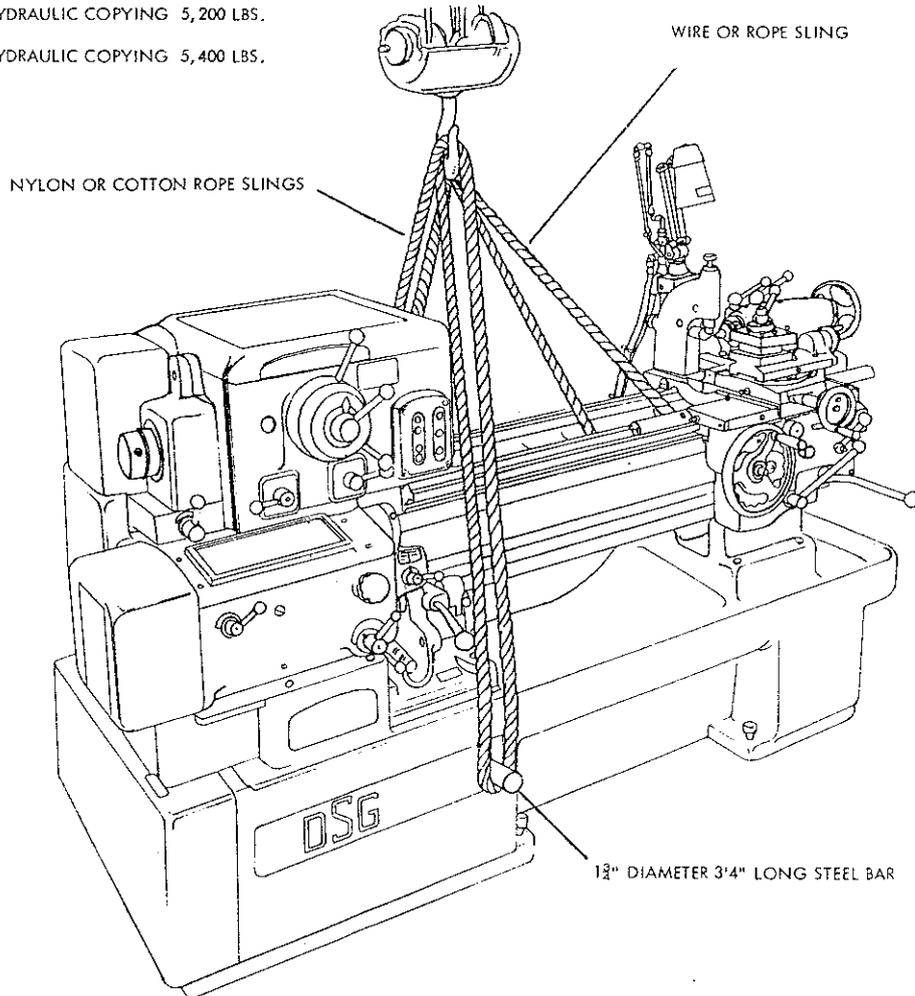


For further information on foundation, lifting and levelling see Instruction Book. Dimensions for bolt centres are theoretical and may vary slightly for each machine.

## 2.4 LIFTING AND REMOVAL OF RUST PREVENTATIVE

### APPROXIMATE NET WEIGHTS:

TYPE 13/1 x 30	4,900 LBS.
TYPE 13/1 x 42	5,100 LBS.
TYPE 13/1 x 30 WITH HYDRAULIC COPYING	5,200 LBS.
TYPE 13/1 x 42 WITH HYDRAULIC COPYING	5,400 LBS.



### LIFTING

For safe lifting the slings should be arranged as shown above. When leaving our plant the saddle is positioned for balanced lifting and should not be moved. Avoid setting the machine down hard on the floor otherwise accuracy may be impaired.

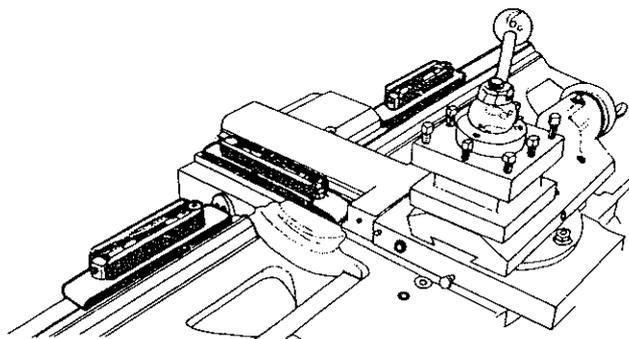
### REMOVAL OF RUST PREVENTATIVE (See Section 1.1)

All parts subject to corrosion are protected by a rust preventative. This can be removed with white spirit or turpentine. Do not use a scraper or any instrument liable to damage machined surfaces. Do not use petrol (gasoline) or paraffin (kerosene).

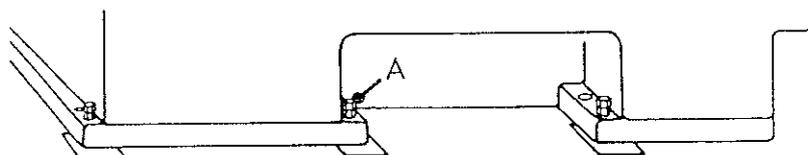
NOTE: IF CHAINS ARE USED FOR LIFTING INSERT WOOD PACKING TO PREVENT DAMAGE TO BEDWAYS AND SHAFTS.

## 2.5 LEVELLING

Your lathe will only turn accurately if attention is given to accurate levelling. Use only a precision spirit level reading 0.0005" in 10".



The level should be placed crosswise on saddle top and lengthwise on the back way of the bed, the saddle being moved along the bed for checking crosswise at the different positions. (If hydraulic copying, remove the front compound slides and place the level on top of the cross slide.) The bed should be levelled initially in the crosswise direction and from end to end in the lengthwise direction using the front and rear adjusting screws at extreme ends of lathe only. When this has been done move the saddle up to the chuck, tighten the front screw at 'A' until the bubble in the level just moves i.e. (2 - divisions if level reads 0.0005" per division in 10") and bring back to level using corresponding rear screw.



NOTE. Locknuts on adjusting screws should be tightened after each adjustment. It is also desirable to keep the machine as near the floor as possible.

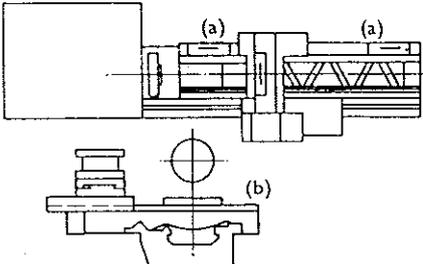
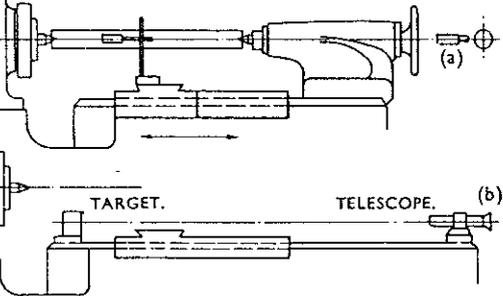
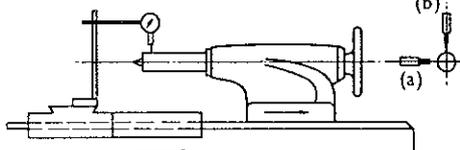
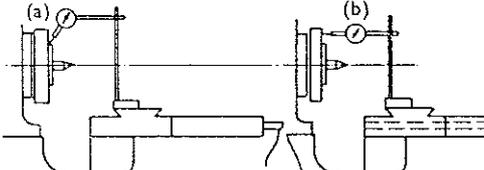
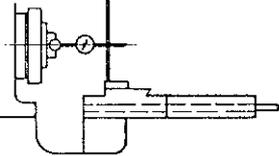
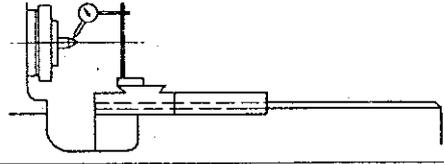
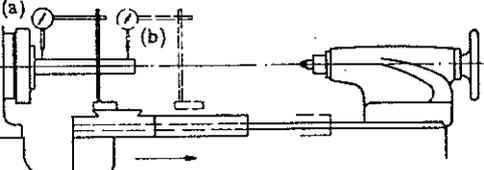
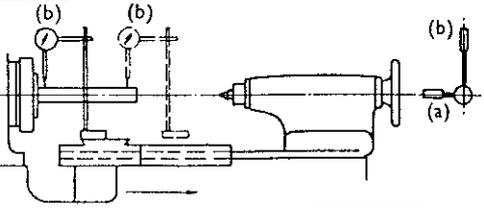
When levelling tests are correct the holding down bolts should be tightened and the level rechecked. At no time should levelling be corrected with the holding down bolts nipped tight. It should be realised that the whole purpose of the levelling operation is to endeavour to reproduce the conditions under which a lathe has been built and inspected at the D.S.G. plant. Here all testing is done with the bed levelled but not bolted down and therefore, free from stress. The level of the lathe should be checked periodically, say every six months.

### TURNING TEST.

Before running read carefully sections 3, 4, & 5.

Take a finishing cut along a bar projecting 12" from the chuck and check diameter by micrometer. The bar should be parallel to within .0004" on diameter in 9". If outside this limit check on top and side of bar using a dial indicator from saddle as parallelism of spindle test on inspection sheet, allowing for taper of bar. Adjust levelling screws of extreme LEFT HAND END of the bed only to correct any inaccuracy. Take a further light cut to check result.

## 2.51 INSPECTION SHEET

TEST TO BE APPLIED	TEST DIAGRAM.	LIMIT ALLOWED	METRIC
<p>1. LEVELLING OF BED.</p> <p>(a) LONGITUDINAL DIRECTION. SLIDWAYS SHOULD BE STRAIGHT IN A VERTICAL PLANE.</p> <p>(b) TRANSVERSE DIRECTION. SLIDWAYS SHOULD BE IN THE SAME PLANE.</p>		<p>CONVEX  <math>.00025''</math>            CONCAVE  <math>.0005''</math>            (a) PER FOOT</p> <p><math>\pm .00025''</math>            (b) PER FOOT</p>	<p>0.02 PER            1000 mm.</p> <p>0.04 PER            1000 mm.</p> <p>0.02 PER            1000 mm</p>
<p>2. BED SLIDWAYS.</p> <p>(a) SHORT BEDS. STRAIGHTNESS OF SADDLE MOVEMENT IN A PLANE DEFINED BY THE AXIS OF THE CENTRES AND THE TOOL POINT.</p> <p>(b) LONG BEDS. STRAIGHTNESS OF SLIDEWAYS</p>		<p><math>.00012''</math>            (a) PER FOOT</p> <p><math>.00025''</math>            (b) PER FOOT</p>	<p>0.01 PER            1000 mm</p> <p>0.02 PER            1000 mm</p>
<p>3. TAILSTOCK. PARALLELISM OF TAILSTOCK AND SADDLE MOVEMENTS.</p> <p>(a) IN A HORIZONTAL PLANE.</p> <p>(b) IN A VERTICAL PLANE.</p>		<p><math>.00025''</math>            (a) PER FOOT</p> <p><math>.00025''</math>            (b) PER FOOT</p>	<p>0.006 PER            300 mm</p>
<p>4. HEADSTOCK.</p> <p>(a) RUN-OUT OF SPINDLE NOSE EXTERNAL TAPER.</p> <p>(b) RUN-OUT OF FLANGE FACE.</p>		<p><math>.0004''</math>            (a)</p> <p><math>.0004''</math>            (b)</p>	<p>0.01 mm</p> <p>0.01 mm</p>
<p>5. PERIODIC AXIAL DISPLACEMENT OF HEADSTOCK SPINDLE.</p>		<p><math>.0003''</math></p>	<p>0.0075 mm</p>
<p>6. HEADSTOCK. RUN-OUT OF CENTRE POINT.</p>		<p><math>.0004''</math></p>	<p>0.01 mm</p>
<p>7. RUN-OUT OF AXIS OF WORK SPINDLE INTERNAL TAPER.</p> <p>(a) UP TO SPINDLE NOSE.</p> <p>(b) AT NOT MORE THAN 12 INS. FROM NOSE.</p>		<p>(a) <math>.0000''</math> TO <math>.0004''</math></p> <p>(b) <math>.0000''</math> TO <math>.0008''</math></p>	<p>0.01 mm</p> <p>0.02 mm</p>
<p>8. PARALLELISM OF SPINDLE AXIS TO SADDLE LONG — ITUDINAL MOVEMENT.</p> <p>(a) IN A HORIZONTAL PLANE. TOWARDS OPERATOR AT FREE END.</p> <p>(b) IN A VERTICAL PLANE RISING TOWARDS FREE END.</p>		<p>(a) <math>.0000</math> TO <math>.00025''</math> PER FOOT</p> <p>(b) <math>.0000''</math> TO <math>.0008''</math> PER FOOT</p>	<p>0.006 PER            300 mm</p> <p>0.02 PER            300 mm</p>

## SHELL LUBRICANTS

The following changes have been made to grade designations in order to comply with ISO Viscosity Classifications.

Viscosities, Specific Gravities, Flash points and other physical characteristics remain unchanged.

**Vitrea oil 25 becomes Vitara oil 32**

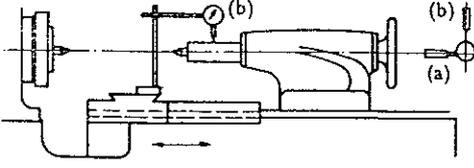
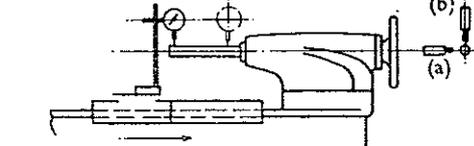
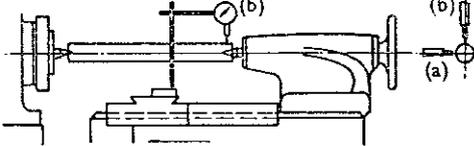
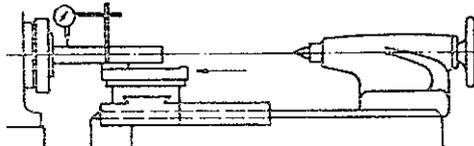
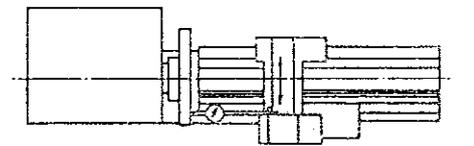
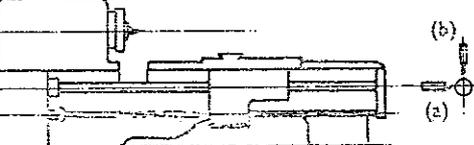
**Tonna oil 33 becomes Tonna oil T68**

**Tellus oil 33 becomes Tellus oil 68**

OIL TYPE	HEADSTOCK	THREAD & FEEDBOX	APRON, SADDLE & SLIDEWAYS	ELEC. TURRET	GEARBOX	REVOLVING CENTRE	HYD COPY UNIT	OIL NIPPLES	AIR LUBE
SHELL	VITREA 32	TONNA T68	TONNA T68	VITREA 32	TONNA T68	ALVANIA EP 2	TELLUS 68	TONNA T68	TELLUS R10
CASTROL	HYSPIN AWS 32	MAGNA BD68	MAGNA BD68	HYSPIN AWS 32	MAGNA BD68	SPHEEROL EPL 2	HYSPIN AWS 68	MAGNA BD68	HYSPIN AWS 10
GULF	HARMONY 32AW	GULFWAY 68	GULFWAY 68	HARMONY 32AW	GULFWAY 68	GULFCROWN EP 2	HARMONY 68AW	GULFWAY 68	HARMONY 10AW
FINA	HYDRAN 32	ARTAC EP68	ARTAC EP68	HYDRAN 32	ARTAC EP68	MARSON EPL2	HYDRAN 68	ARTAC EP68	CIRKAN 10
ESSO	NUTO H32	FEBIS K68	FEBIS K68	NUTO H32	FEBIS K68	BEACON EP2	NUTO H68	FEBIS K68	NUTO H15
TEXACO	RANDO 32	WAY LUBRICANT 68	WAY LUBRICANT 68	RANDO HD32	WAY LUBRICANT 68	MULTIFAK EP2	RANDO HD68	WAY LUBRICANT 68	SPINTEX 10
BP	ENERGOL HLP 32	MACCURAT 68	MACCURAT 68	ENERGOL HLP 32	MACCURAT 68	ENERGREASE LS EP2	ENERGOL HLP 68	MACCURAT 68	ENERGOL HLP 10
ELF	ELFOLNA HM32	MOGLIA 68	MOGLIA 68	ELFOLNA HM32	MOGLIA 68		ELFOLNA HM68	MOGLIA 68	ELFOLNA HM10
MOBIL	DTE 24	VACTRA NO 2	VACTRA NO 2	DTE 24	VACTRA NO 2	MOBILPLEX 47	DTE 26	VACTRA NO 2	DTE 10
OIL WELL	WICKLOW 32	ULTRATAK 68	ULTRATAK 68	WICKLOW 32	ULTRATAK 68		WICKLOW 68	ULTRATAK 68	WICKLOW 32

SLIDEWAY VOGEL UNIT Q8 HEAVYBEAR 68 or OIL WELL ULTRATAK HEAVY 68.

## 2.52 INSPECTION SHEET continued

TEST TO BE APPLIED	TEST DIAGRAM.	LIMIT ALLOWED	METRIC
<p>9. TAILSTOCK. PARALLELISM OF THE AXIS OF TAILSTOCK QUILL TO SADDLE MOVEMENT.</p> <p>(a) IN A HORIZONTAL PLANE TOWARDS OPERATOR AT FREE END.</p> <p>(b) IN A VERTICAL PLANE RISING TOWARDS FREE END.</p>		<p>(a) <math>-.0000''</math> TO <math>-.0005''</math></p> <p>(b) <math>-.0000''</math> TO <math>-.0005''</math></p>	<p>0.012 mm</p> <p>0.012 mm</p>
<p>10. PARALLELISM OF TAILSTOCK QUILL TAPER BORE TO SADDLE MOVEMENT.</p> <p>(a) IN A HORIZONTAL PLANE</p> <p>(b) IN A VERTICAL PLANE</p>		<p>(a) <math>\pm .001''</math> PER FOOT</p> <p>(b) <math>\pm .001''</math> PER FOOT</p>	<p>0.025 mm. PER 300 mm.</p> <p>0.025 mm. PER 300 mm.</p>
<p>11. CENTRES. DIFFERENCE BETWEEN HEADSTOCK AND TAILSTOCK.</p> <p>(a) IN A HORIZONTAL PLANE TOWARDS OPERATOR AT TAILSTOCK.</p> <p>(b) IN A VERTICAL PLANE RISING TOWARDS TAILSTOCK.</p>		<p>(a) <math>-.0000''</math> TO <math>-.00025''</math></p> <p>(b) <math>-.0000''</math> TO <math>-.0008''</math></p>	<p>0.006 mm</p> <p>0.02 mm</p>
<p>12. TOP SLIDE. PARALLELISM OF SPINDLE AXIS AND LONGITUDINAL MOVEMENT OF TOP SLIDE.</p>		<p><math>-.0008''</math> PER FOOT</p>	<p>0.02 PER 300 mm</p>
<p>13. MOVEMENT OF THE CROSS SLIDE TO SPINDLE AXIS.</p>		<p><math>-.0000''</math> TO <math>-.0008''</math> PER FOOT FLAT TO CONCAVE ONLY</p>	<p>0.02 PER 300 mm</p>
<p>14. LEADSCREW AXIAL DISPLACEMENT.</p>		<p><math>-.0004''</math></p>	<p>0.01 mm</p>
<p>15. PARALLELISM OF LEADSCREW AXIS TO BED SLIDWAYS.</p> <p>(a) IN A HORIZONTAL PLANE.</p> <p>(b) IN A VERTICAL PLANE.</p>		<p>(a) <math>-.004''</math></p> <p>(b) <math>-.004''</math></p>	<p>0.1 mm</p> <p>0.1 mm</p>
<p>16. SQUARE TURRET. REPEATABILITY.</p>		<p><math>-.001''</math></p>	<p>0.025 mm</p>
<p>17. SCREWCUTTING.</p>	<p style="text-align: center;">IN ANY FOOT</p>	<p><math>\pm .0010''</math></p>	<p>0.025 mm PER 300 mm</p>
<p>18. SCREWCUTTING.</p>	<p style="text-align: center;">OVERALL</p>	<p><math>+.003''</math> <math>-.002''</math></p>	<p><math>+0.075</math> mm <math>-0.05</math> mm</p>
<p>19. MANDREL HELD IN COLLET CHUCK.</p>		<p><math>-.001''</math> PER INCH PROJECTION</p>	<p>0.025 PER 25 mm</p>

GEARED SCROLL 3-JAW CHUCKS MODEL N° 278D

*Guarantee*

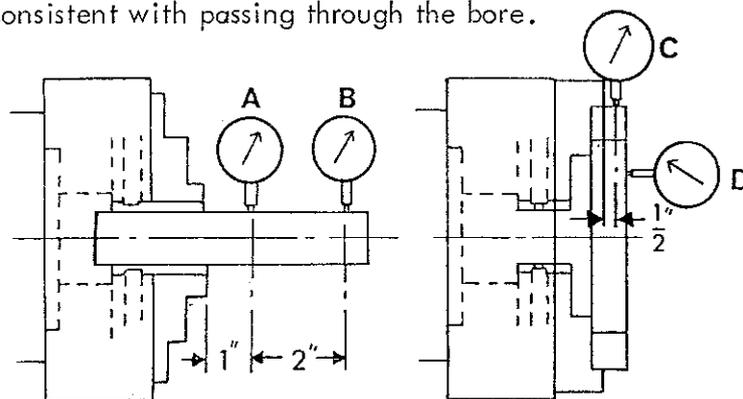
We hereby authorise accredited stockists of Pratt Chucks to replace this Chuck free of all charge should failure occur, due either to faulty material or workmanship, within a period not exceeding two years from date of purchase. In cases where a reasonable doubt exists the Chuck must be returned for examination prior to a replacement being made.

F. Pratt & Co. Ltd., earnestly desire that this tool gives every satisfaction and would be grateful if any complaint which may arise be brought immediately to their attention.

**ACCURACY**

This Chuck has been manufactured according to the limits of accuracy laid down in British Standards 1983 : 1953, which states :-

"The test bars used shall be capable of being passed through the bore in the Chuck body, and may be of any diameter up to the maximum capacity of the Chuck consistent with passing through the bore.

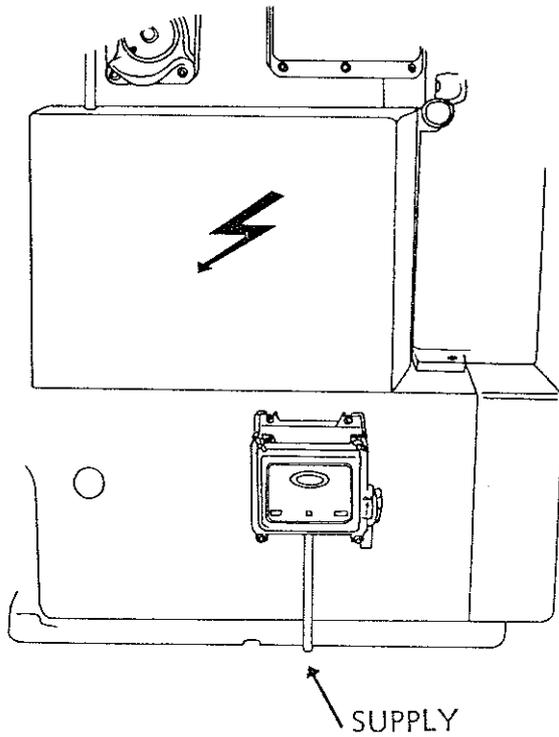


Permissible error total indicator reading.

At	A	.003"	Any Key Position
At	B	.003"	Master Pinion Only
At	C	.003"	Master Pinion Only
At	D	.003"	Master Pinion Only

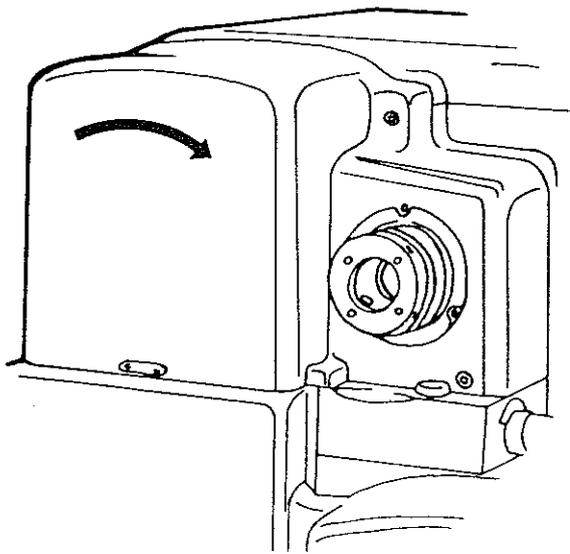
## 2.6 ELECTRICAL INSTALLATION

The electrical equipment supplied with each machine varies with the electrical supply and customers particular requirements. Wiring should therefore be carried out in accordance with the diagrams provided in section 12 of this handbook.



The supply voltage should be checked against the equipment supplied. Lathes for transportation by sea have sealing paper behind the control panel door, this should be removed before putting the electrical equipment into operation.

Connect supply to isolator switch at rear of lathe. This switch is interlocked with control panel cover with the exception of lathes for Canada when a junction box is supplied.



Check direction of motor rotation as indicated by arrow on pulley guard at the headstock end of the lathe.

### 3.1 LUBRICATION

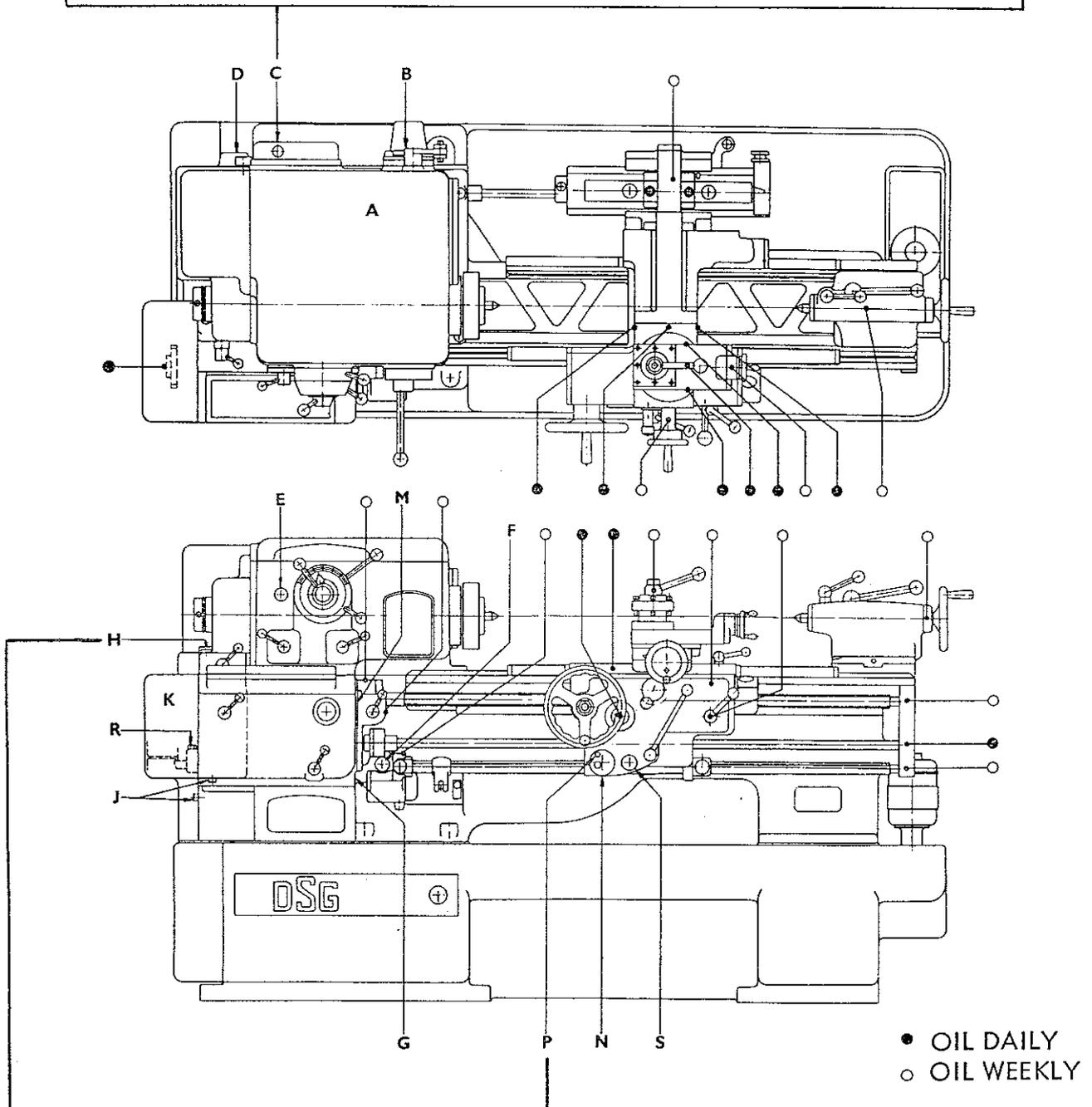
#### HEADSTOCK OIL

Use Shell Vitrea 27  
or equivalent oil.  
Specification as follows

Specific gravity .86      Viscosity at 100°F.      }  
Flash point closed 400°F.      Viscosity index      -      95

{ 150 Redwood Sec. (36.5cs.)  
170 Saybolt

CHANGE OIL IN HEADSTOCK EVERY 6 MONTHS - QUANTITY 26 PINTS (14.8 LITRES)



#### TABLEWAY OIL FOR APRON, GEARBOX AND OIL GUN

Use Shell Tonna 33  
or equivalent oil.  
Specification as follows

Specific Gravity .875      Viscosity at 100 °F.      }  
Flash point closed 400°F.      Viscosity index      -      95  
Containing non drip, anti-wear and oiliness additives

{ 280 Redwood Sec. (69 cs.)  
320 Saybolt

CHANGE OIL IN GEARBOX EVERY 6 MONTHS - QUANTITY 3 PINTS (1.7 LITRES)

NOTE:- GREASE MUST NEVER BE USED IN THE OIL GUN

## 3.11 LUBRICATION continued

### HEADSTOCK

Remove the sealing tape from the breather hole on oil sight 'D'.

The gears and bearings in the headstock are lubricated by the gear pump 'A' situated inside the headstock. The pump can be primed by means of the nipple on the top of the pump body, to effect this, it is necessary to remove the cover from the top of the headstock.

The oil sight 'E' indicates when the oil pump is functioning.

From the pump the oil passes through a combined mechanical and magnetic filter 'B' which should be removed monthly and both elements cleaned. To clean, unscrew the filter and withdraw it from the body casting, then for access to the magnetic filter, remove the knurled nut at the rear.

The headstock is filled through cap 'C' to the centre of the oil sight 'D' with the lathe at rest. The quantity of oil required is 26 pints, (14.8 litres).

To drain the headstock remove cap 'F' at the front of the bed.

The oil should be changed every 6 months. When changing, clean the filter, remove the top cover, clean the headstock and flush out the sump.

Use a flushing oil and NOT petrol or paraffin.

### GEARBOX

The gears and bearings in the gearbox are lubricated by a plunger pump situated under the cover 'K'. To prime, remove the plug 'R' at the top of the pump. The oil sight 'M' indicates when the oil pump is functioning.

The gearbox is filled through cap 'H' to the centre of the oil sight 'G' with the lathe at rest. The quantity of oil required is 3 pints, (1.7 litres).

To drain remove plugs 'J'.

The oil should be changed every six months.

### CHANGE GEARS

The change gear teeth and the intermediate stud situated under the cover 'K' should be oiled daily as these run continuously.

### BED GUIDEWAYS

The bed ways are oiled by the hand pump 'N' at the front of the apron. Give 6 strokes per day. Fill and keep to the centre of the oil sight 'S' through cap 'P'.

### APRON

The apron should be oiled daily through the nipples at the front of the left hand saddle wing and the centre of the rack pinion shaft.

### SADDLE AND COMPOUND SLIDES

Oil the slideways daily through the nipples provided. The tool slide screw nut is oiled through the nipple at the centre of the tool slide.

### CROSS SLIDE NUT

Oil daily through the nipple on the top of the cross slide.

### TAIL END BRACKET

The feed shaft bearing should be oiled daily through the nipple in the centre of the Tail End Bracket.

### GENERAL

All other points should be oiled weekly through the nipples indicated by red washers, using the oil gun provided.

## 3.2 CARE OF MACHINE

TO HELP ENSURE EFFICIENCY & ACCURACY OF THE MACHINE IT IS ESSENTIAL THAT THE POINTS NOTED HERE ARE CARRIED OUT.

- \* Ample & correct lubrication, together with regular oil changes. See machine lubrication section 3.1
- \* It is advisable to flush out the headstock & gear box when changing the oil. Use a flushing oil & NOT petrol (gasoline) or paraffin (kerosene).
- \* Regular cleaning of the machine is paramount. DO NOT, UNDER ANY CIRCUMSTANCES USE COMPRESSED AIR FOR CLEANING. This will force foreign particles under slides and moving parts affecting the performance & accuracy of the machine. Lubricate machine immediately after cleaning.
- \* Ensure that all slide & guideway wipers are regularly cleaned and in good condition, replace if damaged.
- \* Do NOT use overstrong coolant solutions as these may damage the paintwork.
- \* When removing or replacing chucks & faceplates etc., place a board on the bed to protect the guideways from bruising.
- \* To prevent damage or scratching hammers, spanners, tools etc., must NOT be placed on the bed guideways.
- \* Before fitting chucks etc., or attachments ensure mating parts are clean & free from bruises.
- \* If the machine has been standing over the weekend or for longer periods do not immediately engage top speed, but run for a short time on intermediate speed. Ensure that the oil is circulating by running drive motor for a few minutes before engaging the clutch.

OIL TYPE	HEADSTOCK	THREAD & FEEDBOX	APRON, SADDLE & SLIDEWAYS	ELEC. TURRET	GEARBOX	REVOLVING CENTRE	HYD. COPY UNIT	OIL NIPPLES	AIR LUBE
SHELL	TURBO 32	TONNA T68	TONNA T68	TURBO 32	TONNA T68	GADUS S2 V220 2	TELLUS S2 M 68	TONNA T68	TELLUS R10
CASTROL	HYSPIN AWS 32	MAGNA BD68	MAGNA BD68	HYSPIN AWS 32	MAGNA BD68	SPHEEROL EPL 2	HYSPIN AWS 68	MAGNA BD68	HYSPIN AWS 10
GULF	HARMONY 32AW	GULFWAY 68	GULFWAY 68	HARMONY 32AW	GULFWAY 68	GULFCROWN EP 2	HARMONY 68AW	GULFWAY 68	HARMONY 10AW
FINA	HYDRAN 32	ARTAC EP68	ARTAC EP68	HYDRAN 32	ARTAC EP68	MARSON EPL2	HYDRAN 68	ARTAC EP68	CIRKAN 10
ESSO	NUTO H32	FEBIS K68	FEBIS K68	NUTO H32	FEBIS K68	BEACON EP2	NUTO H68	FEBIS K68	NUTO H15
TEXACO	RANDO 32	WAY LUBRICANT 68	WAY LUBRICANT 68	RANDO HD32	WAY LUBRICANT 68	MULTIFAK EP2	RANDO HD68	WAY LUBRICANT 68	SPINTEX 10
BP	ENERGOL HLP 32	MACCURAT 68	MACCURAT 68	ENERGOL HLP 32	MACCURAT 68	ENERGREASE LS EP2	ENERGOL HLP 68	MACCURAT 68	ENERGOL HLP 10
ELF	ELFOLNA HM32	MOGLIA 68	MOGLIA 68	ELFOLNA HM32	MOGLIA 68		ELFOLNA HM68	MOGLIA 68	ELFOLNA HM10
MOBIL	DTE 24	VACTRA NO 2	VACTRA NO 2	DTE 24	VACTRA NO 2	MOBILPLEX 47	DTE 26	VACTRA NO 2	DTE 10
OIL WELL	WICKLOW 32	ULTRATAK 68	ULTRATAK 68	WICKLOW 32	ULTRATAK 68		WICKLOW 68	ULTRATAK 68	WICKLOW 32

SLIDEWAY VOGEL UNIT Q8 HEAVYBEAR 68 or OIL WELL ULTRATAK HEAVY 68.

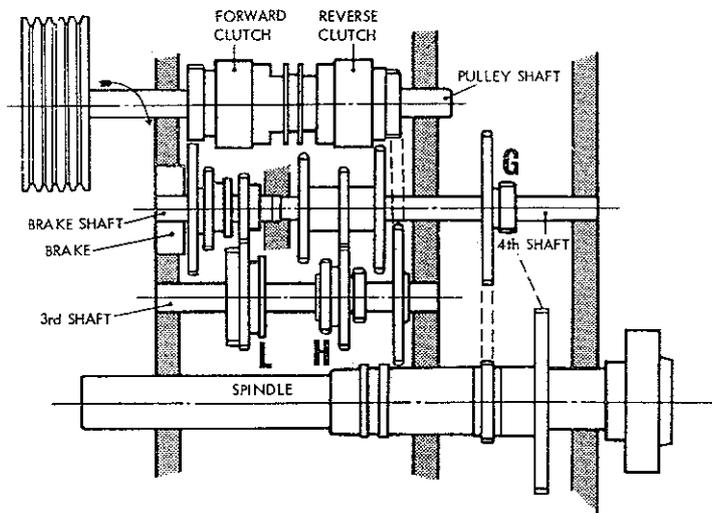
RECOMMENDED LUBRICANTS

FOR ALL TYPES OF LATHE (EXCEPT NC)

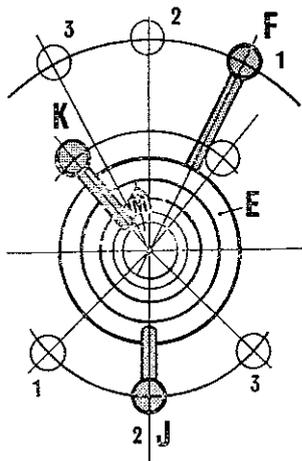
## 4.11 STARTING & SPEED SELECTION continued

### STANDARD HEADSTOCK

Spindle speeds are indicated on the plastic cone 'E'. Two ranges are shown indicated by 'HIGH GEAR' and 'LOW GEAR'. Orange coloured figures indicate reverse speeds.



The engagement of the high or low gear is by lever 'F' controlling gear 'G'. Position 1 is low gear, position 2 neutral and position 3 high gear. (The gear ratio between low and high is 7.25 : 1).



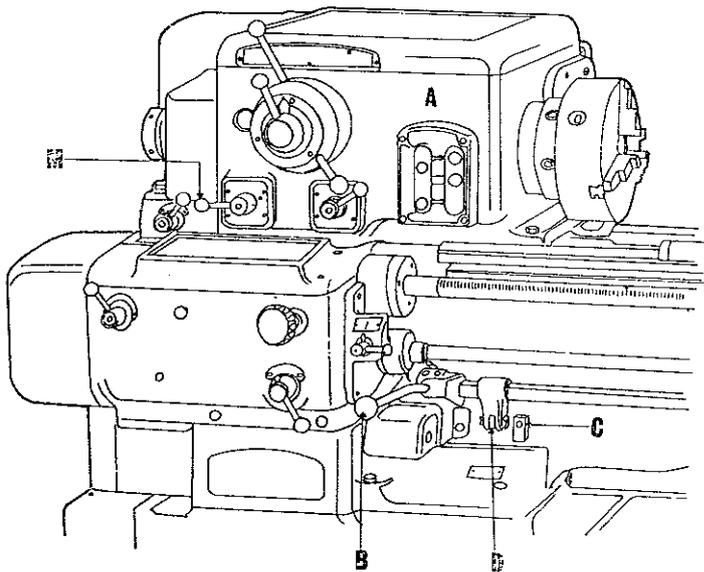
Gear 'H' is operated by lever 'J' which gives three speed changes and moves plastic cover 'E'. It will be seen that speeds are grouped in pairs, the left hand pair representing lower speeds, the right hand pair intermediate speeds and the central pair higher speeds. Position 1 and 3 of lever 'J' are extreme movements and position 2 is indicated by a spring plunger location. THIS LEVER SHOULD ALWAYS BE POSITIONED AT 1, 2 OR 3 AND MUST NOT BE LEFT IN A NEUTRAL POSITION BETWEEN 1 AND 2 OR 2 AND 3, otherwise difficulties may be experienced in engaging speeds and damage to gear teeth can be caused. If gears prove difficult to engage, stop motor and restart. Lever 'K' controls gear 'L' giving two speeds which are indicated by pointer 'M'.

**TO SELECT A REQUIRED FORWARD SPEED.** Disengage clutch, determine if speed is in the high or low gear range and position lever 'F' accordingly. If speed is in a left hand pair, move lever 'J' to position 1, if in central pair to position 2 and right hand pair to position 3. Finally move lever 'K' to bring pointer 'M' opposite speed required.

Do not engage gears with shafts rotating at high speeds. If difficulty is experienced in engaging a gear momentarily engage clutch.

**TO SELECT A REVERSE SPEED.** Move lever 'F' to appropriate range, position lever 'J' as for forward speeds. Engage clutch by moving lever 'B' downwards. Note that lever 'K' does not change reverse speeds.

## 4.1 STARTING & SPEED SELECTION



Do not start headstock before reading lubricating instructions section 3. Electrical equipment cannot be operated until isolator switch at rear of lathe is closed.

The headstock drive motor and coolant pump motor are started from push buttons on panel 'A'.

Clutch engagement is by lever 'B' which has three positions :-

UP - for forward spindle rotation.

CENTRAL - for brake.

DOWN - for reverse spindle rotation.

For normal turning operations forward and brake are used. Block 'C' should be turned to horizontal position behind lever 'D'. This prevents accidental engagement of the reverse clutch. To engage reverse, turn block 'C' to vertical position.

**DO NOT PASS FROM FORWARD TO REVERSE, without holding in brake position until spindle stops.**

When running at high speeds for polishing, the feed reverse lever 'M' should be placed in the neutral position, to avoid running the feed drive gears at excessive speeds.

### SPINDLE SPEEDS

Standard headstocks can be supplied in 3 speed ranges giving 12 forward speeds and 6 reverse speeds.

	FAST RANGE PULLEY SPEED 1295 R. P. M.						MEDIUM RANGE PULLEY SPEED 925 R. P. M.						SLOW RANGE PULLEY SPEED 655 R. P. M.					
FORWARD	35	49	70	97	140	194	24.5	33	48	67	97	134	17.5	25	35	49	70	97
	250	355	500	710	1000	1400	180	250	355	500	710	1000	125	180	250	355	500	710
REVERSE		49		97		194		33		67		134		25		49		97
		355		710		1400		250		500		1000		180		355		710

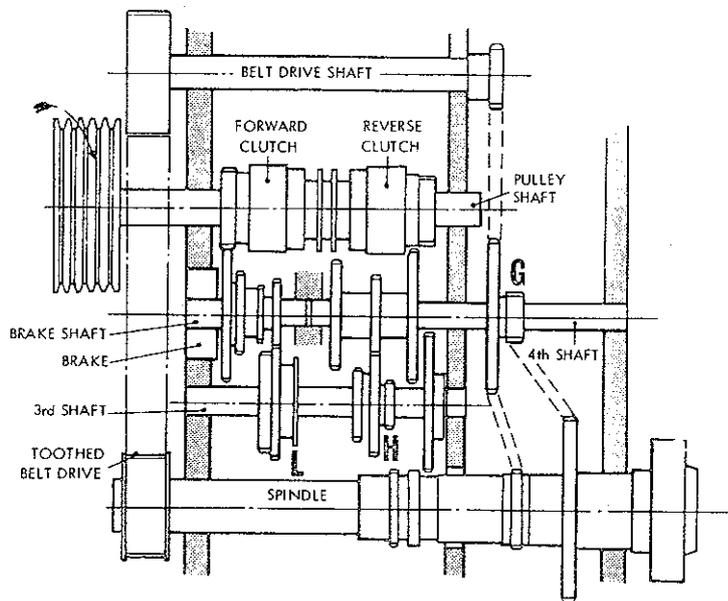
### HIGH SPEED HEADSTOCK

This is supplied as an alternative to the standard headstock and incorporates a toothed belt overdrive to the spindle. This feature increases the number of forward speeds to 18 and reverse speeds to 9.

	FAST RANGE PULLEY SPEED 1295 R. P. M.						MEDIUM RANGE PULLEY SPEED 925 R. P. M.						SLOW RANGE PULLEY SPEED 655 R. P. M.					
FORWARD BELT	400	560	800	1120	1600	2240	280	400	560	800	1120	1600	200	280	400	560	800	1120
	35	49	70	97	140	194	24.5	33	48	67	97	134	17.5	25	35	49	70	97
FORWARD GEAR	250	355	500	710	1000	1400	180	250	355	500	710	1000	125	180	250	355	500	710
		560		1120		2240		400		800		1600		280		560		1120
REVERSE BELT		49		97		194		33		67		134		25		49		97
		355		710		1400		250		500		1000		180		355		710

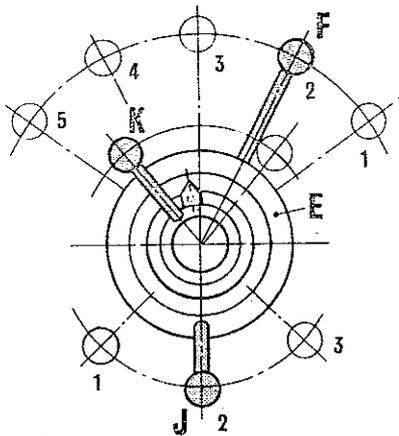
## 4.12 STARTING & SPEED SELECTION continued

### HIGH SPEED HEADSTOCK



Spindle speeds are indicated on the plastic cover 'E'. Three ranges are shown indicated by 'BELT DRIVE', 'HIGH GEAR' and 'LOW GEAR'. Orange coloured figures are speeds obtained in reverse as well as forward.

The engagement of the 'High', 'Low' or 'Belt drive' is by lever 'F' controlling gear 'G'. Position 1 is low gear, position 2 neutral, position 3 high gear, position 4 neutral and position 5 belt drive. The speed ratio between low and high is 7.25 : 1 and between high and belt drive is 1.6 : 1.

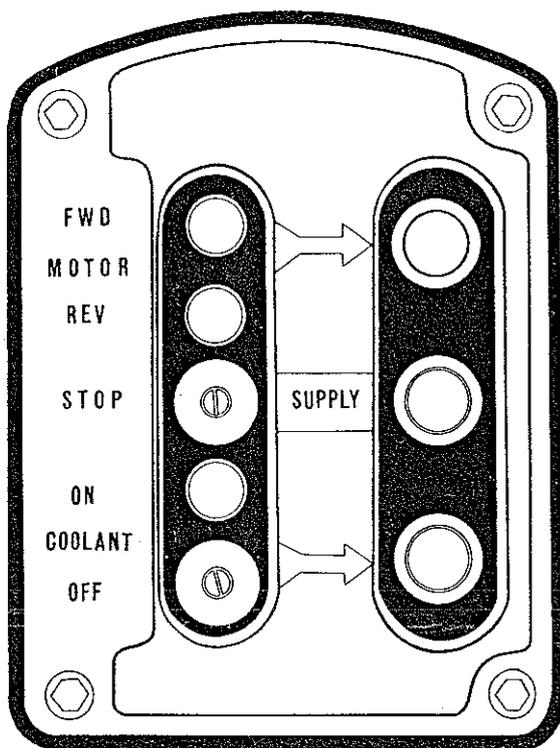


Gear 'H' is operated by lever 'J' giving three speed changes and moves plastic cover 'E'. It will be seen that speeds are grouped in pairs, the left hand pair representing lower speeds, the right hand pair intermediate speeds and the central pair higher speeds. Position 1 and 3 of lever 'J' are extreme movements and position 2 is indicated by a spring plunger location. THIS LEVER SHOULD ALWAYS BE MOVED SHARPLY INTO POSITION AND MUST NOT BE LEFT IN A NEUTRAL POSITION BETWEEN 1 AND 2 OR 2 AND 3, otherwise difficulty may be experienced in engaging speeds and damage to gear teeth can be caused. If gears should prove difficult to engage stop motor and restart. Lever 'K' controls gear 'L' giving two speeds which are indicated by pointer 'M'.

**TO SELECT A REQUIRED FORWARD SPEED.** Disengage clutch, determine if speed is in the high, low or belt drive range and position lever 'F' accordingly. If speed required is in a left hand pair move lever 'J' to position 1 if in central pair to position 2 and right hand pair to position 3. Finally move lever 'K' to bring pointer 'M' opposite speed required. Do not engage speeds with shafts rotating at high speeds. If difficulty is experienced in engaging a gear, momentarily engage clutch.

**TO SELECT A REVERSE SPEED.** Move lever 'F' to appropriate range, position lever 'J' as for forward speeds. Engage clutch by moving lever 'B' downwards. Note that lever 'K' does not change reverse speeds, speeds in white figures reverse at the next higher speed.

## 4.2 ELECTRICAL REVERSE GENERAL CARE OF HEADSTOCK



### ELECTRICAL REVERSE

This feature is supplied as extra equipment and provides for a full range of speeds in reverse. Operation is from the push button panel on the headstock. To change direction, stop spindle by means of the main clutch operating lever. Stop the motor, using the button on the panel and allow the motor to slow down, restart the motor by pressing appropriate button.

### GENERAL CARE OF HEADSTOCK

Follow carefully the instructions for lubrication and the cleaning of the filter in Section 3.

Spindle bearing adjustment is covered in Section 4.4.

Feed reverse and coarse pitch operating levers are explained in Sections 5 & 6.

Before changing from forward to reverse, engage the brake to bring the spindle to rest.

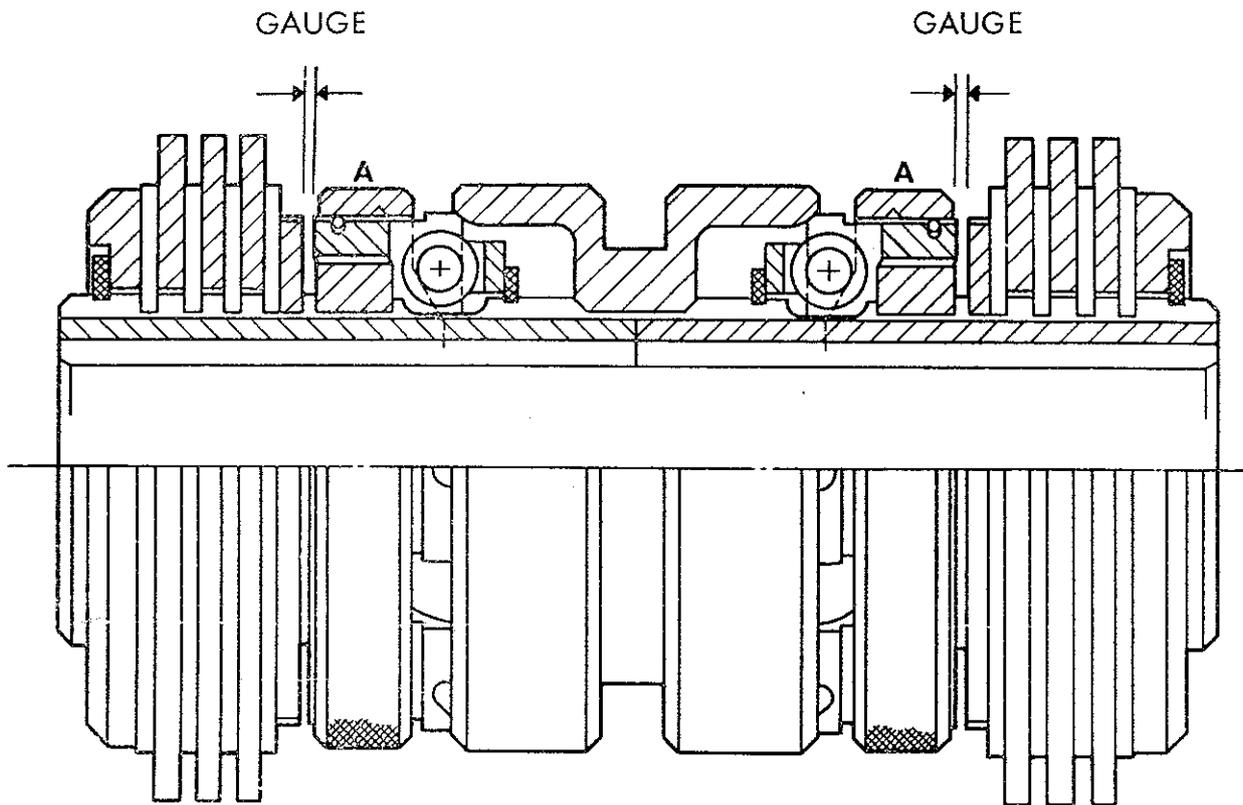
Do not attempt to change speeds under cut or with the spindle rotating at high speeds.

To avoid damage to the gear teeth, the speed change lever 'J' (Sections 4.11 & 4.12) must not be left in the neutral position.

Correct clutch engagement is most important, for method of adjustment see Section 4.3.

Should the brake require adjustment proceed as described in Section 4.31.

## 4.3 CLUTCH ADJUSTMENT



GAUGE WIDTHS.

CLUTCH SIZE	20	25	30	35	40	45	50	55	60	70
GAUGE	.045	.042	.042	.059	.059	.060	.060	.060	.060	.077

The headstock drive is engaged through a Matrix Mechanical ZC40 Duplex Wet Plate Clutch. To compensate for wear on the clutch plates, occasional adjustment is required this should be carried out as follows:-

Isolate the lathe and remove the cover from the headstock.

Set the clutch operating lever in the brake position.

Slide back the knurled ring 'A' and insert the specified feeler gauge behind the splined plate.

Rotate the knurled ring to adjust the gap.

Remove the gauge and slide the knurled ring forward to locate the nearest spline in advance of setting.

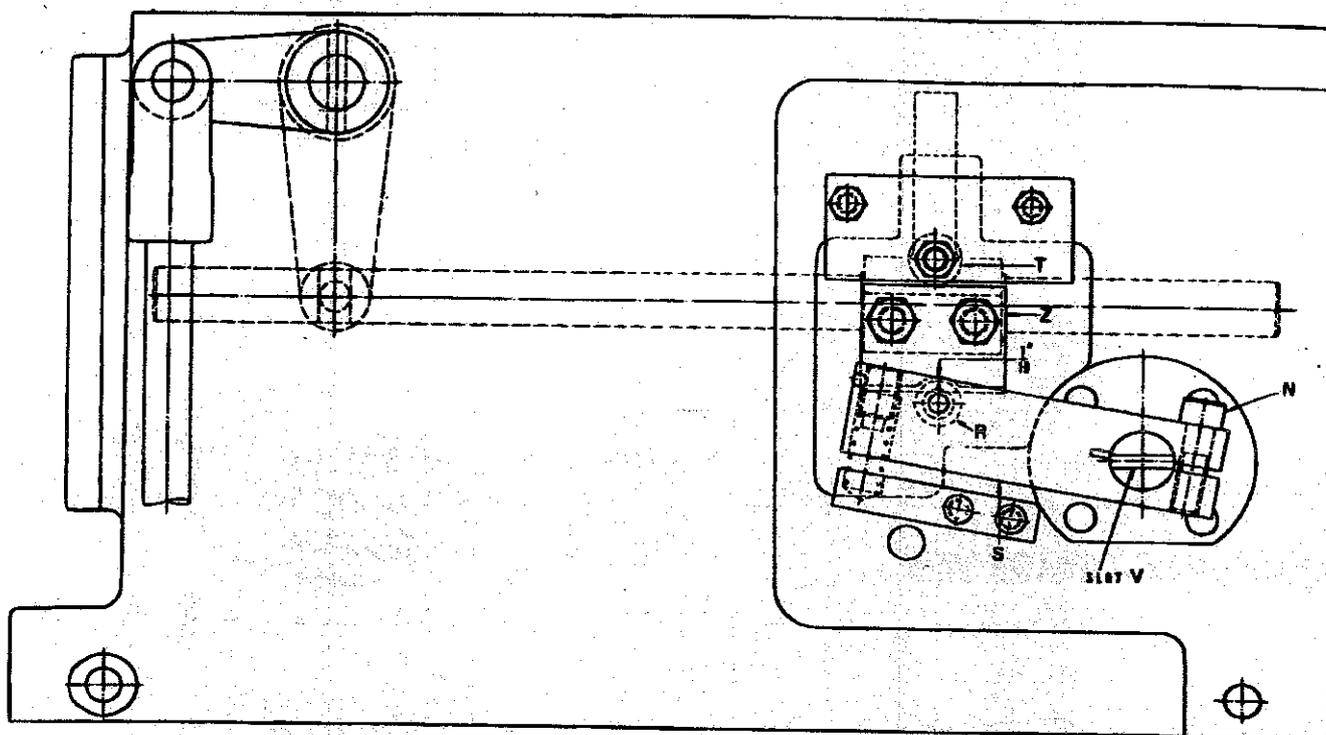
Always wait until the clutch has cooled before adjusting.

Under-adjustment will lead to excessive plate wear due to slip and consequent overheating.

Over-adjustment will overload the operating mechanism unnecessarily and raise the load required to operate the clutch.

**NOTE: NEW BRAKE ASSEMBLY  
FOR ALL TYPE 13-1  
MACHINES AFTER JUNE  
1968**

## **4.31 BRAKE ADJUSTMENT**



The brake is a multi-disc friction type and is correctly adjusted before leaving our works. The illustration above shows the position of the brake arm in the fully braked position, that is with a  $1/16$ " gap between the roller 'R' and the grooved face of the locating block 'Z'. As the brake plates wear, this gap will gradually decrease until the brake ceases to function. When adjustment is necessary the following procedure should be carried out.

Isolate the lathe from the electrical supply.

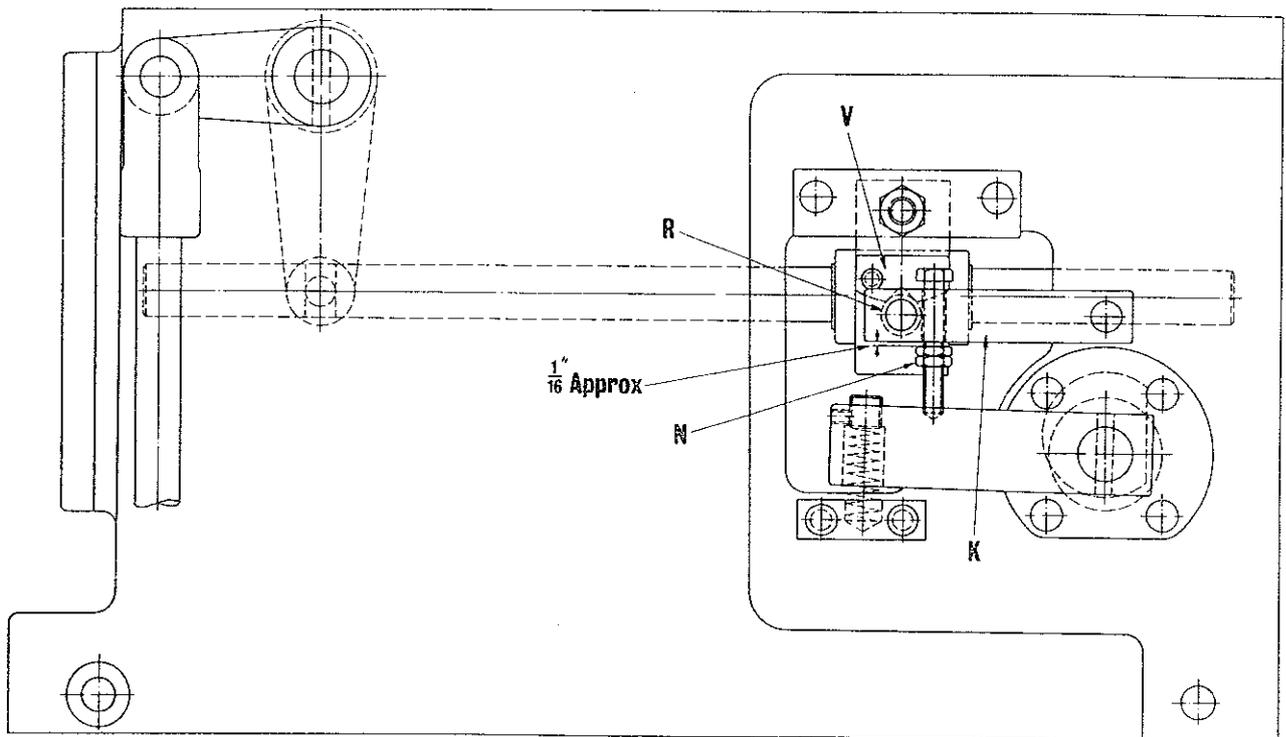
Remove the rear cover from the headstock, check that the clutch engagement lever 'B' (section 4.1) is in the braked position with block 'C' (section 4.1) in the horizontal position, and the operating collar 14 (section 11.13) is central between forward and reverse clutch. Check that the top face of block 'Z' is parallel with the clutch fork support shaft and if not adjust accordingly.

Check that the roller 'T' is engaging with the top face of block 'Z', adjustment can be made by means of the two small hex. head screw.

Gap adjustment is made by releasing clamp screw 'N' and placing a tommy bar in the slot 'V' turning in a clockwise direction to apply pressure to the brake plates, whilst this pressure is held, a  $1/16$ " dia. measuring rod should be inserted between the roller 'R' and the grooved face of the locating block 'Z', with brake arm 'S' now set; tighten clamp screw 'N'.

The operation of the brake should now be checked for freedom of movement and also braking efficiency.

## 4.31 BRAKE ADJUSTMENT



The brake is a multi-disc friction type and is correctly adjusted before leaving our works. If adjustment is required this can be carried out as follows:-

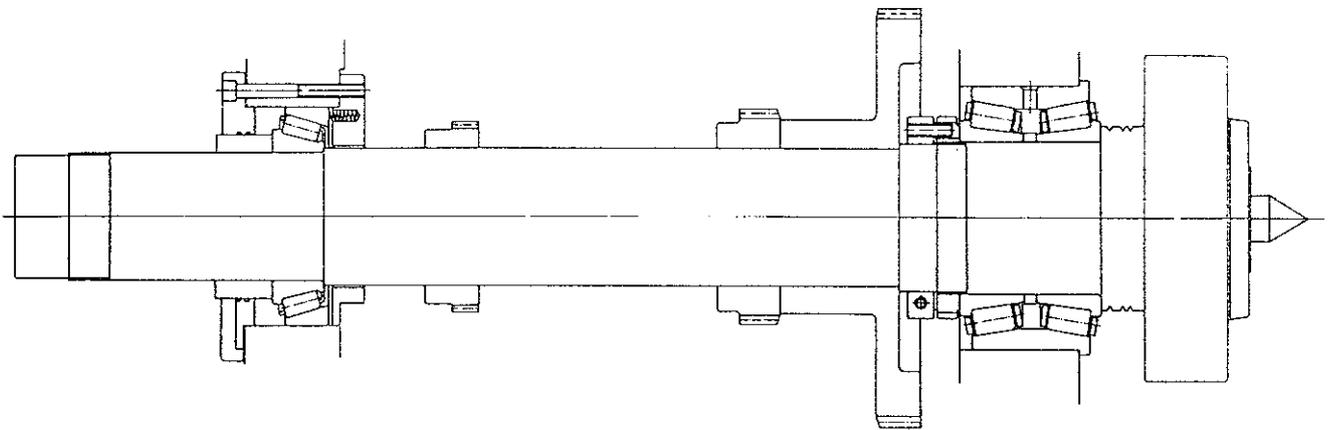
Isolate the lathe.

Remove the top and rear covers from the headstock. Check that the clutch engagement lever 'B' (section 4.1) is in the brake position, with block 'C' (section 4.1) in the horizontal position, and that the operating collar 14 (section 11.13) is central between forward and reverse clutch.

Set roller 'R' in centre of vee notch in block 'V' and adjust the hexagon nuts 'N'. The initial setting distance is approximately  $\frac{1}{16}$ " from the underside of arm 'K'.

Check operation of brake for freedom of movement and make any necessary final adjustment to nuts 'N' before locking.

## 4.4 SPINDLE BEARINGS



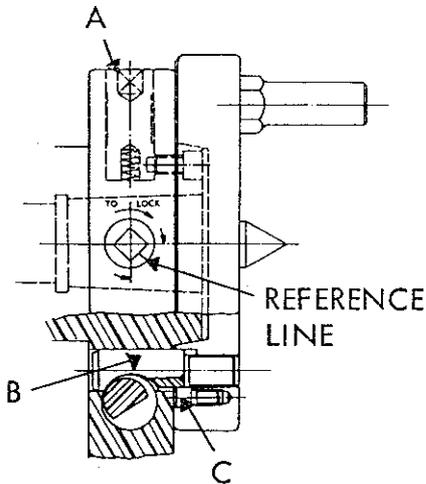
### NOTE:-

The spindle is mounted on 'Gamet' high precision taper roller bearings. The single row rear bearing is self-adjusting. The front double row bearing is pre-adjusted to give the required setting by means of a spacer interposed between the cones. This setting having been made, it is therefore, not possible to re-adjust the front bearing, which should run for many years without further attention. It is important that no attempt be made to further adjust the bearing by tightening the locking nut; since this can only result in distortion of the spindle and loss of bearing accuracy.

In the event that inaccuracy of components or spindle chatter on parting-off operations occurs, some improvement can be obtained by increasing the spring pressure at the rear end of the spindle. However before proceeding on this course of action, the advice of (D.S.G.) Service Dept. should be sought to ensure no damage to the bearings occurs.

## 4.5 CAMLOCK SPINDLE NOSE

### CAMLOCK SPINDLE NOSE

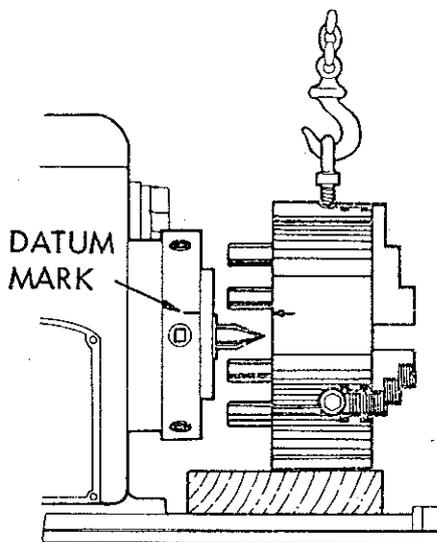


The spindle nose is American Standard type D1 its construction and manufacture ensure precision mounting of chucks, fixtures etc., To mount a chuck or other equipment first clean thoroughly the locating taper and faces and also the spindle nose. NOTE: For accurate location of chucks etc., mount with both datum marks in line.

With the spindle free insert key into cams 'A' and turn anti-clockwise to stop. Lift the chuck gently on to nose, entering studs 'B' in appropriate spindle bore and push on to taper.

Turn cams 'A' in clockwise direction and lightly lock each cam. Finally lock each cam fully so that reference line is between arrows as shown.

With equipment supplied after the lathe has been delivered a datum mark should be made and it may be necessary to set studs 'B' to correctly position cam reference line, to do this remove screw 'C' and turn stud to set. Note that studs should always be loose in their tapped holes .



To avoid damage to locating faces and bedways it is advisable when fitting heavy equipment to support this on a wood bridge piece as shown. This will also enable the equipment to be lifted by crane and supported on the bed.

Note: Where a heavy lock is not necessary on smaller items of equipment such as driving plates, only three driving studs and cams are used.

#### SPECIAL FIXTURES.

The machining of the locating taper and stud holes is difficult without the use of gauges and special tools. To assist customers a range of backplates are available on request, complete with studs. These can be machined in position on the spindle to suit any requirement. Dimensions for the location are shown in section 1.4.

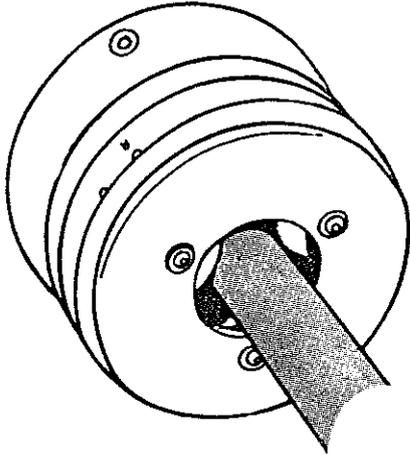
### CHUCKS

Direct mounting chucks are available as additional equipment for the lathe and it is important that the maximum speeds are observed, these speeds are shown in Section 10.2.

Generally it is advisable to have direct mounting chucks but for special or existing chucks, backplates are available on request.

## 4.6 PRATT AUTO-GRIP WORK DRIVER

The "Pratt" Auto Grip work driver is used for driving bars and forgings mounted between centres. Rapid loading and unloading without the aid of keys is the primary feature. Its use will also eliminate danger to the operator from rotating dogs or jaws. Four sizes are available.



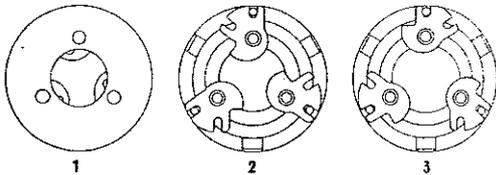
Size No. 1 with one set of jaws  $5/16'' - 1 \frac{3}{8}''$  dia work.  
Max speed 1500 r.p.m.

Size No. 2 with two sets of driving jaws  
( Set A  $1 \frac{1}{2}'' - 2''$  dia work  
( Set B  $7/16'' - 1 \frac{1}{2}''$  dia work  
Max speed 1500 r.p.m.

Size No. 3 with two sets of driving jaws  
( Set A  $2 \frac{3}{8}'' - 3''$  dia work  
( Set B  $\frac{1}{2}'' - 2 \frac{3}{8}''$  dia work  
Max speed 1400 r.p.m.

Size No. 4 with three sets of driving jaws  
( A  $4 \frac{1}{4}'' - 5 \frac{1}{4}''$  dia work  
( B  $2 \frac{1}{4}'' - 4 \frac{1}{4}''$  dia work  
( C  $\frac{3}{4}'' - 2 \frac{1}{4}''$  dia work  
Max speed 1000 r.p.m.

### TO CHANGE JAWS

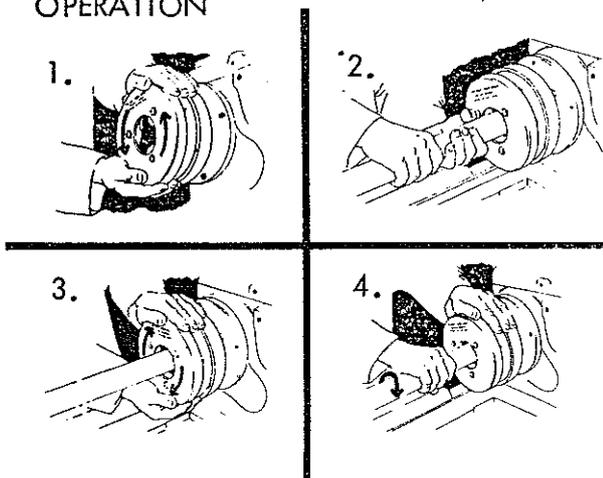


To adjust size range change jaws as follows:

1. Remove the three button head screws with key supplied.
2. Remove cover to expose jaws.
3. Lift jaws off fulcrum pins, add lubricant to pin and engage other slot or change jaws.
4. Replace cover.

For speeds exceeding the above, high speed additional sets of counterbalanced jaws are available, on request. These modify slightly max. and min. capacities.

### OPERATION

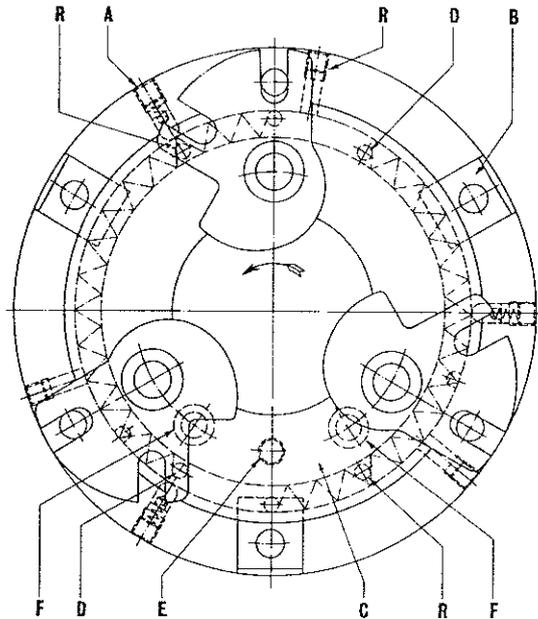


1. To load the workpiece into the driver, first rotate the outer cover in the direction of drive until the driving jaws are fully open.
2. Insert the workpiece between centres.
3. Rotate the outer cover to allow the spring loaded jaws to grip the workpiece.
4. Check the grip by rotating the workpiece against the direction of drive. This also ensures that each jaw is fully engaged on the workpiece.
5. Lubricate occasionally through grub screw hole 'R'.

## 4.61 PRATT AUTO-GRIP WORK DRIVER continued

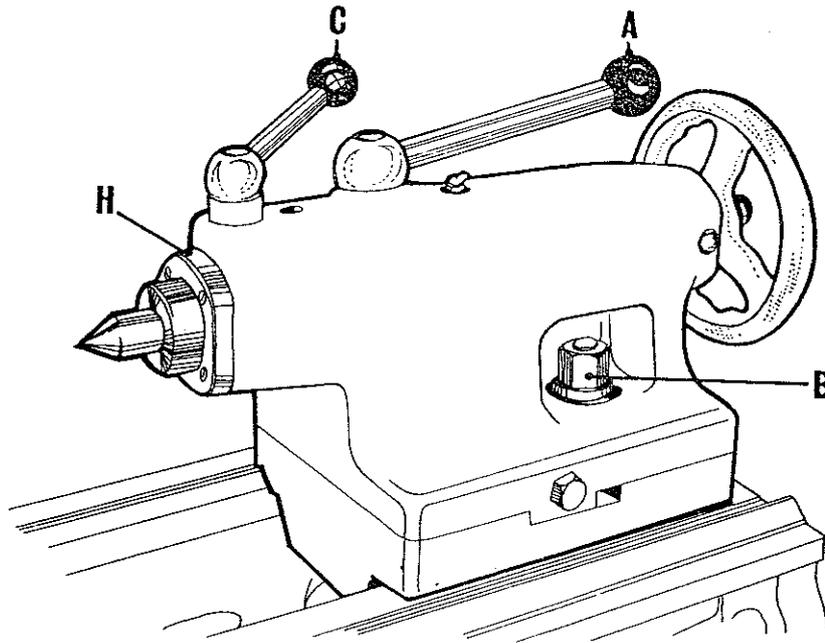
### TO CHANGE DIRECTION OF DRIVE

The driver will drive in either direction. It is supplied for forward spindle rotation. To change the direction of drive the procedure is as follows:-

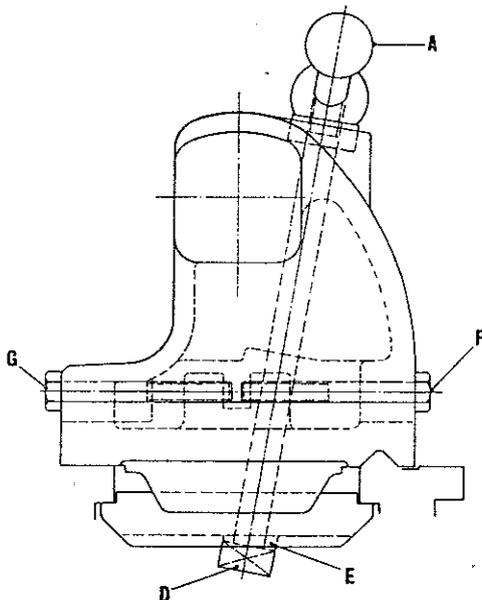


1. Place the driver flat with the cover uppermost.
2. Remove the cover and jaws as described previously.
3. Unscrew three screws and remove the three retaining plates 'B'.
4. Lift the floating ring 'C' clear of the body and detach the springs at the rear.
5. Remove the grub screws and spring plungers from holes 'A' in periphery of body.
6. Move spring anchorage pegs 'D' in the rear of the floating ring to holes marked 'R' on the front of the ring.
7. Recouple the springs so that they pull the floating ring in an anti-clockwise direction.
8. Replace the floating ring making sure that the stop peg 'E' in the ring lies between two pegs 'F' in the body.
9. Replace retaining plates with ends engaging in the groove on the edge of the floating ring.
10. Replace the three spring plungers and grub screws in holes marked 'R' in periphery of body. These grub screws can be adjusted to give the right tension to hold the jaws in the open position for convenient loading.
11. Arrange the jaws to drive in the reverse direction and replace the cover.

## 4.7 TAILSTOCK



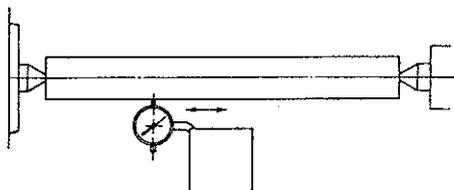
For light duty the tailstock is locked to the bedways by lever 'A', for heavy duty the auxilliary nut 'B' should also be used. Lever 'C' locks the tailstock spindle. The locking position of this lever can be adjusted by turning the nut at the underside of the locking bolt.



The position of lever 'A' can be adjusted by turning locking bolt 'D', to alter position of square head in casting. It is important to note position of taper washer 'E'.

To remove the centre retract the spindle fully, when the centre will be automatically ejected.

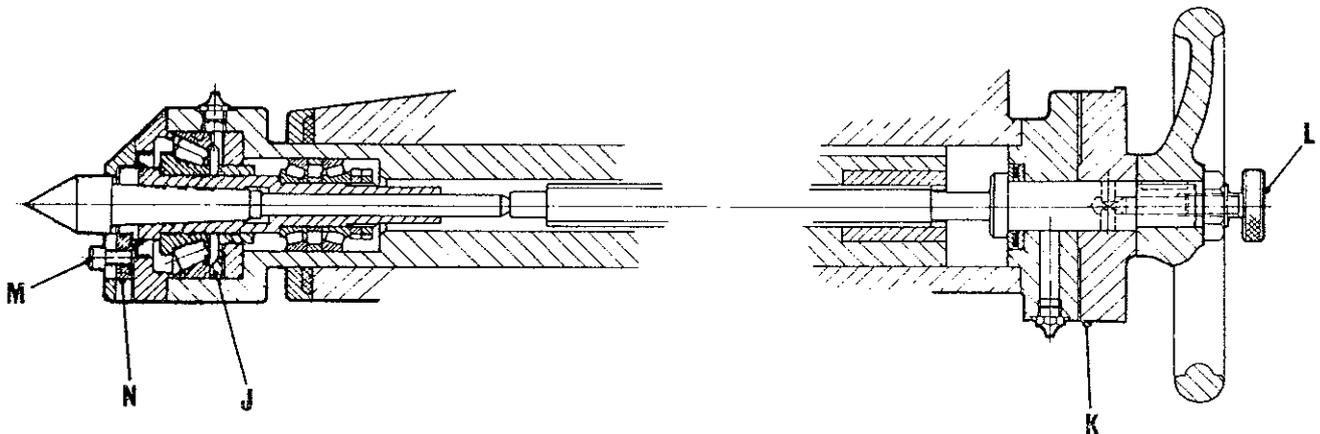
Fine tapers can be turned by offsetting the tailstock. To do this loosen screw 'F' and turn screw 'G' clockwise. Tailstock will then move towards front of lathe, when correctly positioned lock screw 'F'.



Tailstock can be re-aligned using a test bar and dial indicator as shown to limits given on inspection sheet, section 2.51. Alternatively tailstock can be adjusted until a parallel workpiece is produced. Heavy duty drilling from the tailstock is not recommended, as damage to the Morse Taper may result causing subsequent inaccuracy, to avoid this use the power drilling attachment, see section 9.3.

End plate 'H' contains a felt wiper. This should be periodically removed cleaned and re-oiled, or replaced.

## 4.71 BUILT-IN ROLLER BEARING TAILSTOCK CENTRE



Oil daily through the nipple on the front end of the spindle.

This feature is supplied as an additional spindle and is designed to give improved load capacity and life compared to a shank type revolving centre. Protection against overload is provided by a spring steel diaphragm 'J'.

Tailstocks supplied with built in roller bearing spindles also have fitted the micrometer dial 'K'. To operate, advance spindle to engage centre in workpiece, start headstock spindle and adjust until centre revolves. Advance spindle 5 small divisions on dial and lock lever 'C'.

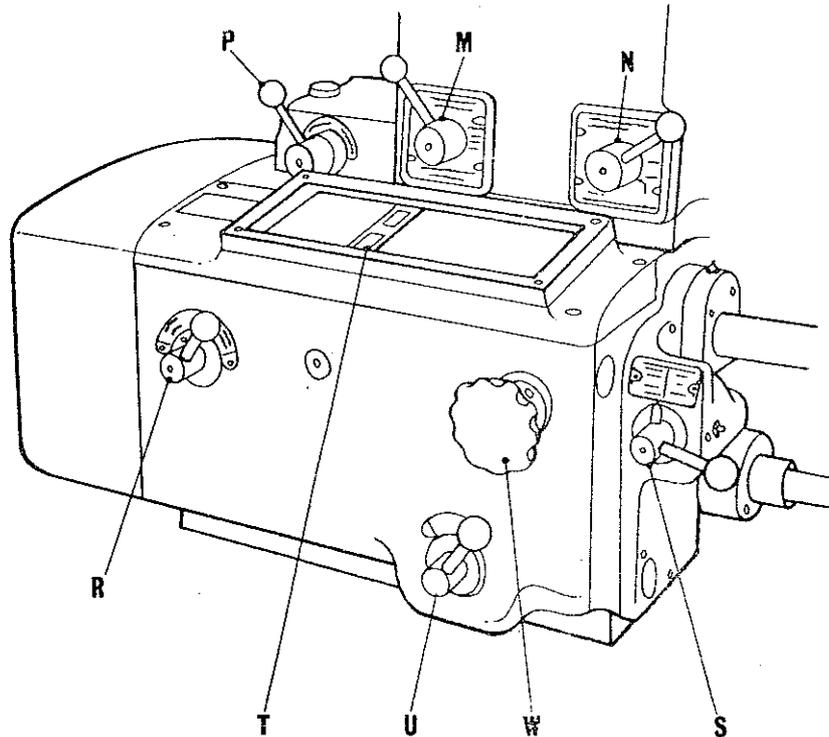
Micrometer dial is locked by screw 'L'.

The centre can be locked for dead centre work by unlocking screw 'M' and engaging key 'N' in sleeve.

When changing spindles care should be taken to avoid damage to the spindle diameter or bruising of the nut threads.

Centres can be ejected by retracting spindle and exerting pressure on handwheel. It is advisable to eject the centre each day to avoid sticking.

## 5.1 GEARBOX



Ensure that the oil is at the correct level and that it is circulating when the gearbox is running, this can be seen through the oil sight.

Drive to the gearbox is through the change gears and these should be lubricated daily. Section 3.11.

The gearbox has 18 changes, which, together with a 3 change in the rear end gearbox, gives 45 changes of feed and 45 different threads per inch without alteration to the change gears. Ranges of mm., and inch pitches are obtained by the movement of two levers, using the same change gears.

A full range of diametral and module pitches can be cut through the box using extra change gears.

Provision is made for a more direct drive to the leadscrew which gives a thread with a slightly more accurate pitch. The threads obtainable through the direct drive are shown on the charts. **THREAD AND FEED SECTION.**

Lever 'M' on the headstock is for selecting the direction of the feed or pitch, i.e. L.H. or R.H.

For all normal feeds and pitches the lever 'N' on the headstock should be in the 'normal' position indicated on the instruction plate.

Levers 'R' and 'S' on the gearbox are for selecting the type of pitch, i.e. module, diametral or inches and should be set accordingly.

Thread indicator plate 'T' should be set by means of the feed change knob 'W' to the column in which the required thread or feed appears. The lever 'P' on the rear end gearbox should then be set to the position shown on the L.H. side of the plate 'T' and lever 'U' on the gearbox should be set to the position shown on the R.H. side of the plate 'T'

Lever 'U' changes the feed in the ratio of 4 to 1.

**NOTE:-** To operate the feed change knob 'W' the gearbox should be run slowly and the lever 'U' put into the neutral position.

## 5.11 GEARBOX continued

Feeds coarser than those shown on the chart can be obtained by placing lever 'N' in the "coarse" position which gives a 4 to 1 coarse pitch ratio. The rear speed selection lever 'F' on the headstock should then be placed in the "Low Gear" position. Refer to section 4.1. These very coarse feeds should always be used with discretion.

Feeds can also be halved by engaging the 4 to 1 coarse pitch ratio and placing the rear speed selection lever 'F' in the "High Gear" position. Thus 9 finer longitudinal feeds from .0008 in. to .00045 in. per rev. may be obtained, on lathes with belt overdrive these feeds are from .0005 to .0003 in. per rev.

A safety spring loaded coupling transmits the feed through the feed shaft to the apron. The slipping load is pre-set, and cannot be adjusted.

The feeds at the higher spindle speeds are limited by the speeds of the feed gearing and the long feed shaft thus:

Up to 1000 R.P.M. max. feed is .0256 in. (.650 m.m.) per rev.
at 1120 R.P.M. max. feed is .0216 in. (.549 m.m.) per rev.
at 1400 R.P.M. max. feed is .016 in. (.406 m.m.) per rev.
at 1600 R.P.M. max. feed is .0142 in. (.361 m.m.) per rev.
at 2240 R.P.M. max. feed is .0111 in. (.282 m.m.) per rev.

NOTE: With the lever 'R' set to module, millimetre or inches pitch the feed shaft is still engaged. But in this condition the lathe should not be used for normal turning, the lever must be put over to the right hand "feed" position.

		INDICATOR POSITION										
		1	2	3	4	5		6	7	8	9	
CHANGE GEARS	THREADS PER INCH	4	4½	4¾	5	5½		5¾	6	6½	7	
		8	9	9½	10	11		11½	12	13	14	
		16	18	19	20	22		23	24	26	28	
		32	36	38	40	44		46	48	52	56	
		64	72	76	80	88		92	96	104	112	
END BOX 30	NORMAL PITCH IN MM.	4	4.5	4.75	5	5.5		5.75	6	6.5	7	
		2	2.25		2.5	2.75			3	3.25	3.5	
		1			1.25				1.5		1.75	
		0.5							0.75			
INTER STUD 55	LONGI-TUDINAL FEEDS IN THOUS. PER REV.	CROSS FEEDS 2/3 x NUMBERS BELOW										
		25.6	22.8	21.6	20.5	18.6		17.8	17.1	15.8	14.6	
		12.8	11.4	10.8	10.2	9.30		8.90	8.55	7.90	7.30	
		6.4	5.70	5.40	5.12	4.65		4.45	4.27	3.95	3.65	
		3.2	2.85	2.70	2.56	2.32		2.22	2.13	1.97	1.82	
		1.6	1.42	1.35	1.28	1.16		1.11	1.06	0.98	0.91	
		SCREW 60										

### ELECTRICAL INTERLOCK.

The lathe will not run unless the change gear cover is in position.

### CHANGE GEARS.

These are 12 D.P. 14½° pressure angle.

### LEADSCREW.

This is designed to be reversible, after eventual wear on the flanks of the thread it can be removed by following the instructions (section 11.51), relating to the removal of the leadscrew only.

## 6.1 THREAD CUTTING

When setting the change gears it is important that there should be .005" to .008" backlash between each set of gears. This ensures that the drive to the screw will be smooth and that no undue stress is set up on the change gear stud, which might lead to breakage. No difficulty should be encountered when mounting the change gears if they are set according to the diagrams on the plates.

When cutting pitches other than T.P.I. shown on the screwcutting dial, (Section 6.2) the leadscrew nuts must not be disengaged. The saddle being run back to the starting position by using the main clutch reverse lever.

For cutting T.P.I. shown on the dial, either the above method or the screwcutting dial can be used. The lever 'M' on the headstock (Section 5.1) is used for selecting R.H. or L.H. threads and cannot be used as a reverse during screwcutting operations.

For accurate screwcutting it is essential that all slides should be adjusted properly, without backlash and locked when possible.

When cutting large Helix Angle Screws the tool slide should be locked during each cut to obviate any digging in of the tool.

As the leadscrew thrust is taken on ball thrust bearings there should be no wear, any slackness will be due to the checknut inside the gearbox, easing off, this should be re-tightened.

The leadscrew is 1.3/8 in. diameter, 1/4 in. pitch right hand acme thread.

Change gears for all standard types of threads are shown in the accompanying charts.

The method of finding change gears for threads and pitches not shown on the charts, is to select a thread or pitch near to the one required and modify the change gear ratio given on the chart in proportion to the thread or pitch required.

$$\text{Ratio} = \frac{\text{Gear Ratio On Chart} \times \text{Pitch Required.}}{\text{Pitch Selected.}}$$

$$\text{OR } \frac{\text{Gear Ratio On Chart} \times \text{T.P.I. Selected.}}{\text{T.P.I. Required.}}$$

Example 1. Required 15 T.P.I. Standard Whitworth Thread.

Thread selected from chart. 20 T.P.I.

$$\text{Ratio} = \frac{30}{55} \times \frac{55}{60} \times \frac{20}{15} = \frac{30}{60} \times \frac{20}{15} = \frac{2}{3} = \frac{30}{45}$$

Change gears. N = 30T. Inter. 55T. S = 45T.

Set the gearbox to give 20 T.P.I. and arrange the change gears as indicated.

Example 2. Required 15/16 inches pitch.

Pitch selected from chart. 5/8 inches pitch.

$$\text{Ratio} = \frac{30}{55} \times \frac{55}{60} \times \frac{15/16}{5/8} = \frac{30}{60} \times \frac{15}{10} = \frac{30}{40}$$

Change gears. N = 30T. Inter. 55T. S = 40T.

Set the gearbox to give 5/8 inches pitch and arrange the change gears as indicated.

It is possible by varying T.P.I. or pitch selected to use change gears which may be a stock item. The numbers of teeth may be noted from the gears shown on the charts. (Section 6.11 & 6.12).

## 6.11 THREAD CUTTING continued

### INCH AND MM. PITCHES

Lever 'N' on the headstock should be set to the "Normal" or "Coarse" pitch as required.

Set levers 'R' and 'S' on the gearbox to the required type of pitch, and levers 'P' and 'U' to the positions shown on the chart.

The indicator 'T' should be set to the column number in which the required pitch appears on the chart.

For 32 to 56 MM. pitches, set to "Coarse" pitch on the headstock and reverse the change gears, i.e. N=60T, 55T, Inter. S. = 30T.

### DIAMETRAL AND MODULE PITCHES

Arrange the change gears as shown and operate as above.

### B. A. AND OTHER THREADS.

Arrange the change gears to suit the chart.

Set to the T.P.I. shown on the chart and operate the other levers in the ordinary way.

INDICATOR	1	2	3	4	5	6	7	8	9	FOR 32 TO 56 M.M. SET TO COARSE AND REVERSE CHANGE GEARS		
LEVERS		SCREW PITCHES IN MILLIMETRES										
E	B	32	36	38	40	44	46	48	52	56	COARSE	CHANGE GEARS
E	A	16	18	19	20	22	23	24	26	28		
	B	8	9	9.5	10	11	11.5	12	13	14	NORMAL	END BOX N 30 INTER 55
E	A	4	4.5	4.75	5	5.5	5.75	6	6.5	7		
	B	2	2.25		2.5	2.75		3	3.25	3.5	NORMAL	SCREW S 60
D	A	1			1.25			1.5		1.75		
	B	0.5						0.75				
		SCREW PITCHES IN INCHES										
E	A	1	1/8	1/16	1/4	1/8	1/16	1/2	1/8	1/4	COARSE	CHANGE GEARS
	B	1/2	9/32	19/32	5/8	11/16	23/32	3/4	13/16	7/8		
E	A	1/4	9/32		5/16	11/32		3/8	13/32	7/16	NORMAL	END BOX N 30 INTER 55 SCREW S 60
	B	1/8			5/32	11/32		3/16	7/32			

INDICATOR	1	2	3	4	5	6	7	8	9	CHANGE GEARS		
LEVERS		DIAMETRAL PITCHES										
D	A	2	2.25	2.375	2.5	2.75	2.875	3	3.25	3.5	COARSE	55 END BOX 30 INTER
	B	4	4.5	4.75	5	5.5	5.75	6	6.5	7		
D	A	8	9	9.5	10	11	11.5	12	13	14	NORMAL	35 INTER 60 SCREW
	B	16	18	19	20	22	23	24	26	28		
E	A	32	36	38	40	44	46	48	52	56	NORMAL	60 SCREW
	B	64	72	76	80	88	92	96	104	112		
	C	128	144	152	160	176	184	192	208	224		
		MODULE PITCHES										
E	A	8	9	9.5	10	11	11.5	12	13	14	COARSE	CHANGE GEARS
	B	4	4.5	4.75	5	5.5	5.75	6	6.5	7		
E	A	2	2.25		2.5	2.75		3	3.25	3.5	NORMAL	60 SCREW
	B	1			1.25			1.5		1.75		
	C	0.5						0.75				

B.A. THREADS						
B.A. No.	PITCH M.M.	SET TO T.P.I.	CHANGE GEARS			
			N	P	R	S
0	1	64	63	40	45	50
1	0.9	80	63	40	45	50
2	0.81	64	50	35	45	63
3	0.73	64	65	45	35	55
4	0.66	104	45	50	60	40
5	0.59	80	65	35	30	60
6	0.53	88	63	40	35	60
7	0.48	104	45	55	60	50
8	0.43	112	45	38	40	50
9	0.39	112	63	55	45	60
10	0.35	92	38	55	60	60

CHANGE GEARS

OTHER THREADS				
THREAD REQUIRED	THREAD SET FOR	CHANGE GEARS		
		N	INTER	S
13 1/2 T.P.I.	18 T.P.I.	40	55	60
27 T.P.I.	36 T.P.I.	40	55	60
33 1/2 T.P.I.	40 T.P.I.	30	35	50
42 T.P.I.	40 T.P.I.	30	35	63
60 T.P.I.	80 T.P.I.	40	35	60
2" PITCH	1/2" PITCH	60	55	30

## 6.12 THREAD CUTTING continued

DIRECT DRIVE FOR T.P.I. MODULE, METRIC, INCH AND DIAMETRAL PITCHES.

Arrange the change gears to suit the chart.

Set lever 'N' on headstock to "Normal" or "Coarse" pitch as required.

NOTE: Lever 'R' and 'S' on the gearbox MUST be set to the "Direct Drive" position, and lever 'P' to the position shown on the chart.

Lever 'U' should be placed in the neutral position.

T.P.I. WITH DIRECT DRIVE									
SET LEVERS TO DIRECT DRIVE									
T.P.I. OBTAINED					CHANGE GEARS				
COARSE		NORMAL			N	P	R	S	S
A	B	A	B	C					
1	2	4	8	16	40	50	40		
		4 1/2	9	18	45	55	45		
		4 3/4	9 1/2	19	44	35	40		
	2 1/2	5	10	20	40	45	50		
	2 5/8	5 1/4	10 1/2	21	60	50	40		63
		5 1/2	11	22	40	45	55		
		5 3/4	11 1/2	23	40	50	40		46
	3	6	12	24	40	45	60		
		6 1/2	13	26	40	45	65		
		6 3/4	13 1/2	27	49	45	45		60
	3 1/2	7	14	28	45	50	40		63
		7 1/2	15	30	40	50	40		60
		8	16	32	30	55	60		
				36	40	45	30		60
				40	40	50	30		60

MODULE PITCHES WITH DIRECT DRIVE									
SET LEVERS TO DIRECT DRIVE									
MODULE PITCH OBTAINED					CHANGE GEARS				
COARSE		NORMAL			N	P	R	S	S
A	B	A	B	C					
16	8	4	2	1	63	35	55	50	
15	7.5	3.75			66	40	45	40	
14	7	3.5	1.75		63	40	55	50	
13	6.5	3.25			55	35	45	44	
12	6	3	1.5	0.75	65	40	45	50	
11	5.5	2.75			60	35	50	63	
10	5	2.5	1.25		55	40	45	50	
9	4.5	2.25			65	35	30	50	

### DIRECT DRIVE FOR B.A. THREADS

Arrange the change gears to suit the chart.

Set lever 'N' on the headstock to "Normal" pitch. Set levers 'R' and 'S' on the gearbox to the "Direct Drive" position, and lever 'P' to the central position. (C)

Place lever 'U' in the neutral position.

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METRIC PITCHES WITH DIRECT DRIVE									
SET LEVERS TO DIRECT DRIVE									
METRIC PITCHES OBTAINED					CHANGE GEARS				
COARSE		NORMAL			N	P	R	S	S
A	B	A	B	C					
52	26	13	6.5	3.25	65	50	63	40	
50	25	12.5	6.25		63	40	50	40	
48	24	12	6	3	63	40	60	50	
44	22	11	5.5	2.75	63	40	55	50	
40	20	10	5	2.5	63	50	40		
36	18	9	4.5	2.25	63	40	45	50	
32	16	8	4	2	63	40	50		
30	15	7.5	3.75		63	40	45	60	
28	14	7	3.5	1.75	63	40	35	50	
24	12	6	3	1.5	63	40	30	50	
20	10	5	2.5	1.25	63	40	30	60	
16	8	4	2	1	63	50	30	60	
8	4	2	1	0.5	30	65	45	66	

INCHES PITCH WITH DIRECT DRIVE									
SET LEVERS TO DIRECT DRIVE									
INCHES PITCH OBTAINED					CHANGE GEARS				
COARSE		NORMAL			N	P	R	S	S
A	B	A	B	C					
2	1	1/2	1/4	1/8	60	55	30		
1 7/8	15/16	15/32			60	40	50	40	
1 3/4	7/8	7/16	7/32		63	40	50	45	
1 5/8	13/16	13/32			65	45	40		
3 1/2	3/4	3/8	3/16	3/32	60	45	40		
3 3/8	11/16	11/32			55	50	40		
1 1/4	5/8	5/16	5/32		50	55	40		
1 1/8	9/16	9/32			45	50	40		

DIAMETRAL PITCHES (DIRECT DRIVE)									
SET LEVERS TO DIRECT DRIVE									
DIAM. PITCHES OBTAINED					CHANGE GEARS				
COARSE		NORMAL			N	P	R	S	S
A	B	A	B	C					
2	4	8	16	32	55	45	35		
2.25	4.5	9	18	36	55	35	40	45	
2.5	5	10	20	40	55	35	40	50	
2.75	5.5	11	22	44	40	50	35		
3	6	12	24	48	55	35	40	60	
3.25	6.5	13	26	52	55	35	40	65	
3.5	7	14	28	56	44	35	45	63	

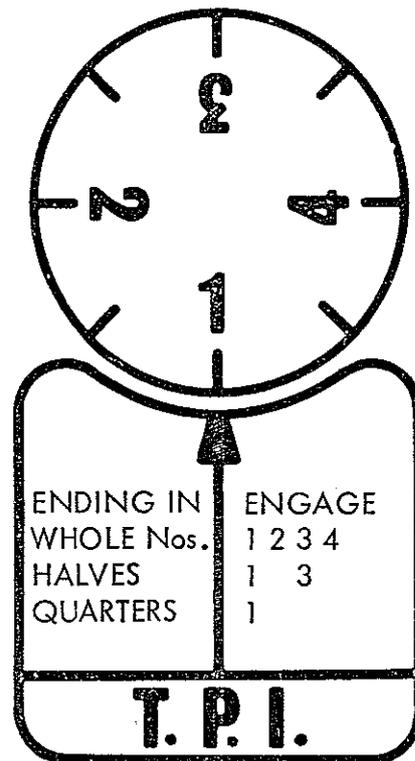
B.A. THDS. (Dir. Drive)					
SET LEVERS TO DIRECT DRIVE, C & NORMAL					
B.A. No.	CHANGE GEARS				
	N	P	R	S	S
0	63	50	30	60	
1	63	50	27	60	
2	45	42	30	63	
3	39	45	35	66	
4	30	50	45	65	
5	39	50	30	63	
6	28	55	42	64	
7	27	65	40	55	
8	28	64	39	63	
9	27	55	30	60	
10	27	65	35	66	

CHANGE GEARS

TYPE 13-1 & 16 SB.

## 6.2 SCREWCUTTING DIAL



### USE OF SCREWCUTTING DIAL

This is a most useful aid to screwcutting although its use is limited to certain threads and pitches. Where applicable it enables the nuts to be engaged without cross threading. The dial may be used when cutting any pitch which is contained a whole number of times in a length of 4 in. From this it will be seen that the whole numbers of threads per inch can be cut, also threads per inch ending in quarters and halves, viz.  $2\frac{1}{4}$ ,  $2\frac{1}{2}$ , t.p.i.

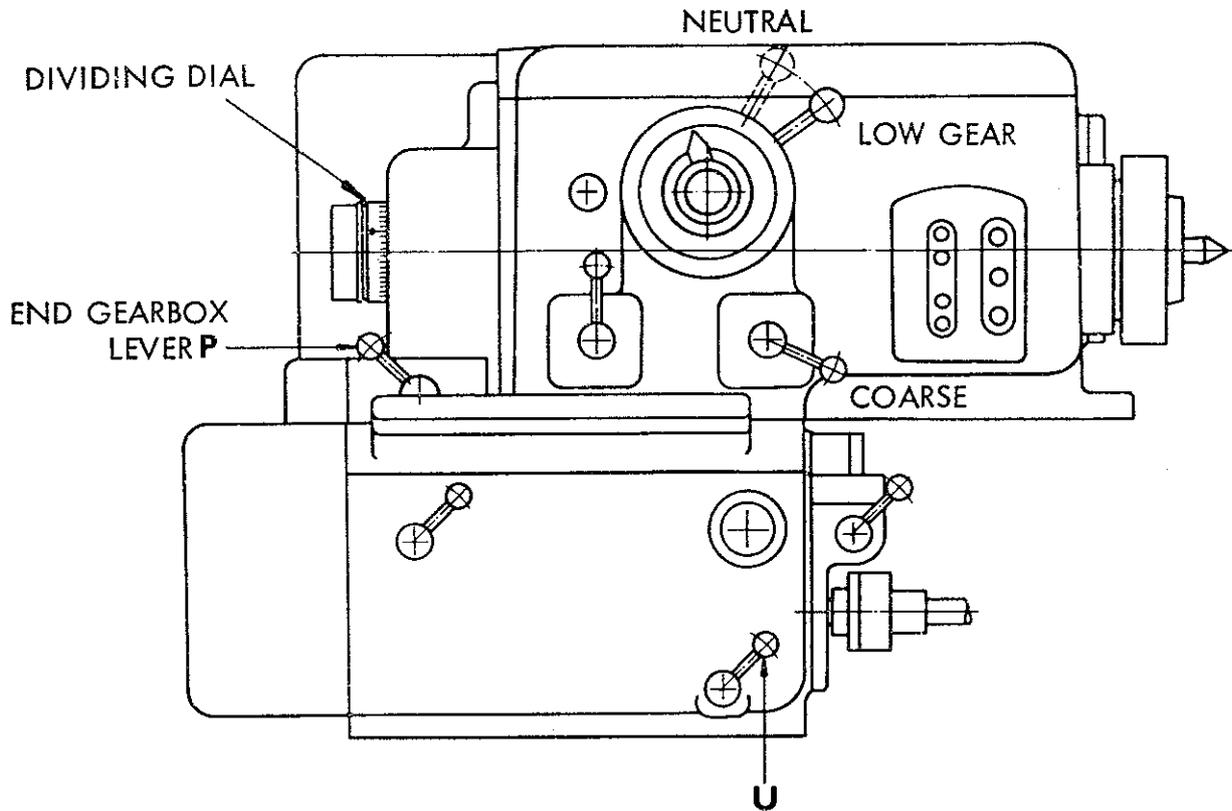
The dial makes one revolution for 16 turns of the leadscrew, and as the screw is  $\frac{1}{4}$  in. pitch this is equivalent to 4 in. length of thread on the screw. As the dial is divided into 8 divisions, the alternate ones being numbered 1 to 4, then from one numbered division to the next is  $\frac{1}{4}$  of a revolution and is equivalent to 1 in. of screw thread. It will be seen therefore that when cutting a screw having a whole number of threads per inch the spindle will make a whole number of revolutions in one inch length, and as the leadscrew likewise makes a whole number of revolutions in the same distance the leadscrew nuts can be engaged at any numbered division on the dial. From this it follows that if the threads per inch on the screw to be cut is an even number a whole number of threads is contained in  $\frac{1}{2}$  in. and the nuts may be engaged at any of the 8 divisions on the dial.

Similarly odd numbers of t.p.i. can only be engaged at any numbered division, threads ending in halves engaged at every half revolution and threads ending in quarters at every revolution. For linear inch pitches, convert the pitch to an equivalent number of threads per inch (viz.  $\frac{1}{3}$  inch pitch = 3 t.p.i.) and follow the above rules.

If the number of threads per inch is neither a whole number or does not end in  $\frac{1}{2}$  or  $\frac{1}{4}$  then the dial cannot be used, in which case the screw must be cut completely without disengaging the nuts and by using the main clutch reverse lever to run the saddle back with the nuts engaged.

Information or advice on any particular application of the dial, will be supplied by our technical department on request.

## 6.3 MULTIPLE START THREADS



For all multiple start threads where the number of starts will divide into 72, engage the coarse pitch ratio and use the following method of dividing.

When the first start of the thread has been cut, take up all the backlash with the work and the leadscrew turning in the direction of the cut. Set the dividing dial at the rear end of the spindle to zero. Move the rear speed selection lever on the headstock from the low gear position to the neutral position, i.e. Move lever 'F' from position 1 to position 2, see section 4.11. Rotate the spindle by hand in the direction of the cut to the next appropriate number on the dial and re-engage low gear. This procedure is repeated on completion of each subsequent start. Care should be taken not to disturb any other motion whilst this is being done,

The rear speed selection lever on the headstock controls the 18T pinion 'G' (section 4.11) which meshes with the 72T front wheel on the spindle. Thus any number of starts which will divide into 72 can be cut in this way.

5 start worms can be cut using either the normal or coarse pitch ratio and the following method of dividing.

When the first start of the thread has been cut, take up all the backlash with the work and the leadscrew turning in the direction of the cut. Set the dividing dial at the rear end of the spindle to zero. Move the lever 'P' on the end gearbox into an adjacent neutral position, and set lever operating speed cone to a neutral position and then rotate the spindle by hand in the direction of the cut to the next appropriate number on the dial, and re-engage the lever 'P'.

Repeat the procedure for each start.

## 6.31 MULTIPLE START THREADS continued

For leads shown on the charts in the normal ranges set all levers to the positions indicated, excepting lever 'U' on the gearbox which should be placed in the 'D' position instead of 'E' and engage the 4 to 1 coarse pitch ratio on the headstock. The changing of lever 'U' from 'D' to 'E' position gives a 4 to 1 ratio, thus cancelling out the coarse pitch ratio. When using the coarse pitch ratio for multiple start screws designated in T.P.I. i.e. 12 T.P.I. 3 starts, the gearbox levers should be set to the T.P.I. on the chart which is found in the following manner:-

$$\text{T.P.I. On chart} = \frac{\text{T.P.I. of work} \times 4}{\text{Number of starts}}$$

Example 1. To cut 12 T.P.I. 3 starts.

$$\text{T.P.I. on chart} = \frac{12 \times 4}{3} = 16 \text{ T.P.I.}$$

Therefore set the levers to 16 T.P.I. and coarse pitch.

If the T.P.I. thus found is not on the chart, convert to an equivalent inch pitch.

Example 2. To cut 10 T.P.I. 3 starts.

$$\text{T.P.I. on chart} = \frac{10 \times 4}{3} = \frac{40 \text{ T.P.I.}}{3} = \frac{3 \text{ ins. pitch.}}{40}$$

If the pitch is not on the chart for screw pitches, the change gears may be found from:-

$$\frac{N}{S} \text{ or } \frac{N}{P} \times \frac{R}{S} = \frac{\text{Pitch required} \times \text{T.P.I. set for}}{2}$$

Example 2. Change gears required for  $\frac{3}{40}$  ins. pitch.  
(Continued)

$$\text{Change gears} = \frac{3 \times (10 \text{ T.P.I. set for})}{40 \times 2}$$

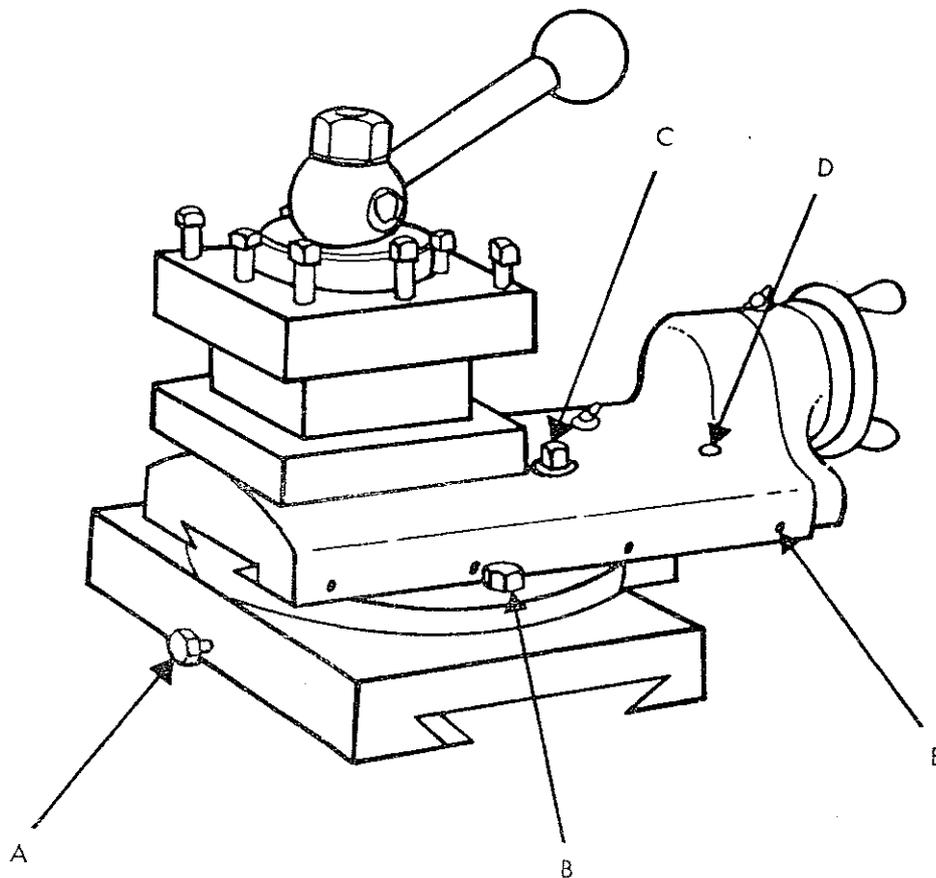
$$\text{Change gears} = \frac{3}{8} = \frac{45}{60} \times \frac{30}{60}$$

Therefore set the gearbox to give 10 T.P.I. and set to coarse pitch. Use change gears,

$$\frac{N}{P} \times \frac{R}{S} = \frac{45}{60} \times \frac{30}{60}$$

Information on any particular case will be supplied on request by our technical department.

## 8.1 COMPOUND SLIDES



The tool slide can be swivelled to any angle by releasing the two hexagon nuts 'B'. The angle being indicated on the top of the cross slide.

The tool slide dial may be set to zero by releasing the screw in the handwheel, the dial is graduated 125 divisions each division representing .001" movement of the tool.

When taking heavy or intermittent cuts, the cross slide can be locked to the saddle by the screw 'A'. For facing cuts or drilling, the tool slide can be locked by screw 'C'.

A slip is provided for the adjustment of the tool slide guides.

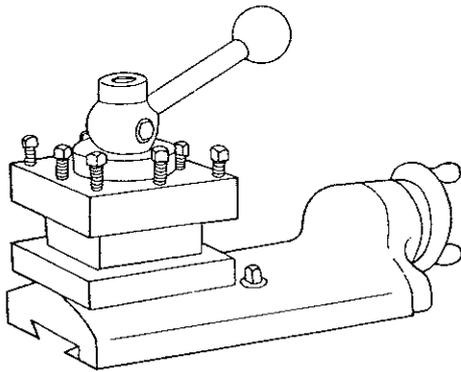
To effect this adjustment it is necessary to remove the square turret. To do this, rotate the turret lever in an anti-clockwise direction until the screw is clear of the nut, the turret will then lift off.

Release the screws 'D' on the top of the slide, adjust the slip by means of the screws 'E' then re-lock the screws 'D'.

Replace the square turret.

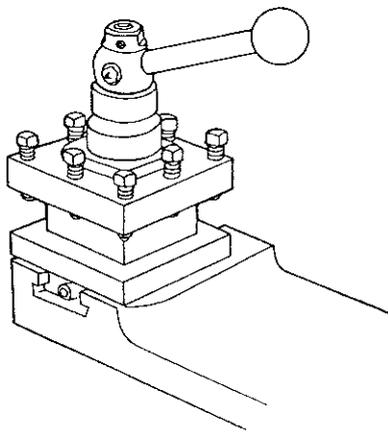
## 8.2 TOOL SLIDES

### SQUARE TURRET



The square turret is designed to operate on four stations, but it can also be locked in intermediate positions if required.

To rotate the turret move the lever in an anti-clockwise direction, this will unlock and lift the turret from its locating plunger. It can then be rotated by hand in either direction to the required tool position. The lever can be made to lock in any convenient position by adjusting the nut on top of the locking bolt.



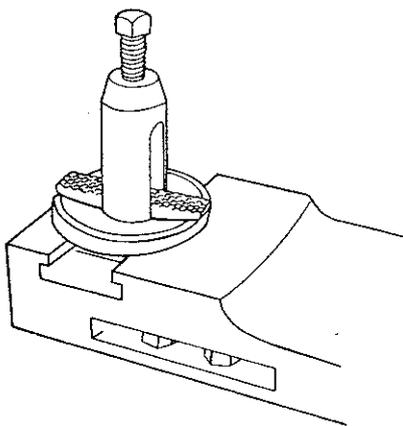
The tool size and dimensions of the turret are given on the capacity chart section 1.4.

### DETACHABLE SQUARE TURRET

This type of square turret is mounted on a tee slotted tool slide and is designed to operate on twelve stations.

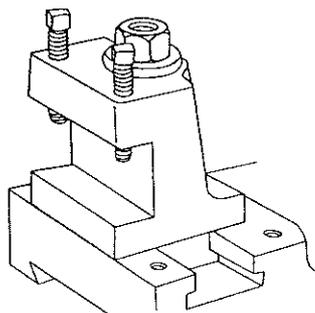
To rotate the turret move the lever in an anti-clockwise direction, this will unlock the turret and release the locating plunger. It can then be rotated by hand to the required tool position.

To lock the turret move the lever in a clockwise direction.



### SINGLE TOOL POST

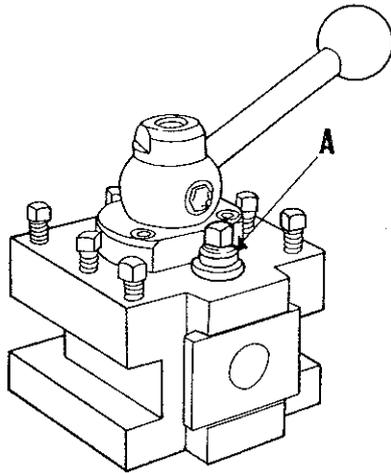
This type of toolholder is mounted on a tee slotted tool slide. The tool post can be clamped in any position across the width of the slide. The tool and the tool post being locked simultaneously by the square head screw.



### SWIVELLING TOOLHOLDER

This type of toolholder is mounted on a tee slotted tool slide. The toolholder can be clamped in any position across the width of the slide by means of the hexagon nut, it can also be swivelled to any angle.

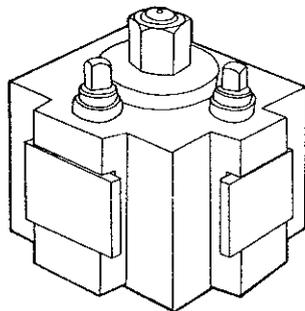
## 8.21 TOOL SLIDES continued



### SQUARE TURRET WITH ONE FACE FOR INTERCHANGEABLE TOOLHOLDERS.

This type of square turret gives four stations and provides three normal tool positions with one face to suit interchangeable toolholders. The toolholders being locked in position by means of the square head screw 'A'.

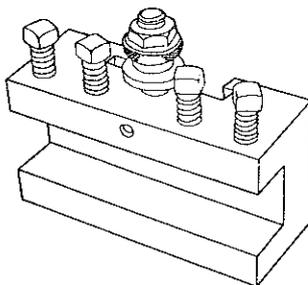
The turret operates in the same way as the square turret. See Section 8.2.



### TOOLBLOCK FOR INTERCHANGEABLE TOOLHOLDERS.

This type of toolblock gives two stations and has two faces to suit interchangeable toolholders.

To rotate the toolblock, release the hexagon nut, lift the knurled locating plunger and turn the block by hand through 90°. Replace the plunger and lock the hexagon nut.

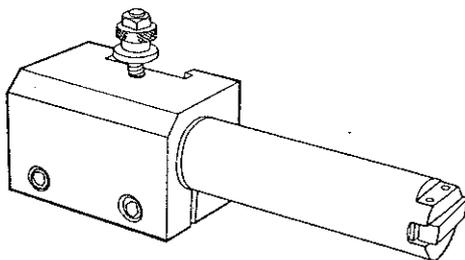


### INTERCHANGEABLE TOOLHOLDERS.

The tools are set in the normal way and it is only necessary to change the toolholders. The correct level of the tool is set by means of a screwed collar and locknut.

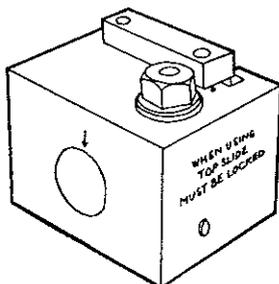
The toolholder for drilling is positioned by a fixed stop.

Three types of toolholder are available.



### TOOLHOLDER FOR TURNING AND FACING TOOLS.

Tool size  $\frac{3}{4}$ " deep x  $\frac{5}{8}$ " wide x  $4\frac{1}{2}$ " long.



### TOOLHOLDER FOR BORING BARS.

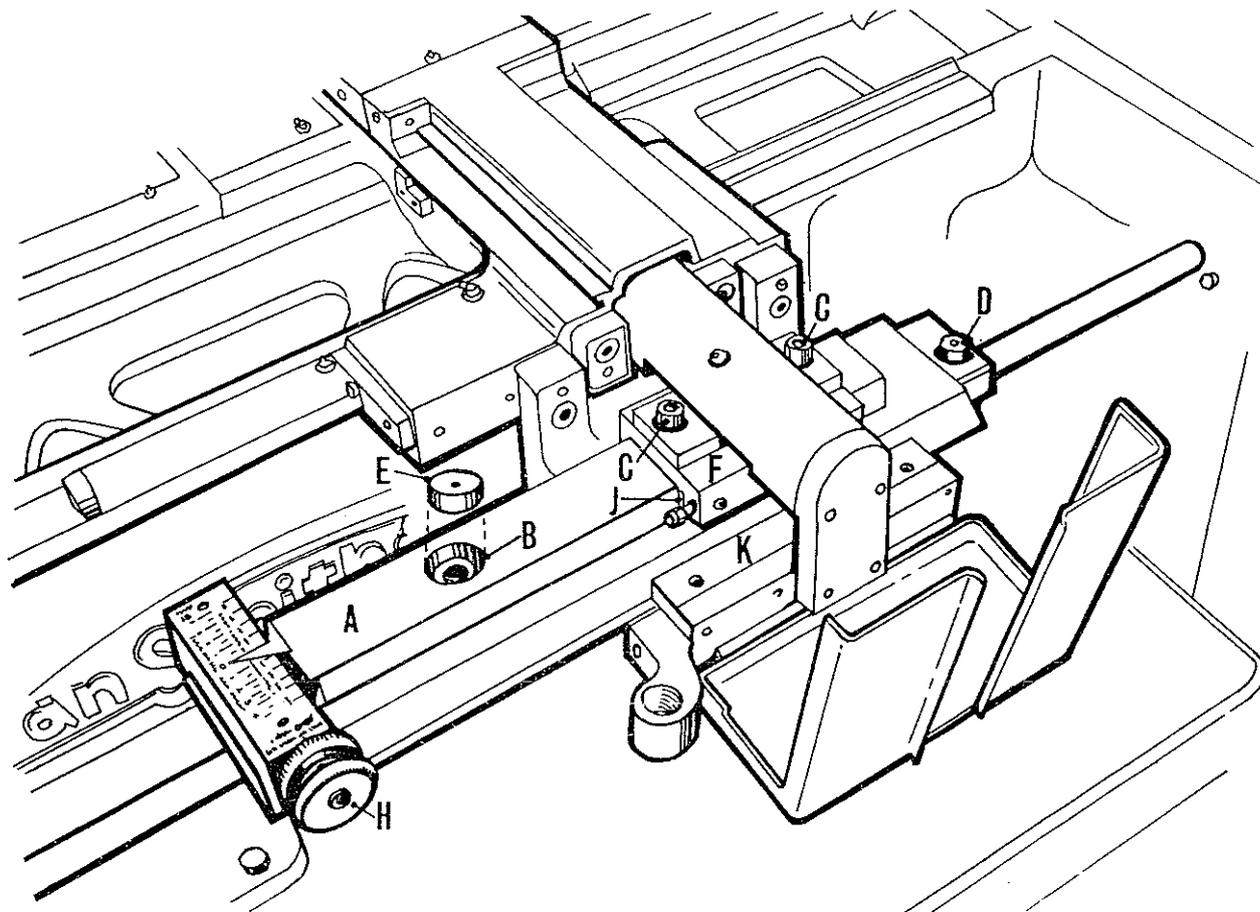
Bore size 1.250" dia.

### TOOLHOLDER FOR DRILLING.

When using this type the tool slide must be locked. See section 8.1.

Bore size. 1.250" dia.

## 9.1 TAPER TURNING ATTACHMENT



The attachment will turn tapers up to  $20^{\circ}$  included angle (4 inches per foot on dia.) and up to 12 inches in length.

When not in use guide bar 'A' should be set approximately to zero, screws 'B' and 'C' should be locked and nut 'D' released. The attachment and slides will then travel with the saddle.

If the attachment has not been used for some time, thoroughly clean and lubricate all sliding parts.

To set for a required taper tighten nut 'D' and position saddle so that guide block 'F' is approximately central on guide bar 'A'. Remove two caps 'E' and release nuts 'B' at each end of the guide bar. Also release capscrews 'C'. Adjust guide bar to correct taper by thimble 'H'. It is important to note that the divisions on this thimble are to assist fine setting but are not related to the divisions on the setting plate. After setting, tighten nuts 'B' and screws 'C' and replace caps 'E'. Tapering will commence with the longitudinal travel of the saddle. Depth of cut adjustment is made by the cross slide handwheel which is connected by a telescopic joint to the screw. Tapering is temporarily disconnected by releasing nut 'D'. Every effort is made in construction to reduce backlash to a minimum. It is impossible to remove completely the effect of backlash and it is advisable to allow for this when establishing the point of the taper.

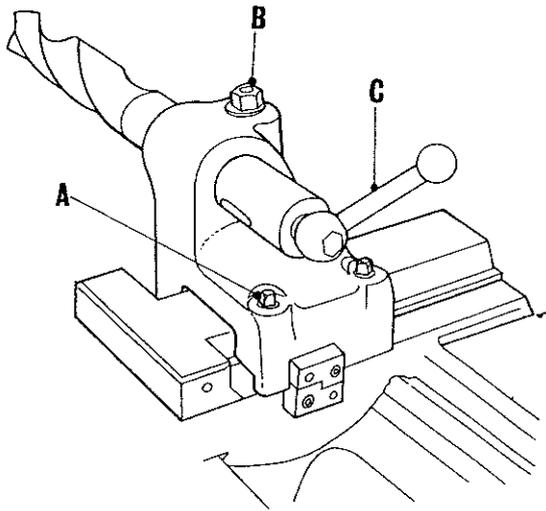
Any wear on the slide bars can be taken up by the adjustment of the slips 'J' and 'K'. When taper turning it is advisable to keep the backlash in the saddle screw nuts to a minimum. For adjustment instructions see Section 7.2.

## 9.2 ADDITIONAL EQUIPMENT AVAILABLE

12 ins. dia. Faceplate.  
10 ins. dia. 4-Jaw Steel Chuck.  
10 ins. dia. 3-Jaw Steel Chuck. 1400 R. P. M.  
8½ ins. dia. 3-Jaw Steel Chuck. 2240 R. P. M.  
Blank Backplates for D1.6 Spindle Nose.  
Spindle Nose Type Collet Chuck.  
Collets for above as required.  
Pratt Auto-Grip Workdriver.  
Travelling Chip Guard.  
Square Turret on Compound Slides. Section 8.2.  
Above Turret with one Face for interchangeable Toolholders. Section 8.21.  
Toolblock for interchangeable Toolholders. Section 8.21.  
Interchangeable Toolholders for above. Section 8.21.  
Square Turret on Tee-slotted Compound Slides. Section 8.2.  
Single Tool Post for above.  
Swivelling Toolholder for above.  
Taper Turning attachment. 12 ins. long.  
Stationary Steady. To take 5 ins. dia. Section 9.3.  
Stationary Steady. To take 7 ins. dia. Section 9.3.  
Travelling Steady. To take 3 ins. dia. Section 9.3.  
Interchangeable Travelling Steady. To take 3 ins. dia.  
Spherical Turning Attachment. Section 9.31.  
Hydraulic Copying Unit.  
Reducing Sockets for Drilling Attachment.  
Micrometer Dead Stop.  
Compound Dials. (Direct reading for cross and longitudinal movements).  
Cross Stops. Non-Tripping.  
Longitudinal Stops. Section 9.3.  
Threading Trip.  
Revolving Centre with Morse Taper Shank.  
Lo-Vo-Lite Lighting Unit,  
Electrical Reverse.  
Coolant Pump and Piping.  
Foundation Bolts.  
Levelling Plates.  
Tool Cabinet.  
Spring loaded centre. Section 9.31.  
Tailstock Spindle with Built-in Revolving Centre. Section 4.71.

## 9.3 AUXILIARY EQUIPMENT

### POWER DRILLING ATTACHMENT.

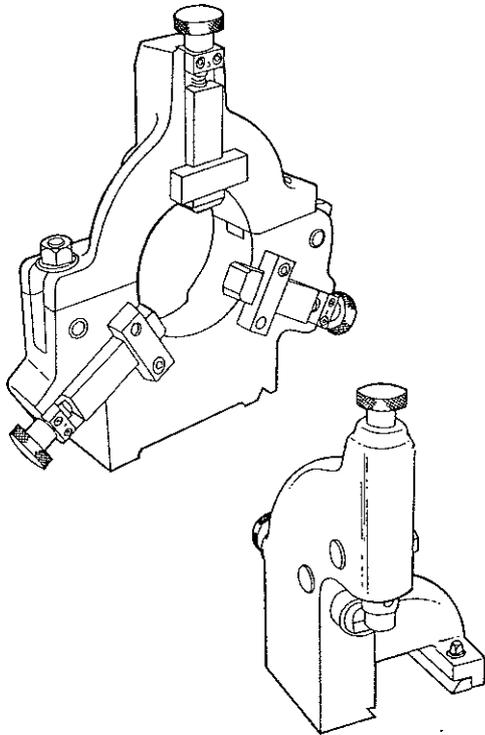


The power drilling attachment is used primarily for drilling operations but it can also be used to carry a boring bar, reamer or diehead. It can be used with hand traverse or power feed.

The attachment is mounted on the saddle at the rear of the cross slide, it is locked to the saddle by the screws 'A'. A centre stop locates the drill in line with the spindle, this allows for the removal of the attachment to the rear of the saddle.

The attachment is supplied with a No. 4 Morse Taper Sleeve which is locked in position by means of the nut 'B', provision having been made for the ejection of drills by lever 'C'.

### STATIONARY STEADY.



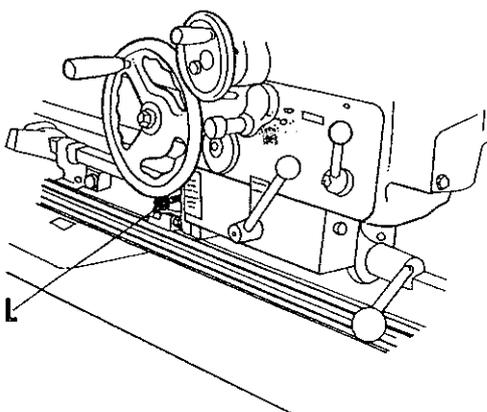
The stationary steady is of rigid design, having a maximum capacity of 5 ins. bar diameter, the steady has 3 adjustable pads with nylon inserts. Roller type pads are available if specially ordered.

A large stationary steady with a maximum capacity of 7 ins. bar diameter is available if specially ordered.

### TRAVELLING STEADY.

The travelling steady is of rigid design, having a maximum capacity of 3 ins. bar diameter. The steady has 2 adjustable sleeves with nylon inserts. Roller type sleeves are available if specially ordered.

### LONGITUDINAL STOPS.

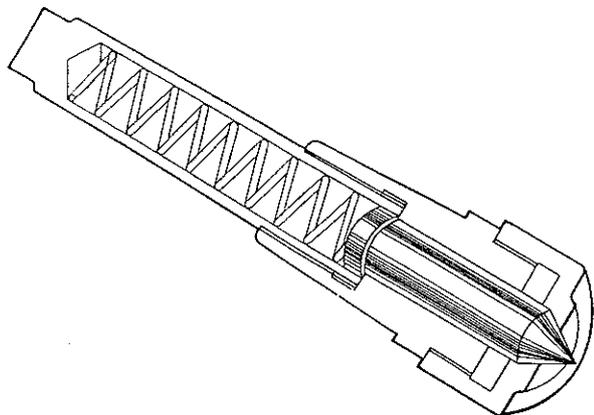


When using the longitudinal stops to locate for a cross feed operation, as soon as the feed has been tripped lift the lever 'L' and traverse the apron by hand up to the stop. Place the feed selection lever 'D' in the cross feed position and engage the feed. (Section 7.1).

The stop bar has six stations.

## 9.31 AUXILIARY EQUIPMENT continued

### SPRING LOADED HEADSTOCK CENTRE.

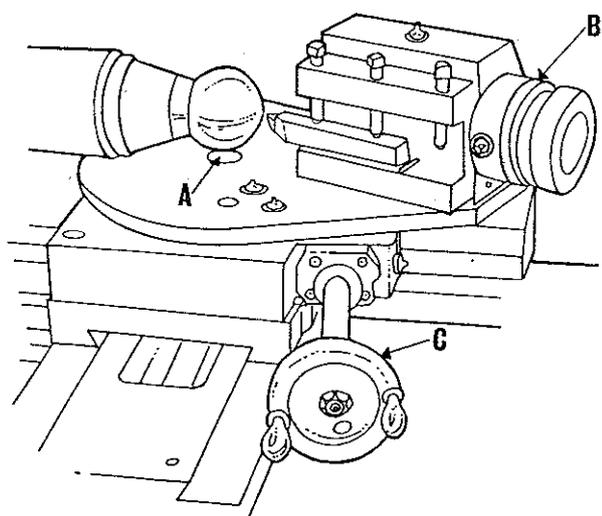


This is used for the location of workpieces with faced and centred ends to facilitate shoulder turning. This is particularly advantageous when using a copying unit, the shaft being located in the correct relative position to the template, any variation in the depth of the centre holes being eliminated.

Two sizes of stop caps are available to suit large (9/16" dia.) or small (1/4" dia.) centre holes.

This type of centre is ideal for use in conjunction with Pratt auto-grip work drivers, see section 4.61.

### SPHERICAL TURNING ATTACHMENT.



The spherical turning attachment is mounted on the cross slide. It replaces the compound slides and is held in position by three screws, to remove the compound slides release the two hexagon nuts on the top of the swivel slide, lift the slides off and remove the screws from the tee slot.

To set the tool for a given ball radius, withdraw the plug 'A' from the centre of the top slide and insert the 5/8 ins. diameter measuring rod, supplied with the attachment. The radius can then be set by using measuring blocks and the dial 'B'. The dial is graduated 125 divisions each division representing .001" movement of the tool.

The radius being produced by turning the hand-wheel 'C'. The maximum ball radius is 1½ ins.

## 10.1 FAULT FINDING

CAUSE	INACCURATE WORK	REMEDY
1. Lathe not correctly installed causing tapering.		1. Check levelling (Section 2.5)
2. Excessive play in saddle guideways.		2. Adjust gib plates on saddle.
3. Excessive play in cross slide and compound slides.		3. Adjust slips on cross slide (Section 7.2) & on compound slide (Section 8.1).
4. Tailstock spindle out of line with headstock spindle.		4. Check & adjust (Section 4.7)
5. Foreign matter preventing correct location of chucks, faceplates and centres.		5. Remove & clean requisite parts.
6. Centres running out.		6. Check centres for bruising. For built in roller bearing centre follow instructions on tailstock. See Section 4.71.
7. Uneven locking of spindle nose cams.		7. Refer to locking sequence. (Section 4.5).
8. Uneven nipping of chuck jaws.		8. Repair or replace jaws.
9. Incorrect centres in work piece.		9. Centre should be trued up.

### INFERIOR FINISH OF WORKPIECE

1. Excessive play in spindle bearings.		1. Check and adjust preload (Section 4.4)
2. Belt slip.		2. Adjust belts (Section 12.1)
3. Vibration caused by unbalanced work or intermittent cutting.		3. Counter balance workpiece. It is advisable for this type of work to have the machine bolted to the foundations. (Section 2.1.)
4. Drive to the feed motion is taken through the end change gears, and regular pitch markings occur if gears are too deep in mesh.		4. Check & adjust for correct backlash (Section 6.1)
5. Bent feed shaft or cross slide screw giving regular pitch markings.		5. Remove & straighten.
6. Levelling screws not correctly set & locked.		6. Re-level machine (Section 2.5)
7. Inefficient clamping of work piece.		7. Check clamping on chucks & driving mediums.
8. Insufficiently supported work piece.		8. Use steadies or tailstock support.
9. Dull cutting edge or incorrect cutting and clearance angles.		9. Check tool & regrind accordingly.
10. Tool not set to correct centre height.		10. Re-set correctly. Any packing used should be parallel & flat.
11. Tool inadequately clamped.		11. Re-clamp.
12. Unsuitable feeds & speeds.		12. Try adjacent feeds & speeds.
13. Lack of cutting fluid.		13. Use appropriate cutting fluid.
14. Incorrect oil on bed or cross slide.		14. Use correct oil (Section 3.1).
15. Dirty oil in headstock causes roughness in spindle bearings.		15. Change oil & clean filter (Section 3.11).

## 10.2 PRACTICAL INFORMATION

### WEIGHT OF WORK PIECE CAPACITY

SPINDLE SPEEDS	WEIGHT IN CHUCK C. of G. up to 6 ins. from chuck face	WEIGHT BETWEEN CENTRES		MAXIMUM UNBALANCED
		13 x 30	13 x 42	
1000 R. P. M. Max. eccentricity of C. of G.	90 lbs. .007 ins.	280 lbs .003 ins	400 lbs .002 ins	10 oz. ins.
500 R. P. M. Max. eccentricity of C. of G.	90 lbs .028 ins	280 lbs .009 ins	400 lbs .006 ins	40 oz. ins.

### MAXIMUM SPEEDS OF CHUCKS AND FACEPLATES

#### DIAMETER OF STEEL CHUCK

#### MAXIMUM SPEED

8½ ins.	3 Jaw	2240 R. P. M.
10 ins.	3 or 4 Jaw	1400 R. P. M.
14 ins.	4 Jaw	1000 R. P. M.

#### DIAMETER OF C. I. FACEPLATE

#### MAXIMUM SPEED

12 ins.	710 R. P. M.
16 ins.	500 R. P. M.

The above maximum speeds are recommended only in cases where the work being held is comparatively light (up to half the weight of the chuck) and well balanced.

Speeds must be considerably reduced under the following conditions:-

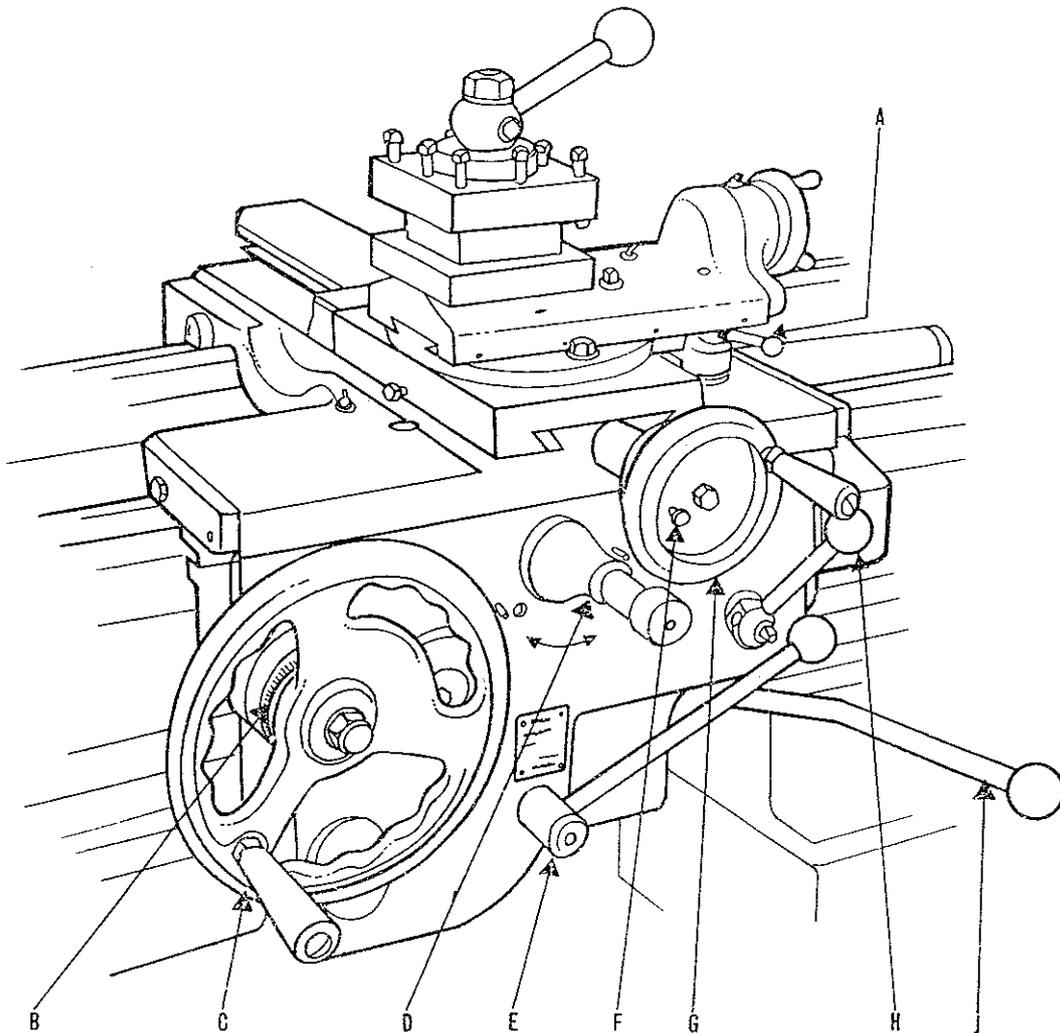
1. Work out of balance.
2. Heavy work (exceeding half the weight of the chuck).
3. Work having large projection from the face of chuck or faceplate.

### SPEED AND FEED COMBINATION

To avoid running the feed gears and feed shaft at excessive speeds, the feeds at the higher spindle speeds must be limited as follows:-

Up to 1000 R. P. M.	Max. feed is .0256 in. (.650 mm) per rev.
At 1120 R. P. M.	" " " .0216 in. (.549 mm) " "
" 1400 R. P. M.	" " " .016 in. (.406 mm) " "
" 1600 R. P. M.	" " " .0142 in. (.361 mm) " "
" 2240 R. P. M.	" " " .0111 in. (.282 mm) " "

## 7.1 APRON



Do not operate the apron before reading the lubricating instructions. Section 3.

For selection of feeds from the gearbox see section 5.

Manual movement of the apron along the bed is by means of the handwheel 'C'. Ensure that the trip lever 'E' is in the trip position and the leadscrew nut operating lever 'H' is in the disengaged position as shown.

For length measurement the dial 'B' may be set to zero, it is graduated 64 divisions each division representing  $1/64$ " , thus one revolution of the handwheel gives one inch of travel. The cross slide is traversed by the handwheel 'G'. The cross feed dial may be set to zero by releasing the screw 'F'. The dial is graduated 200 divisions each division representing .001" movement of the tool or .002" alteration in the diameter of the workpiece.

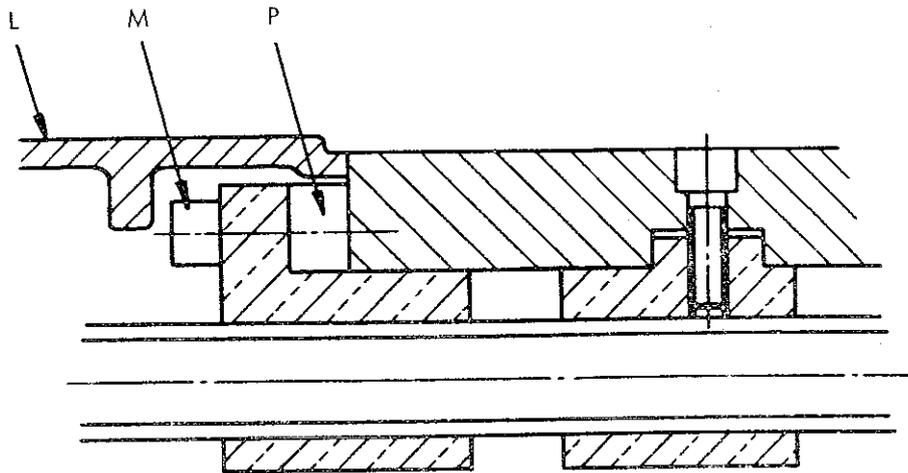
Longitudinal or cross feed selection is made by lever 'D'. To operate, pull the lever out to disengage the locating plunger. When the cross feed is engaged the saddle should be clamped to the bed by lever 'A'.

The feed engage and trip lever 'E' is interlocked with the leadscrew nut operating lever 'H'. Clutch engagement lever 'J' travels with the apron and is additional to lever 'B' Section 4.1.

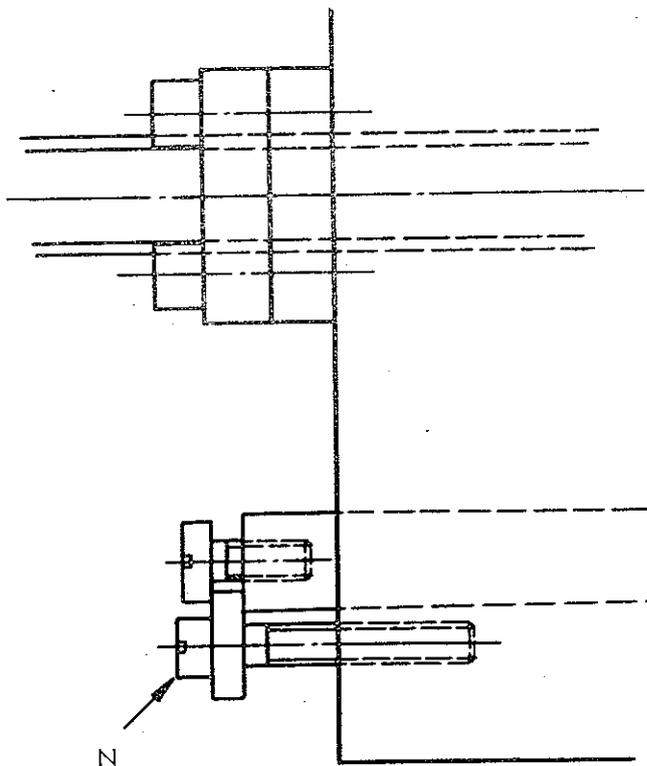
## 7.2 SADDLE

The saddle should not be moved before reading the lubricating instructions. Section 3. Wipers are fitted on the end of the saddle wings and on the cover at the rear of the cross slide, it is advisable to remove these periodically to clean them. To re-assemble, use a light pressure to force the springing edge of the wiper down onto the bed or slideway, simultaneously tightening the retaining screws.

The wipers should be checked regularly and renewed when necessary.



SECTION THROUGH CROSS SLIDE SCREW NUTS.



PLAN VIEW OF CROSS SLIDE.

Two saddle screw nuts are fitted and provision made for adjustment to minimise the backlash. This adjustment being carried out as follows:-

Measure the backlash by means of the cross slide dial.

Remove the cover 'L' at the rear of the cross slide. Release the two Allen fixing screws 'M' and lift off the slotted plate 'P'. Grind the plate to give the required adjustment and replace.

When a taper turning attachment is fitted, the backlash between the key and keyway of the telescopic joint must be taken into account.

On lathes supplied with a Hydraulic Copying unit, only one nut is fitted and the above procedure does not apply.

A taper slip is provided for the adjustment of the cross slide guides.

The slip is adjusted by screw 'N' which is held in position by a locking screw. The screw being situated under cover 'L'.

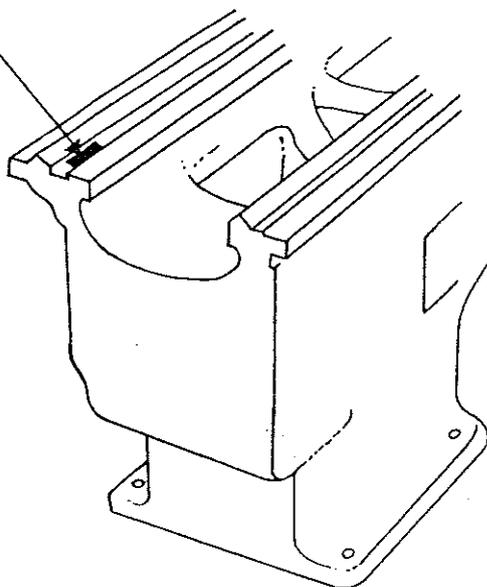
## SPARE PARTS

Prompt service on spare parts orders depends upon the correct information being supplied.

The following spares lists show the parts for each unit of the lathe with item numbers and descriptions.

NOTE: Parts are not carried in our stock under these numbers and giving the unit and item number alone is not sufficient. We also require the number of the sheet on which the required part appears and the SERIAL NUMBER of the lathe, the latter is engraved on the nameplate at the front of the headstock and on the tailstock end of the bed, as indicated.

Serial number stamped here



### CHUCKS

Spare parts for chucks should be ordered direct from the manufacturer, quoting the number stamped on the front face of the chuck.

## IMPORTANT!

When ordering spare parts the following information is required:-

1. Quantity required.
2. Name and item number of part as listed.
3. Sheet number on which part appears.
4. Serial number and type of lathe.

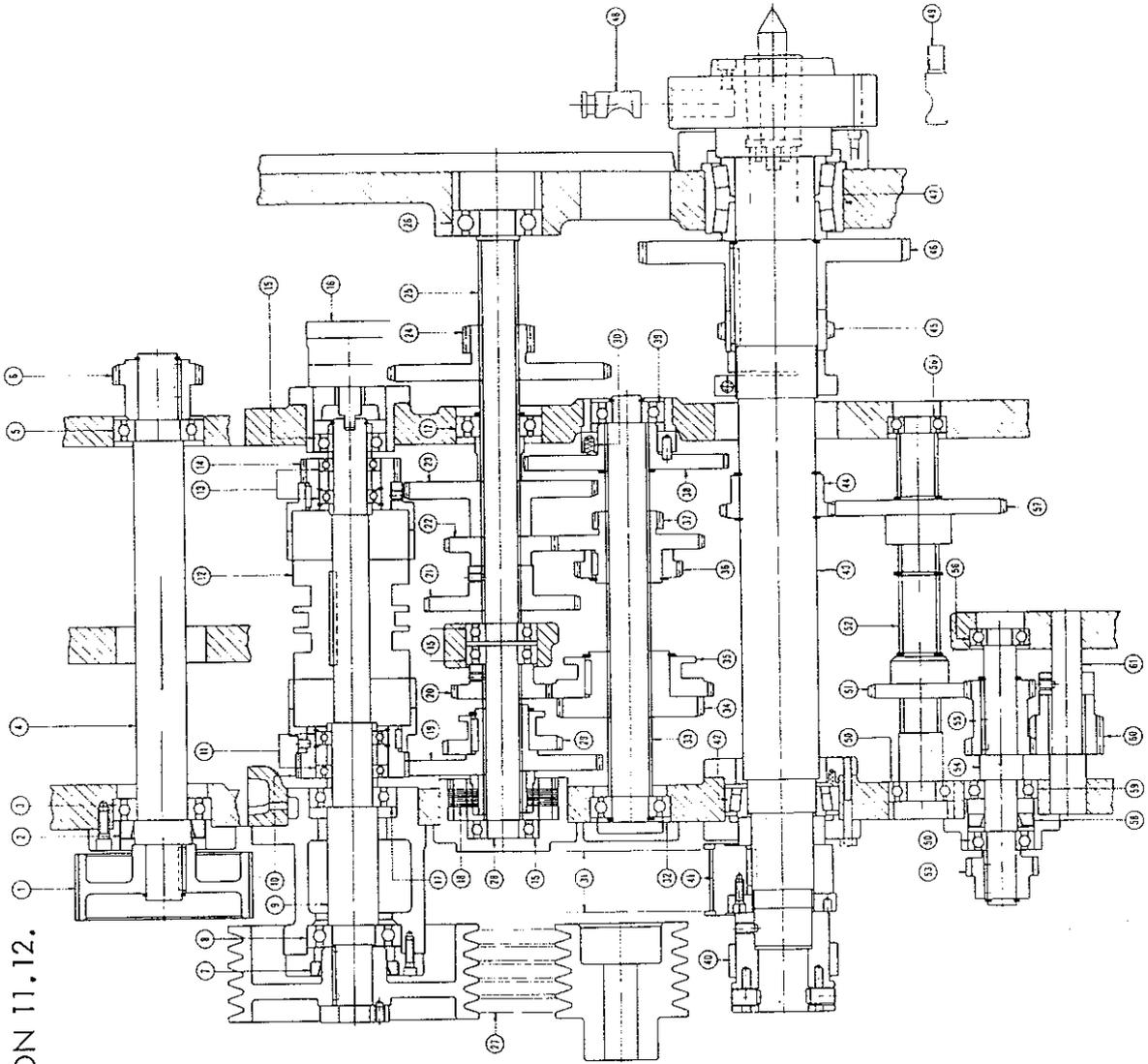
Example: 2 - Hoff. S 12½ Item No.11. Sheet No. 353, Lathe No. 32461. Type 13-1.

It will be appreciated that all parts of the lathe cannot be shown. Therefore where such a part is required it is advisable to relate this to one already listed.

Example: GEAR SHIFTER for 18/58T Double Gear No. 24 Sheet No. 353 Lathe No.32461.

# 11.1 SPARE PARTS LIST FOR HEADSTOCK

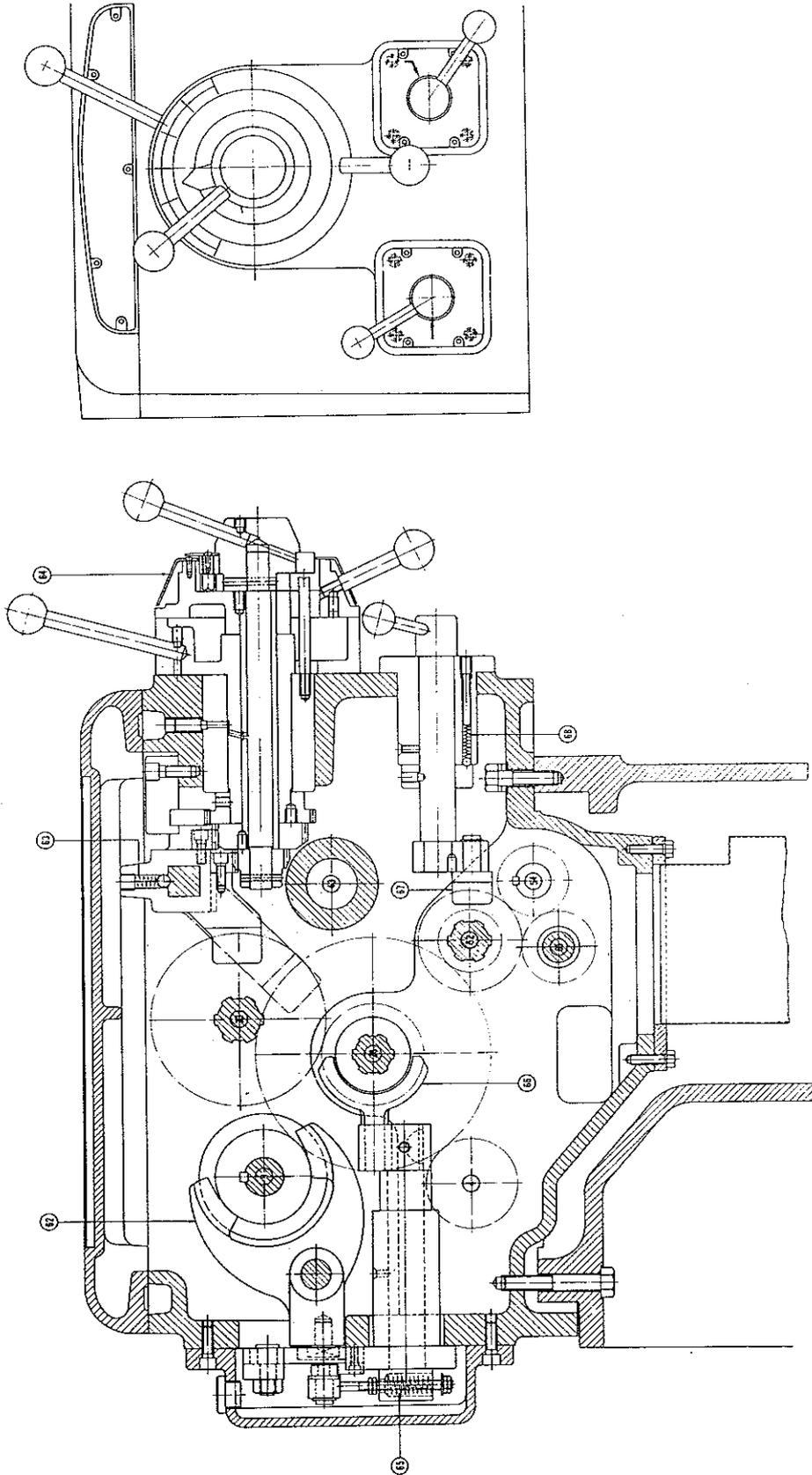
PLEASE STATE MACHINE SERIAL NUMBER, SHEET NUMBER AND ITEM NUMBER.  
FOR PARTS LIST SEE SECTION 11.12.



ALL FIXING SCREWS ARE STD. WHITWORTH OR B.S.F. THREAD  
EXCEPT SPINDLE NOSE GAM SCREWS WHICH ARE UNIFIED THREAD.

# 11.11 SPARE PARTS LIST FOR HEADSTOCK continued

PLEASE STATE MACHINE SERIAL NUMBER, SHEET NUMBER AND ITEM NUMBER.



FOR PARTS LIST SEE SECTION 11.12.

ALL FIXING SCREWS ARE STD. WHITWORTH OR B. S. F. THREAD

## 11.12 SPARE PARTS LIST FOR HEADSTOCK continued

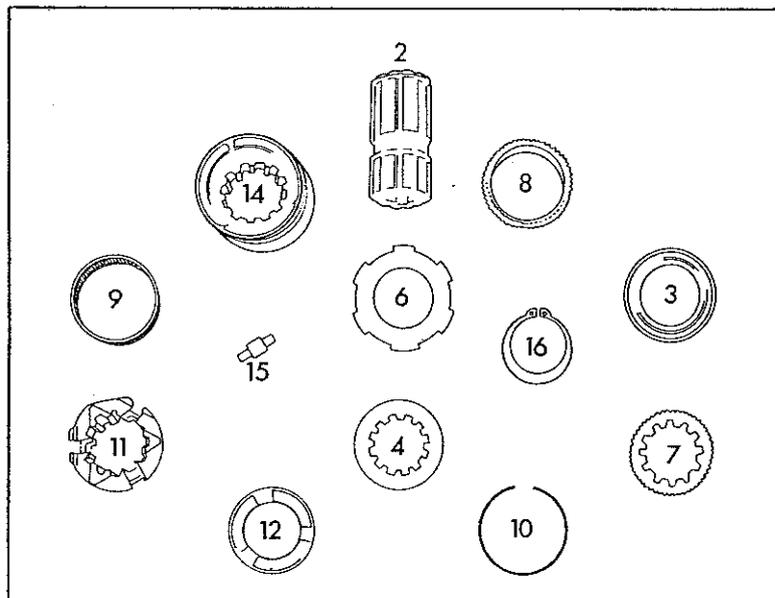
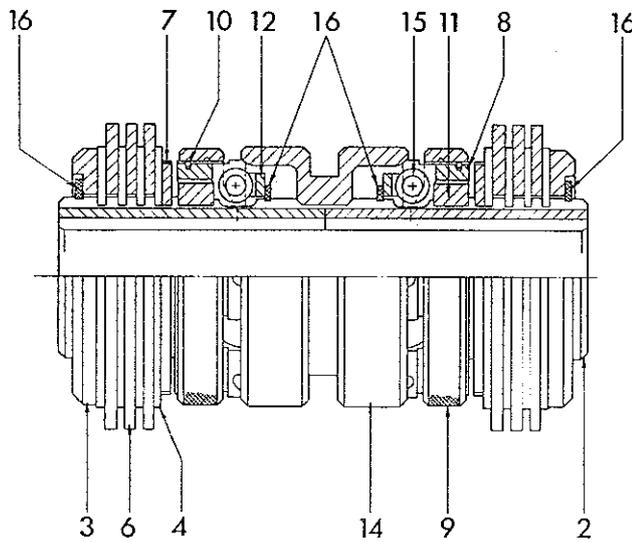
- |   |  |
|---|--|
| <p>1. Belt Drive Shaft Pulley.<br/>         2. Oil seal 30020050.<br/>         3. Hoff. 145 - R. &amp; M. L.J. 45.<br/>         4. Belt Drive Shaft.<br/>         5. Hoff. 140 - R. &amp; M. L.J. 40.<br/>         6. 26T. 8 D.P. Gear on Belt Shaft.<br/>         7. Oil seal 30022550.<br/>         8. Hoff. L.S.13 - R. &amp; M. L.J. 1½<br/>         9. Pulley Shaft.<br/>         10. 37T. Gear on L.H. Clutch Driver.<br/>         11. Hoff. S.12½-R. &amp; M. K.L.N.J.<br/>         1 3/8.<br/>         12. Matrix ZC40 Wet Type Duplex<br/>         Clutch.<br/>         13. Hoff. S.11. - R. &amp; M. K.L.N.J.<br/>         1 1/8.<br/>         14. 32T. Gear on R.H. Clutch Driver.<br/>         15. Hoff. L.S.11 - R. &amp; M. L.J. 1 1/8.<br/>         16. Geared Oil Pump.<br/>         17. Hoff. L.S.12½ - R. &amp; M. L.J. 1 3/8.<br/>         18. No.2 B.O.M. Croft Plates. Wet<br/>         Type. 7 outer and 7 inner.<br/>         19. 68T. Gear on Brake Shaft.<br/>         20. 33T. Gear on Brake Shaft.<br/>         21. 53T. Gear on 4th Shaft.<br/>         22. 38T. Gear on 4th Shaft.<br/>         23. 66T. Gear on 4th Shaft.<br/>         24. 18/58T. 8 D.P. Double Gear.<br/>         25. 4th Shaft.<br/>         26. Hoff. M.S.12 - R. &amp; M. M.J.<br/>         1½.<br/>         27. Vee Ropes. (Matched set).<br/>         28. Brake Shaft.<br/>         29. 40T. Gear on Brake Shaft.<br/>         30. Springs for 72T. Gear.<br/>         31. Powergrip Belt 78T. 39" P.C.D.<br/>         ½" Pitch No.390H.200.<br/>         32. Hoff. L.S.12 - R. &amp; M. L.J. 1½.<br/>         33. 3rd Shaft.</p> | <p>34. 48T. Gear on 3rd Shaft.<br/>         35. 55T. Gear on 3rd Shaft.<br/>         36. 35T. Gear on 3rd Shaft.<br/>         37. 22/50T. Double Gear.<br/>         38. 70T. Gear on 3rd Shaft.<br/>         39. Hoff. M.S.10 - R. &amp; M. M.J.1.<br/>         40. Work Steady<br/>         41. Spindle Pulley.<br/>         42. Gamet 130069x/D130120.<br/>         43. Spindle.<br/>         44. 38T. Gear on Spindle.<br/>         45. 32T. 8 D.P. Gear on Spindle.<br/>         46. 72T. 8 D.P. Gear on Spindle.<br/>         47. Gamet 140082x/D140140H.<br/>         48. Spindle Nose Cam.<br/>         49. Studs for chucks etc.<br/>         50. Hoff. L.S.10 - R. &amp; M. L.J.1.<br/>         51. 33T. Gear on 6th Shaft.<br/>         52. 6th Shaft.<br/>         53. Feed Gear.<br/>         54. Feed Drive Shaft.<br/>         55. 22T. Double Gear.<br/>         56. Hoff. L.S.9 - R. &amp; M. L.J. 7/8.<br/>         57. 57T. Gear on 6th Shaft.<br/>         58. Oil seal 22511850.<br/>         59. Hoff. 130 - R. &amp; M. L.J. 30.<br/>         60. 23T. Reverse Gear.<br/>         61. Feed Reverse Shaft.<br/>         62. Clutch operating fork.<br/>         63. Gear Shifter Spring.<br/>         64. Speed Indicator Plate.<br/>         65. Brake Adjustment Spring.<br/>         66. Brake Operating Fork<br/>         67. Operating Die.<br/>         68. Spring for Operating Die.</p> |
|---|--|

## 11.13 ASSEMBLY & SPARE PARTS LIST FOR MATRIX CLUTCH

### REPLACEMENT OF WORN FRICTION PLATES

The procedure for replacing worn friction plates on Duplex clutches does not entail complete dismantling of the clutch. Using the diagram below the method is as follows:-

- Withdraw the clutch from the shaft and remove the operating collar 14, place each half of the clutch on end with the friction plates uppermost.
- Remove the circlip 16.
- Slide off the end flange 3.
- Remove the stack of friction plates.
- Replace worn plates as required, starting with a steel counterplate 4.
- Assemble the remainder of the stack alternating friction and counterplates, finishing with a steel counterplate.
- Replace the end flange 3 with the recess facing upwards.
- Replace circlip 16 in the groove.

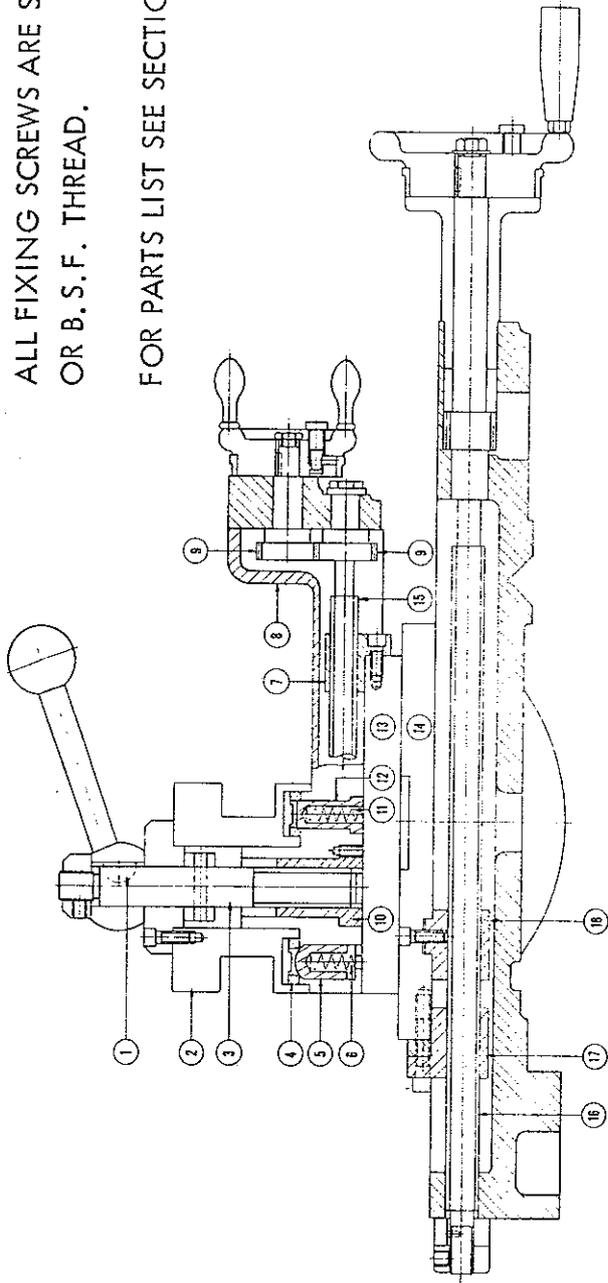


- 2. Hub
- 3. End flange
- 4. Fixed plate
- 6. Spinning plate
- 7. Lock plate
- 8. Adjusting nut
- 9. Locking ring
- 10. Spring
- 11. Track ring
- 12. Thrust washer
- 14. Operating collar
- 15. Bearing assembly
- 16. Circlip

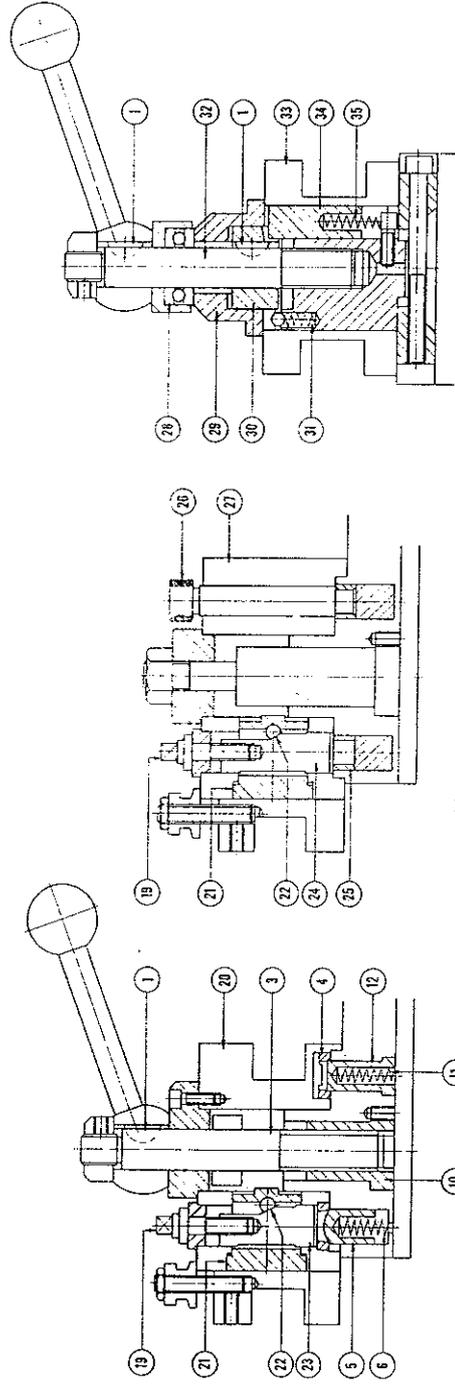
PLEASE STATE MACHINE SERIAL NUMBER, SHEET NUMBER AND ITEM NUMBER

ALL FIXING SCREWS ARE STD. WHITWORTH  
OR B. S. F. THREAD.

FOR PARTS LIST SEE SECTION 11.41.



STANDARD SQUARE TURRET ON COMPOUND SLIDES.



DETACHABLE  
SQUARE TURRET.

TOOLBLOCK FOR  
INTERCHANGEABLE  
TOOLHOLDERS.

SQUARE TURRET WITH ONE FACE  
FOR INTERCHANGEABLE TOOLHOLDERS.

## 11.131 DISMANTLING OF MATRIX CLUTCH

### DISMANTLING

The need for dismantling 'Matrix' clutches only becomes necessary after long periods of use. When this need arises however the following procedure should be adopted:-

( Refer to illustration on sheet No. 486)

Disengage the clutch, slide collar 14 off the hub 2 and place each half of the clutch on end with friction plates downwards.

Remove the circlip 16.

Slide off the thrust washer 12.

Slide off the track ring 11 together with bearing assemblies 15 and adjusting mechanism 8,9 and 10.

Slide off the lock plate 7, friction plate stack 4 and 6, and end flange 3.

Remove the remaining circlip 16.

The sub-assembly of track ring 11, adjusting mechanism 8,9 and 10 and bearing assemblies 15 can be further dismantled as follows:-

Remove bearing assemblies 15.

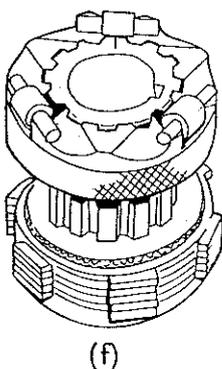
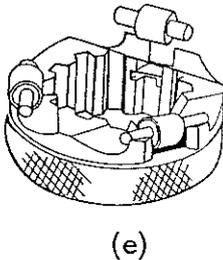
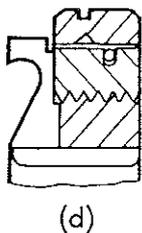
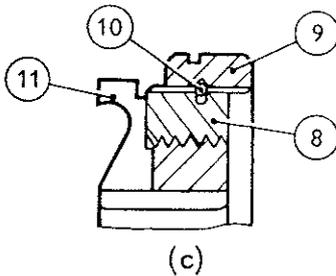
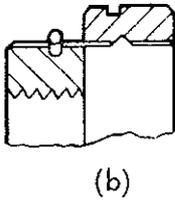
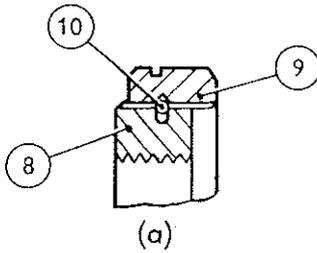
Unscrew adjusting mechanism 8,9 and 10 from track ring 11.

Slide locking ring off adjusting nut 8 and remove the spring 10 from the groove.

Clean or renew parts as necessary.

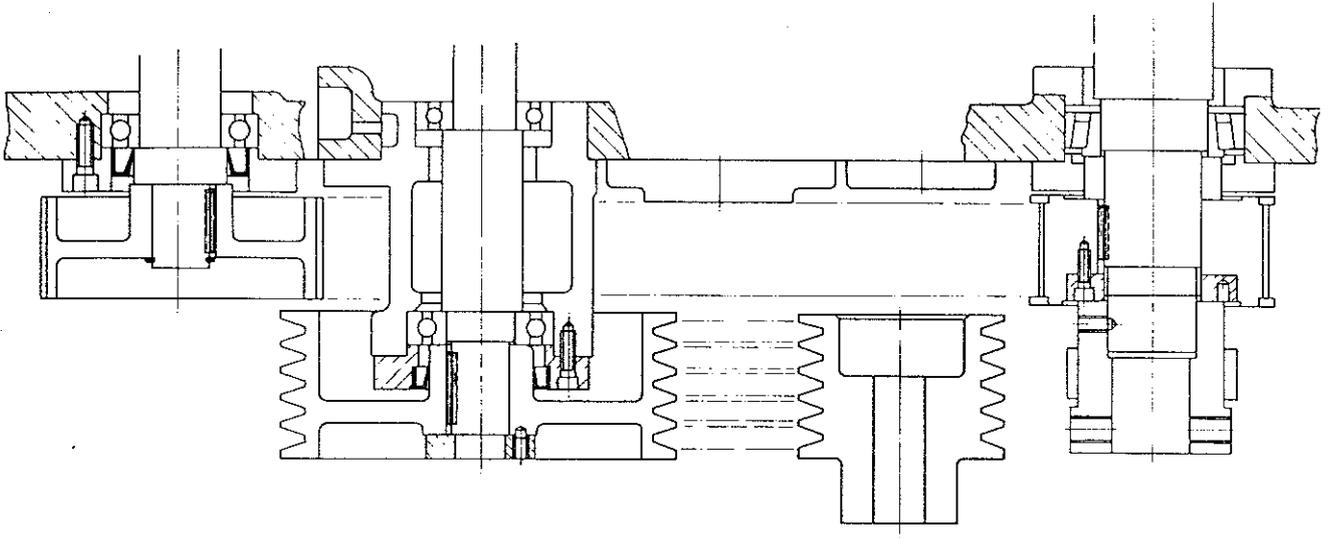
## 11.132 ASSEMBLY OF MATRIX CLUTCH

### ASSEMBLY



1. Place spring 10 in the groove of adjusting nut 8, hold the spring down into the groove and slide the locking ring 9 over until the spring locates in the vee groove (see Fig.a). The locking ring should project by an amount approximately equal to the thickness of the lock plate 7. To attain this condition assemble as shown at Fig.b.
2. Holding the locking ring 9 at its projecting end, screw the adjusting nut 8 up to the shoulder of the track ring 11 (see Fig c) Press the locking ring back against the track ring shoulder (see fig d).
3. Place the subassembly of the track ring 11 and adjusting mechanism 8, 9 and 10 on the bench with the slotted end of the track ring uppermost and load the bearing assemblies 15 into the slots (see fig e).
4. Locate the circlip 16 on hub 2 in the groove near to the end face. Place the hub on the bench, circlip end down and assemble the other components on the hub in the following order:-
  - (a) End flange 3 recess face down.
  - (b) Steel counterplate 4 and friction plates 6 alternately, finishing with a steel plate.
  - (c) Lock plate 7.
5. Place the track ring subassembly on the hub with the bearings uppermost (see fig f)
6. Assemble the thrust washer 12 with slotted end down and mate the slots with the bearings 15. Fit circlip 16 and assemble collar 14 ensuring that the radius key forms on the collar line up with the bearings 15.
7. Adjust the clutch as described in the Adjustment Section on Sheet No. 485 (Section 4.3)
8. The mating clutch is assembled as described above. At operation 5 mount the track ring sub assembly in the same relative position to the hub keyway.

## 11.14 HEADSTOCK ASSEMBLY



### INSTRUCTIONS FOR REMOVING THE "POWERGRIP" BELT.

Remove all the covers from the headstock end of the lathe.

Raise the motor platform to relieve the tension on the vee ropes and remove them. Section 12.1.

To withdraw the main headstock driving pulley, release the allen grub screw and unscrew the checknut.

The work steady can be taken off the spindle end after easing back the allen grub screw.

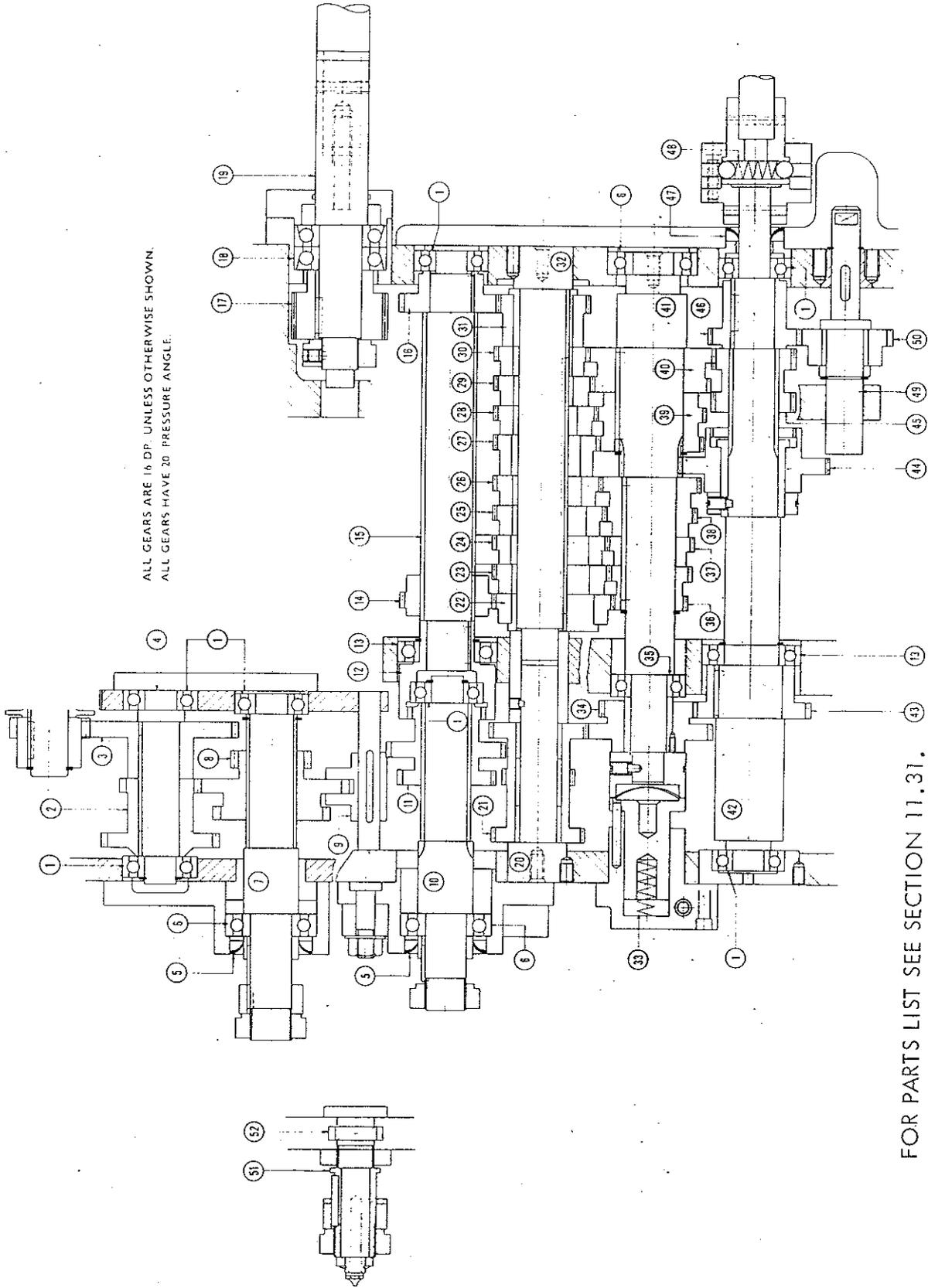
Unscrew the checknut holding the spindle pulley, after taking out the allen cap screw.

Remove the circlip from the rear pulley shaft and withdraw both pulleys, together with the belt.

When re-assembling reverse the above instructions.

# 11.3 SPARE PARTS LIST FOR GEARBOX

PLEASE STATE MACHINE SERIAL NUMBER, SHEET NUMBER AND ITEM NUMBER.

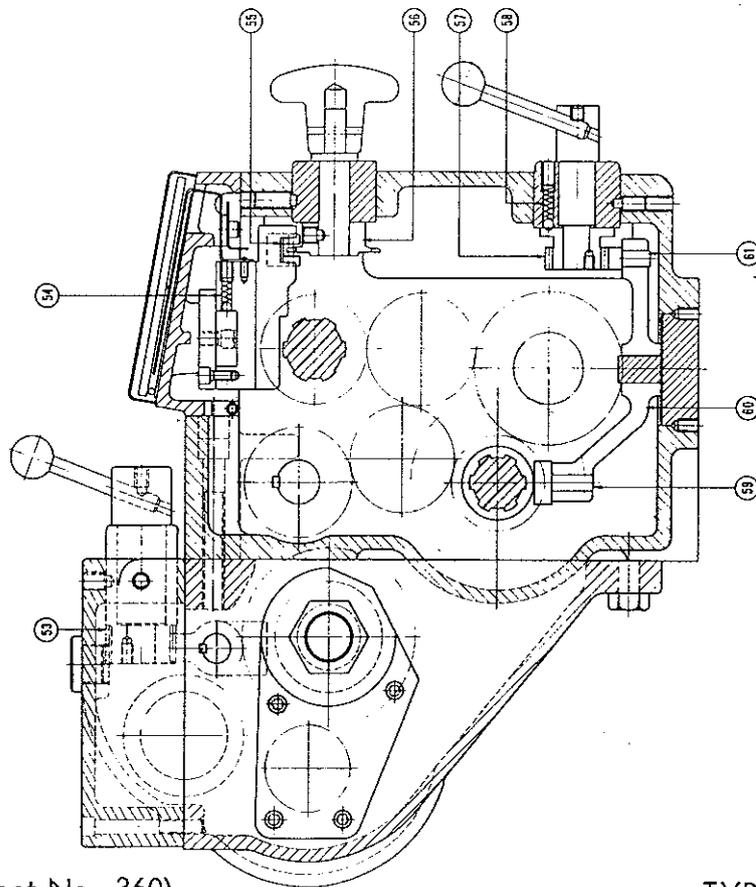


ALL GEARS ARE 1/8 DP. UNLESS OTHERWISE SHOWN.  
ALL GEARS HAVE 20° PRESSURE ANGLE.

FOR PARTS LIST SEE SECTION 11.31. ④③ ①②  
ALL FIXING SCREWS ARE STD. WHITWORTH OR B.S.F. THREAD

PLEASE STATE MACHINE SERIAL NUMBER, SHEET NUMBER AND ITEM NUMBER.

1. Hoff L.S.9 - R. & M. L.J. 7/8.
2. 20/30T. 10 D.P. Gear on 1st Shaft in End G/Box.
3. 40T. 10 D.P. Gear on 1st Shaft in End G/Box.
4. 1st Shaft in End G/Box.
5. Gitsal 22515037.
6. Hoff. L.S.11 - R. & M. L.J. 11/8.
7. 2nd Shaft in End G/Box.
8. 20, 30 & 40T. 10 D.P. Gear on 2nd shaft in End G/Box.
9. Gear Shifter for Treble Gear on 2nd shaft in End G/Box.
10. 1st Shaft.
11. 32, 42/41 & 50T Gear on 1st Shaft.
12. 32T. Internal Gear on 1st Shaft.
13. Hoff XLS 1 1/2 - R. & M. XLJ 1 1/2.
14. 40T. Sliding Gear on 5th Shaft.
15. 5th Shaft.
16. Special 40T. Gear on 5th Shaft.
17. Special 40T. Gear on Leadscrew.
18. Hoff. L.S.11 AC-R. & M. L.J.T. 1 1/8 N1180 Specially Paired and pre-loaded back to back.
19. Leadscrew socket.
20. Short 2nd Shaft.
21. 40/39, 30, 42/41 Gear on Short 2nd Shaft.
22. 52T. Gear on Long 2nd Shaft.
23. 50T. Gear on Long 2nd Shaft.
24. 49T. Gear on Long 2nd Shaft.
25. 48T. Gear on Long 2nd Shaft.
26. 46T. Gear on Long 2nd Shaft.
27. 45T. Gear on Long 2nd Shaft.
28. 44T. Gear on Long 2nd Shaft.
29. 42T. Gear on Long 2nd Shaft.
30. 40T. Gear on Long 2nd Shaft.
31. Special 40T. Gear on Long 2nd Shaft.
32. Long 2nd Shaft.
33. Pump Spring
34. 56/55, 40/41T Double Gear on 3rd Shaft.
35. Hoff 125 - R. & M. L.J. 25.
36. 32 & 36T Double Gear on 3rd Shaft.
37. 38T. Gear on 3rd Shaft.
38. 40 & 44T Double Gear on 3rd Shaft.
39. 46 & 48T Double Gear on 3rd Shaft.
40. 52 & 56T Double Gear on 3rd Shaft.
41. 3rd Shaft.
42. 4th Shaft.
43. 50T. Gear on 4th Shaft.
44. 65T. Ext. & 35T Int. Gear on 4th Shaft.
45. 35T Double Gear on 4th Shaft.
46. Special 40T Gear on 4th Shaft.
47. Gitsal 16208737.
48. Spring in Slip Coupling.
49. Slider Shaft.
50. Special 40T. Gear on Slider Shaft.
51. Change Gear Sleeve.
52. Change Gear Stud.
53. 16T 12D.P. Operating Pinion.
54. 3/4" Ball and Spring.
55. Renold 1/2" Pitch Chain 41 links closed ends No. 111044.
56. 1/2" Pitch Feed Selector Sprocket.
57. 16T. 12 D.P. Operating Pinion.
58. 3/4" Ball & Spring.
59. Operating Die for 4th Shaft.
60. Swinging Arm.
61. Toothed Operating Die.



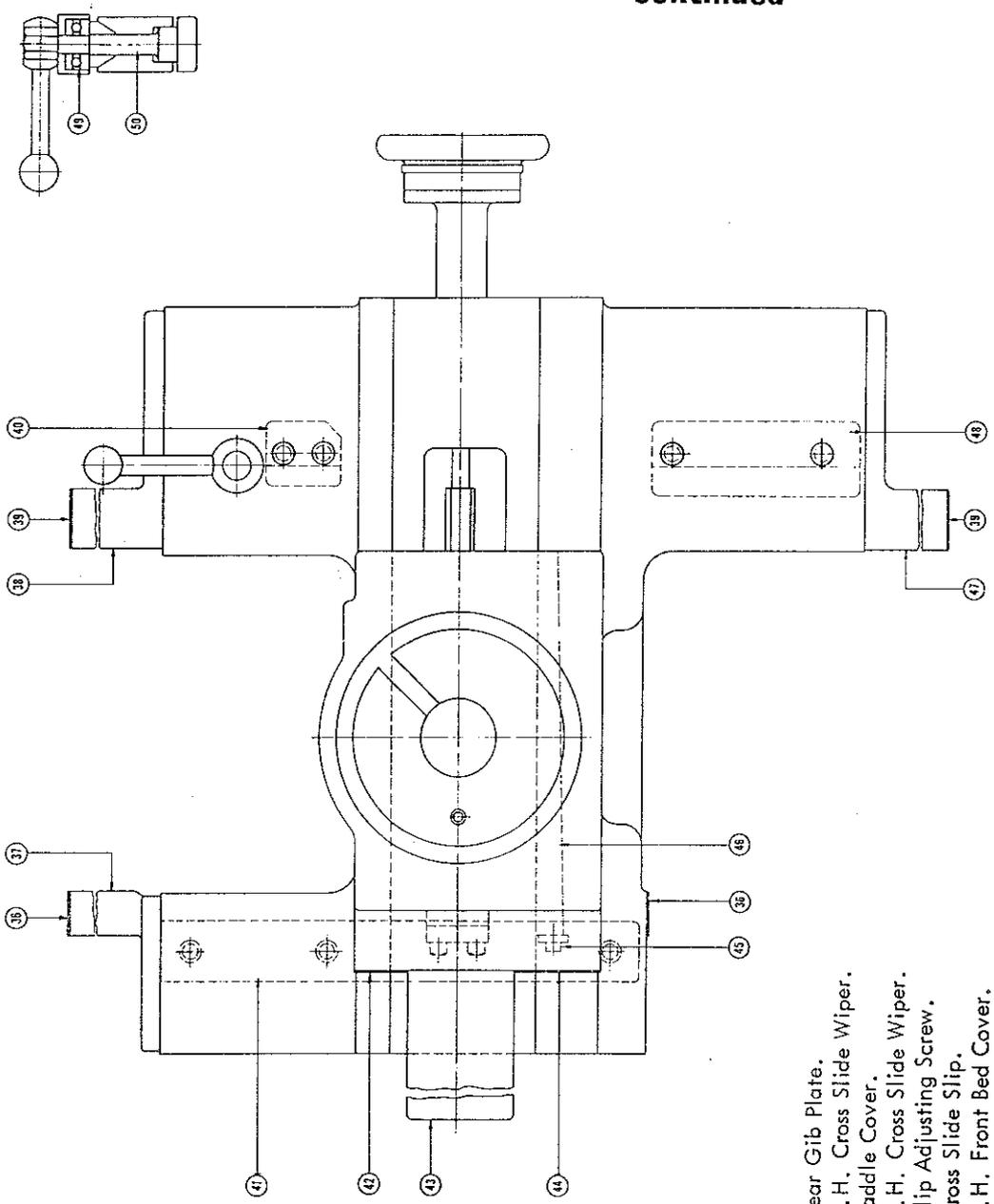
## 11.31 SPARE PARTS LIST FOR GEARBOX continued

ALL FIXING SCREWS ARE STD. WHITWORTH OR B. S. F. THREAD

PLEASE STATE MACHINE SERIAL NUMBER, SHEET NUMBER AND ITEM NUMBER.

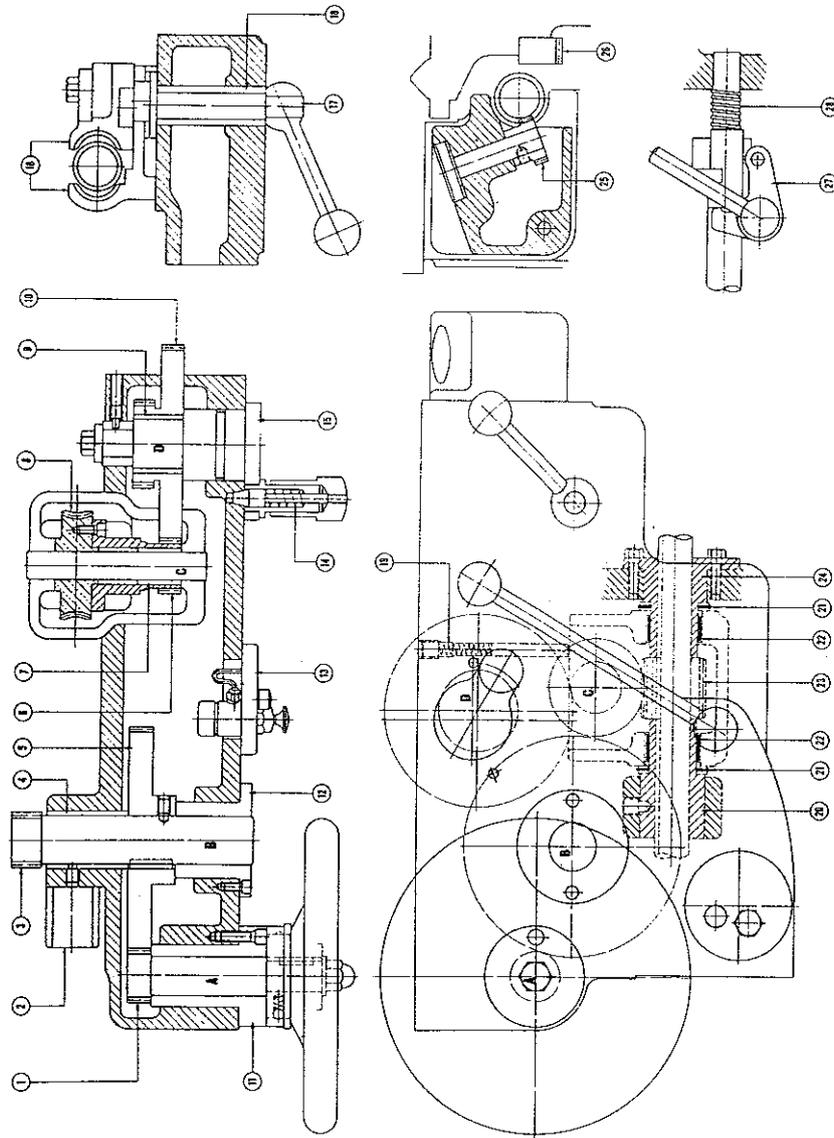
ALL FIXING SCREWS ARE STD. WHITWORTH OR B. S. F. THREAD.

1. Woodruff key No.9.
2. Square Turret.
3. Turret Locking Bolt.
4. Locating Bushes.
5. Auxiliary Plunger.
6. Auxiliary Plunger Spring.
7. Tool Slide Nut.
8. Tool Slide.
9. 18T Gear in Tool Slide.
10. Turret Locking Nut.
11. Locating Plunger Spring.
12. Locating Plunger.
13. Swivel Slide.
14. Cross Slide.
15. Tool Slide Screw.
16. Cross Slide Screw.
17. Flanged Nut on Cross Slide.
18. Tongued Nut on Cross Slide.
19. Locking Screw.
20. Interchangeable Square Turret.
21. Clamping Plate.
22. Locking Pin.
23. Lock Pad( Sq. Turret Type.)
24. Lock Pad( Toolblock Type.)
25. Locating Bushes.
26. Locating Plunger.
27. Toolblock.
28. Bearing Hoff. W 7/8. - R & M. LT 7/8.
29. Locating Plate.
30. Plunger Cam.
31. Auxiliary Spring.
32. Turret Locking Bolt.
33. Tee Slot Square Turret.
34. Locating Plunger.
35. Locating Plunger Spring.
36. Rear Bed Wipers.
37. R. H. Rear Bed Cover.
38. R. H. Front Bed Cover.
39. Front bed wipers.
40. R. H. Front Gib Plate.
41. Rear Gib Plate.
42. R. H. Cross Slide Wiper.
43. Saddle Cover.
44. L. H. Cross Slide Wiper.
45. Slip Adjusting Screw.
46. Cross Slide Slip.
47. L. H. Front Bed Cover.
48. L. H. Front Gib Plate.
49. Bearing Hoff. W 7/16. - R & M LT 7/16.
50. Saddle Lock Bolt.



11.41 SPARE PARTS LIST FOR SADDLE  
continued

PLEASE STATE MACHINE SERIAL NUMBER, SHEET NUMBER AND ITEM NUMBER.

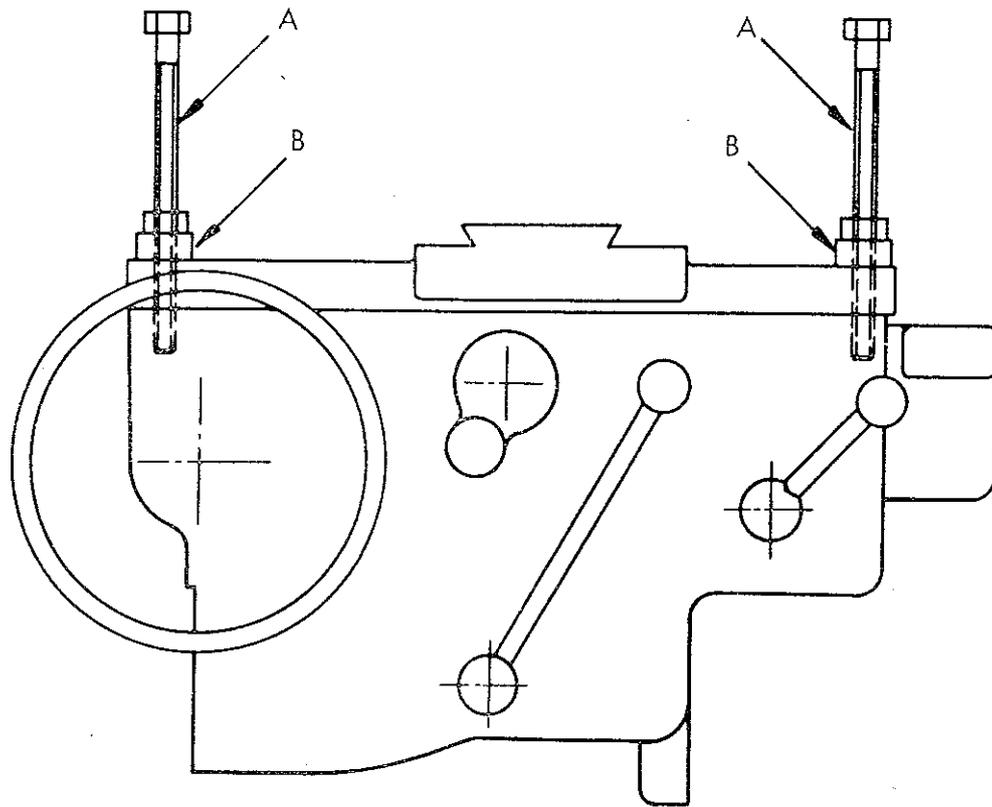


## 11.5 SPARE PARTS LIST FOR APRON

1. Hand Racking Shaft.
2. Leadscrew Support Bracket.
3. Rack Pinion Shaft.
4. " " Bush.
5. 88T Gear on Rack Pinion Shaft.
6. 22T Gear on Worm Wheel.
7. Bush in 22T Gear.
8. Worm Wheel.
9. Bush in Double Gear.
10. Double Gear.
11. Handwheel Bearing Bush.
12. Rack Pinion Bearing Bush.
13. 'Bijur' Oil Pump.
14. Eccentric Shaft Plunger spring.
15. Eccentric Shaft.
16. Leadscrew Nuts.
17. Leadscrew Nut operating Shaft.
18. Bush for Nut Operating Shaft.
19. Worm Box Operating Spring.
20. L.H. Feed Shaft Support Bush.
21. Torrington Thrust Brg. NTA 2233 Thrust Race JD 24295 .
22. Torrington Needle Brg. GB 2212 Worm.
23. R.H. Feed Shaft Support Bush.
24. Screwcutting Dial Wheel.
25. Rack.
26. Worm Box operating lever.
27. Spring on Trip Shaft.
- 28.

ALL FIXING SCREWS ARE STD. WHITWORTH OR B.S.F. THREAD.

## 11.51 APRON ASSEMBLY



### INSTRUCTIONS FOR LOWERING THE APRON.

Remove the tail end bracket.

Disconnect the leadscrew, the feed shaft and the clutch operating shaft and withdraw the shafts toward the tailstock.

To disconnect the leadscrew remove the spring pin connecting the leadscrew and socket (part No. 19. Section 11.31), remove the gearbox lid and release the allen fixing screw on the end of the leadscrew. Should difficulty be encountered in withdrawing the leadscrew from the socket, engage the leadscrew nuts and hand traverse the apron along the bed. To disconnect the feed shaft, remove the spring pin from the right hand side of the slip coupling. Section 1.3 Item 26.

Remove the two extreme fixing screws and fit two  $\frac{1}{2}$ " whit. jacking screws 'A' as shown, the two remaining fixing screws may now be removed.

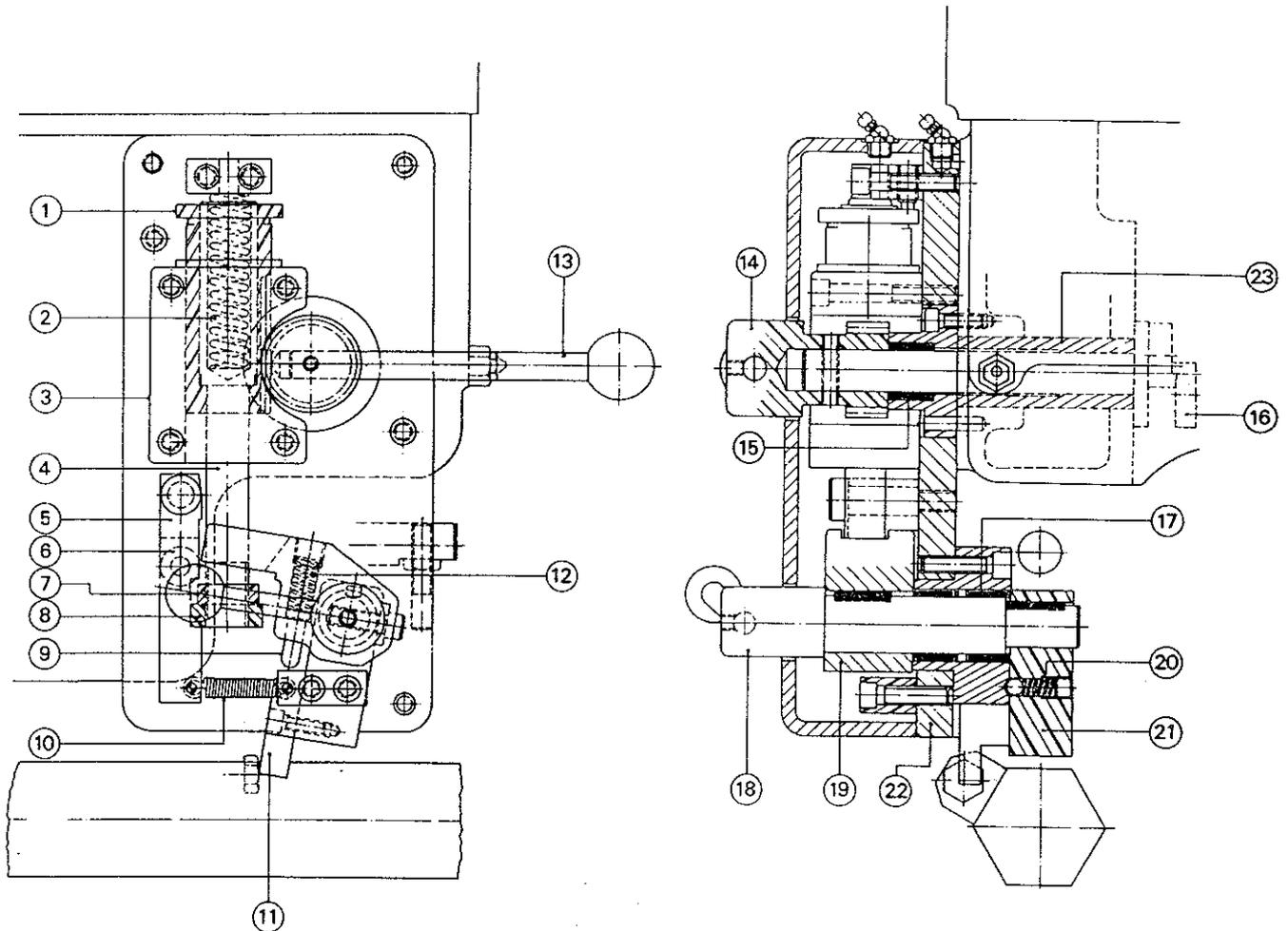
The apron can then be lowered by means of the hexagon nuts on the jacking screws, the load being taken by the thrust races 'B'. It is advisable to lower the apron onto blocks placed in the lathe trough.

To replace the apron, the above procedure is reversed.

When replacing the feed shaft care must be taken to align the keyway in the shaft with the key in the worm.

## 11.52 SPARE PARTS LIST FOR APRON continued

### AUTO-NUT TRIPPING

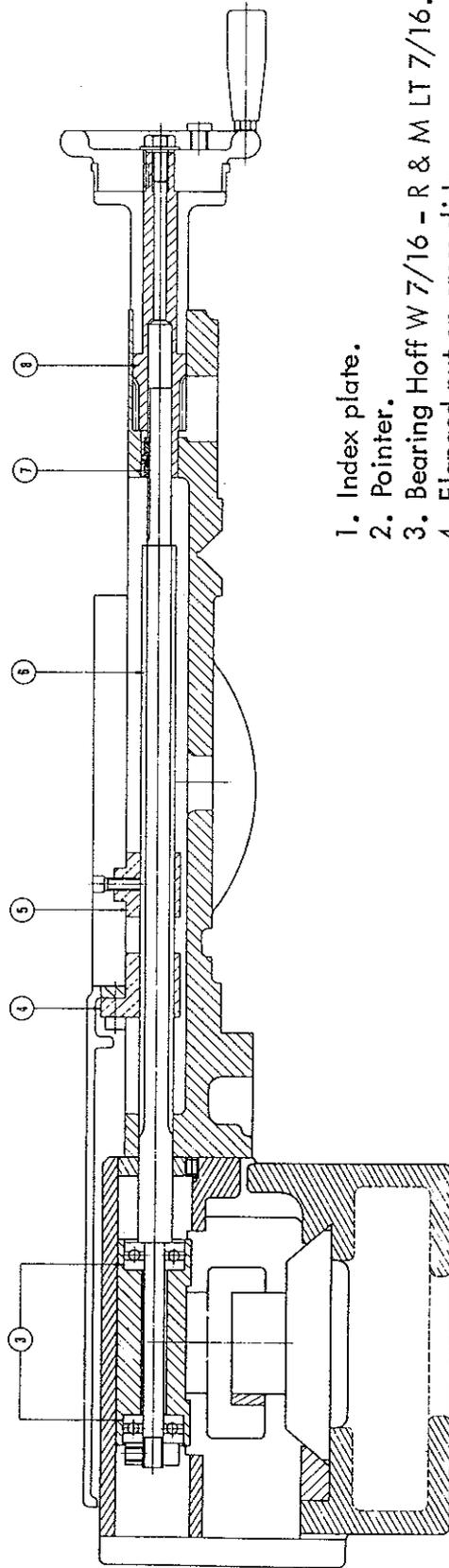
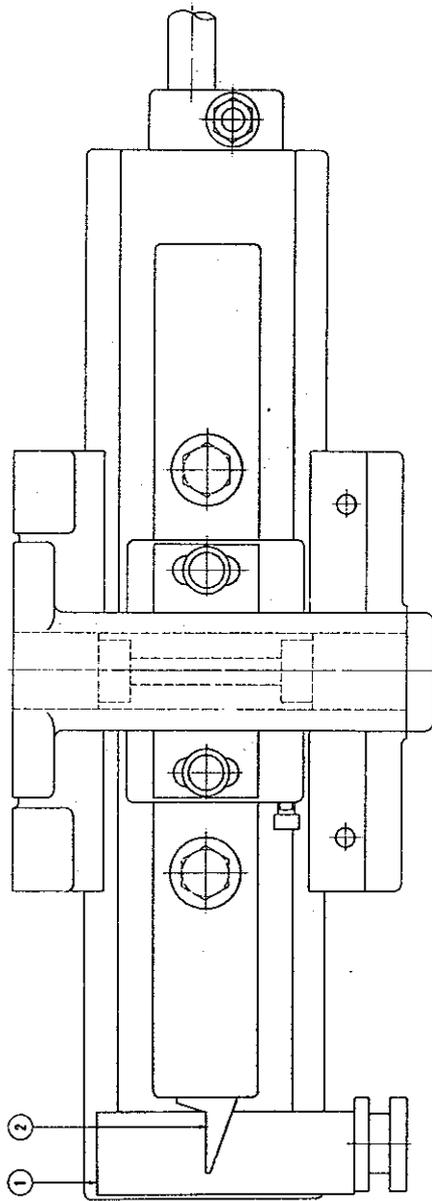


- |                                      |                                  |
|--------------------------------------|----------------------------------|
| 1. Sleeve                            | 13. Operating handle             |
| 2. Spring No.156                     | 14. Operating pinion             |
| 3. Plunger block                     | 15. Torrington bearing B.1212    |
| 4. Trip rod.                         | 16. Nut operating shaft          |
| 5. Latch                             | 17. Torrington bearing B.1612    |
| 6. Release roller                    | 18. Trip block shaft             |
| 7. Hex. Nut N.33                     | 19. Trip arm                     |
| 8. Hex. Nut N.34 Hardened and ground | 20. Spring No.9 & 5/16" Dia ball |
| 9. Plunger                           | 21. Trip block                   |
| 10. Spring No.157                    | 22. Baseplate                    |
| 11. Trip arm                         | 23. Eccentric bush               |
| 12. Spring No.20                     |                                  |

ALL FIXING SCREWS ARE STD. WHITWORTH OR B. S. F. THREAD

PLEASE STATE MACHINE SERIAL NUMBER, SHEET NUMBER AND ITEM NUMBER

PLEASE STATE MACHINE SERIAL NUMBER, SHEET NUMBER AND ITEM NUMBER



1. Index plate.
2. Pointer.
3. Bearing Hoff W 7/16 - R & M LT 7/16.
4. Flanged nut on cross slide.
5. Tongued nut on cross slide.
6. Cross slide screw for Taper Turning.
7. Stem key.
8. Pinion shaft.

ALL FIXING SCREWS ARE STD. WHITWORTH OR B. S. F. THREAD

# 13.1 TABLE OF CUTTING SPEEDS

Dia. in inches ↕	FEET PER MINUTE																			Dia. in inches ↗
	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	1000		
REVOLUTIONS PER MINUTE																				
1/4	307	384	461	515	569	623	677	731	785	839	893	947	1001	1055	1109	1163	1217	1271	1325	1379
1/2	154	192	232	267	307	346	384	423	461	500	538	577	615	654	692	731	769	808	846	885
3/4	102	128	153	175	205	236	267	298	329	360	391	422	453	484	515	546	577	608	639	670
7/8	88	110	131	145	166	187	208	229	250	271	292	313	334	355	376	397	418	439	460	481
1	76	96	115	130	150	169	188	207	226	245	264	283	302	321	340	359	378	397	416	435
1 1/8	68	85	102	116	136	154	173	191	209	227	245	263	281	299	317	335	353	371	389	407
1 1/4	62	77	92	107	123	138	154	169	184	199	214	229	244	259	274	289	304	319	334	349
1 1/2	56	70	84	100	112	128	144	159	174	189	204	219	234	249	264	279	294	309	324	339
1 3/4	52	64	77	93	103	118	132	146	160	174	188	202	216	230	244	258	272	286	300	314
2	44	55	66	80	91	105	119	132	145	158	171	184	197	210	223	236	249	262	275	288
2 1/2	38	48	57	70	81	94	107	119	131	143	155	167	179	191	203	215	227	239	251	263
3	31	38	46	56	67	78	89	100	111	121	131	141	151	161	171	181	191	201	211	221
3 1/2	25	32	38	45	53	61	69	77	85	93	101	109	117	125	133	141	149	157	165	173
4	22	27	33	40	47	55	62	69	76	83	90	97	104	111	118	125	132	139	146	153
4 1/2	19	24	29	35	41	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132
5	17	21	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
5 1/2	15	18	21	25	29	33	37	41	45	49	53	57	61	65	69	73	77	81	85	89
6	14	17	20	23	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72
7	13	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69
8	12	14	17	19	22	25	28	31	34	37	40	43	46	49	52	55	58	61	64	67
9	11	13	15	18	20	23	26	29	32	35	38	41	44	47	50	53	56	59	62	65
10	10	12	14	16	19	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
11	9	11	13	15	17	20	22	25	28	31	34	37	40	43	46	49	52	55	58	61
12	8	10	12	14	16	18	21	23	26	29	32	35	38	41	44	47	50	53	56	59
13	7	9	11	13	15	17	20	22	25	28	31	34	37	40	43	46	49	52	55	58
14	6	8	10	12	14	16	18	21	23	26	29	32	35	38	41	44	47	50	53	56
15	5	7	9	11	13	15	17	20	22	25	28	31	34	37	40	43	46	49	52	55
16	4	6	8	10	12	14	16	18	21	23	26	29	32	35	38	41	44	47	50	53
18	3	5	7	9	11	13	15	17	20	22	25	28	31	34	37	40	43	46	49	52
20	2	4	6	8	10	12	14	16	18	21	23	26	29	32	35	38	41	44	47	50
22	1	3	5	7	9	11	13	15	17	20	22	25	28	31	34	37	40	43	46	49
24	1	2	3	4	5	6	8	10	12	14	16	18	21	23	26	29	32	35	38	41

# 13.2 METRIC CONVERSION TABLES

1 METRE = 39.370113 INCHES

## INCHES TO MILLIMETRES

## FRACTIONS

Inch		M/m.	Inch		M/m.	Inch		M/m.	
$\frac{1}{16}$	$\frac{1}{16}$	-015625	$\frac{3}{8}$	$\frac{1}{16}$	-34375	$\frac{3}{4}$	$\frac{5}{16}$	-671875	
	$\frac{3}{32}$	-03125		$\frac{23}{64}$	-359375		$\frac{11}{16}$	$\frac{63}{64}$	-6875
	$\frac{1}{8}$	-046875		$\frac{25}{64}$	-375		$\frac{3}{2}$	$\frac{45}{64}$	-703125
	$\frac{5}{32}$	-0625		$\frac{27}{64}$	-390625		$\frac{7}{4}$	$\frac{47}{64}$	-71875
$\frac{1}{8}$	$\frac{3}{8}$	-078125	$\frac{7}{16}$	$\frac{1}{2}$	-40625	$\frac{1}{2}$	$\frac{49}{64}$	-734375	
	$\frac{5}{16}$	-09375		$\frac{29}{64}$	-421875		$\frac{5}{4}$	$\frac{51}{64}$	-75
	$\frac{3}{4}$	-109375		$\frac{31}{64}$	-4375		$\frac{9}{4}$	$\frac{53}{64}$	-765625
	$\frac{7}{8}$	-125		$\frac{33}{64}$	-453125		$\frac{5}{2}$	$\frac{55}{64}$	-78125
$\frac{3}{16}$	$\frac{9}{16}$	-140625	$\frac{1}{2}$	$\frac{1}{2}$	-46875	$\frac{1}{2}$	$\frac{57}{64}$	-796875	
	$\frac{5}{8}$	-15625		$\frac{1}{2}$	-484375		$\frac{3}{2}$	$\frac{59}{64}$	-8125
	$\frac{11}{16}$	-171875		$\frac{1}{2}$	-5		$\frac{3}{2}$	$\frac{61}{64}$	-828125
	$\frac{3}{4}$	-1875		$\frac{1}{2}$	-515625		$\frac{5}{2}$	$\frac{63}{64}$	-84375
$\frac{1}{4}$	$\frac{1}{4}$	-203125	$\frac{1}{2}$	$\frac{1}{2}$	-53125	$\frac{1}{2}$	$\frac{65}{64}$	-859375	
	$\frac{1}{2}$	-21875		$\frac{1}{2}$	-546875		$\frac{3}{2}$	$\frac{67}{64}$	-875
	$\frac{3}{4}$	-234375		$\frac{1}{2}$	-5625		$\frac{3}{2}$	$\frac{69}{64}$	-890625
	$\frac{7}{8}$	-25		$\frac{1}{2}$	-578125		$\frac{5}{2}$	$\frac{71}{64}$	-90625
$\frac{5}{16}$	$\frac{5}{16}$	-265625	$\frac{1}{2}$	$\frac{1}{2}$	-59375	$\frac{1}{2}$	$\frac{73}{64}$	-921875	
	$\frac{3}{8}$	-28125		$\frac{1}{2}$	-609375		$\frac{3}{2}$	$\frac{75}{64}$	-9375
	$\frac{1}{2}$	-296875		$\frac{1}{2}$	-625		$\frac{3}{2}$	$\frac{77}{64}$	-953125
	$\frac{5}{8}$	-3125		$\frac{1}{2}$	-640625		$\frac{5}{2}$	$\frac{79}{64}$	-96875
$\frac{3}{4}$	-328125	$\frac{1}{2}$	-65625	$\frac{1}{2}$	-65625	$\frac{81}{64}$	-984375		
	$\frac{7}{8}$	-328125					$\frac{83}{64}$	-984375	

## UNITS

Inches	10	20	30	40	50	60	70	80	90	100	
0		254.0	508.0	762.0	1016.0	1270.0	1524.0	1778.0	2032.0	2286.0	2540.0
1	25.4	279.4	533.4	787.4	1041.4	1295.4	1549.4	1803.4	2057.4	2311.4	2565.4
2	50.8	304.8	558.8	812.8	1066.8	1320.8	1574.8	1828.8	2082.8	2336.8	2590.8
3	76.2	330.2	584.2	838.2	1092.2	1346.2	1600.2	1854.2	2108.2	2362.2	2616.2
4	101.6	355.6	609.6	863.6	1117.6	1371.6	1625.6	1879.6	2133.6	2387.6	2641.6
5	127.0	381.0	635.0	889.0	1143.0	1397.0	1651.0	1905.0	2159.0	2413.0	2667.0
6	152.4	406.4	660.4	914.4	1168.4	1422.4	1676.4	1930.4	2184.4	2438.4	2692.4
7	177.8	431.8	685.8	939.8	1193.8	1447.8	1701.8	1955.8	2209.8	2463.8	2717.8
8	203.2	457.2	711.2	965.2	1219.2	1473.2	1727.2	1981.2	2235.2	2489.2	2743.2
9	228.6	482.6	736.6	990.6	1244.6	1498.6	1752.6	2006.6	2260.6	2514.6	2768.6

## MILLIMETRES TO INCHES

## UNITS

M/m.	10	20	30	40	50	60	70	80	90	
0		-39370	-78740	1.18110	1.57480	1.96851	2.36221	2.75591	3.14961	3.54331
1	-03937	-43307	-82677	1.22047	1.61417	2.00788	2.40158	2.79528	3.18898	3.58268
2	-07874	-47244	-86614	1.25984	1.65354	2.04725	2.44095	2.83465	3.22835	3.62205
3	-11811	-51181	-90551	1.29921	1.69291	2.08662	2.48032	2.87402	3.26772	3.66142
4	-15748	-55118	-94488	1.33858	1.73228	2.12599	2.51969	2.91339	3.30709	3.70079
5	-19685	-59055	-98425	1.37795	1.77165	2.16536	2.55906	2.95276	3.34646	3.74016
6	-23622	-62992	-1.02362	1.41732	1.81103	2.20473	2.59843	2.99213	3.38583	3.77953
7	-27559	-66929	-1.06299	1.45669	1.85040	2.24410	2.63780	3.03150	3.42520	3.81890
8	-31496	-70866	-1.10236	1.49606	1.88977	2.28347	2.67717	3.07087	3.46457	3.85827
9	-35433	-74803	-1.14173	1.53543	1.92914	2.32284	2.71654	3.11024	3.50394	3.89764

M/m.	100	200	300	400	500	600	700	800	900	
0		3.93701	7.87402	11.8110	15.7480	19.6851	23.6221	27.5591	31.4961	35.4331
10	-39370	4.33071	8.26772	12.2047	16.1417	20.0788	24.0158	27.9528	31.8898	35.8268
20	-78740	4.72441	8.66142	12.5984	16.5354	20.4725	24.4095	28.3465	32.2835	36.2205
30	1.18110	5.11811	9.05513	12.9921	16.9291	20.8662	24.8032	28.7402	32.6772	36.6142
40	1.57480	5.51181	9.44883	13.3858	17.3228	21.2599	25.1969	29.1339	33.0709	37.0079
50	1.96851	5.90552	9.84252	13.7795	17.7165	21.6536	25.5906	29.5276	33.4646	37.4016
60	2.36221	6.29922	10.2362	14.1732	18.1103	22.0473	25.9843	29.9213	33.8583	37.7953
70	2.75591	6.69292	10.6299	14.5669	18.5040	22.4410	26.3780	30.3150	34.2520	38.1890
80	3.14961	7.08662	11.0236	14.9606	18.8977	22.8347	26.7717	30.7087	34.6457	38.5827
90	3.54331	7.48032	11.4173	15.3543	19.2914	23.2284	27.1654	31.1024	35.0394	38.9764