TYPE 1307

PLEASE QUOTE WITH ALL CORRESPONDENCE

TYPE .....1307 x 46.....

SERIAL NO. .....40590.....

CUSTOMERS ORDER NO. .....

INSTRUCTIONS TO THE OPERATOR

The design of your new D.S.G. Lathe is backed by over a hundred years of manufacturing and operating experience. Every endeavour has been made to ensure lasting precision and trouble free operation.

Please ensure that this book is placed in the hands of your operator as it is written primarily for his guidance. Adherence to the instructions given will avoid damage to the machine through abuse and faulty operation.

Further copies will be supplied on application to:-

DEAN SMITH & GRACE LTD

P.O. BOX 15, KEIGHLEY, WEST YORKSHIRE, ENGLAND BD21 4PG

TELEPHONE No. KEIGHLEY 5261 (10 LINES)

TELEGRAMS: LATHES KEIGHLEY.

TELEX No. 51-123

1 GENERAL INFORMATION

2 INSTALLATION

3 LUBRICATION AND CARE OF MACHINE

4 HEADSTOCK AND TAILSTOCK

5 GEARBOX

6 THREADING

7 SADDLE AND APRON

8 TOOL SLIDES

9 AUXILIARY EQUIPMENT

10 FAULT FINDING AND PRACTICAL INFORMATION

11 SPARE PARTS LISTS AND ASSEMBLY DETAILS

12 ELECTRICAL EQUIPMENT AND MOTOR DRIVE

13 CHARTS AND TABLES

14 HYDRAULIC COPYING

GENERAL INFORMATION

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.

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.

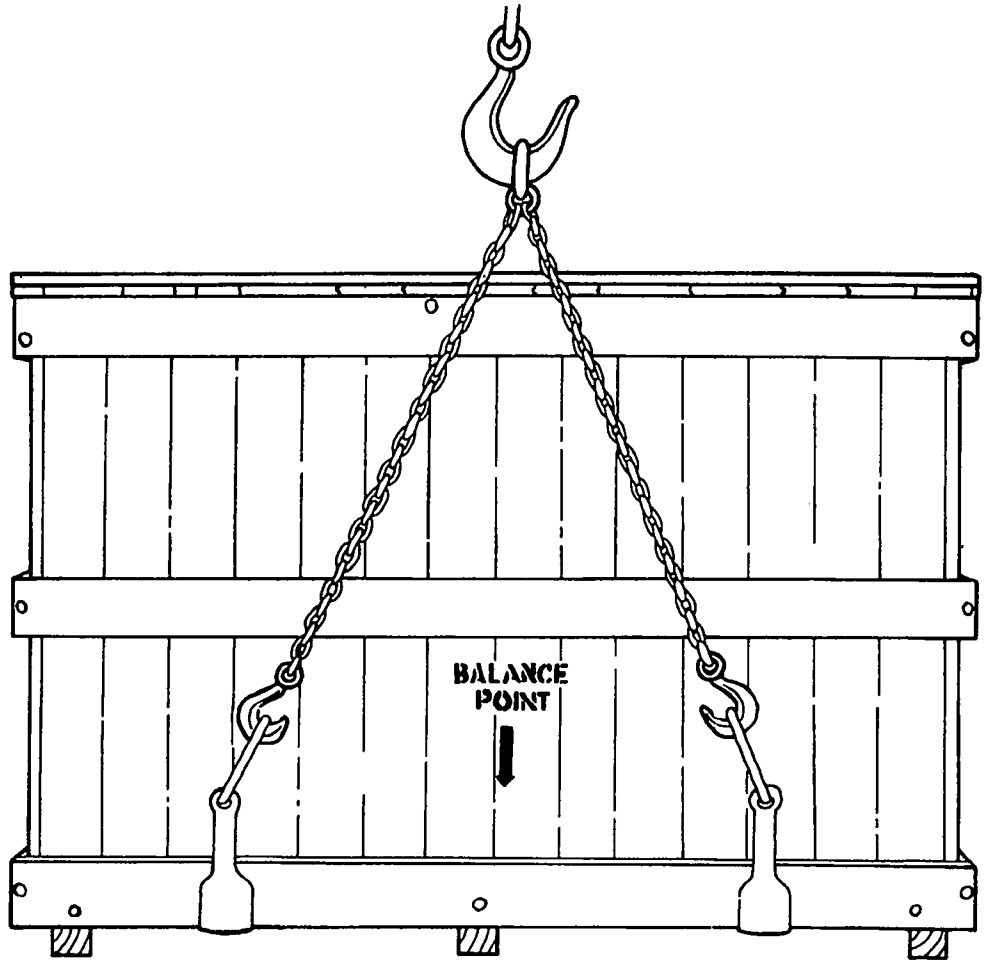
Use only white spirits or turpentine to remove preserving fluid.

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.

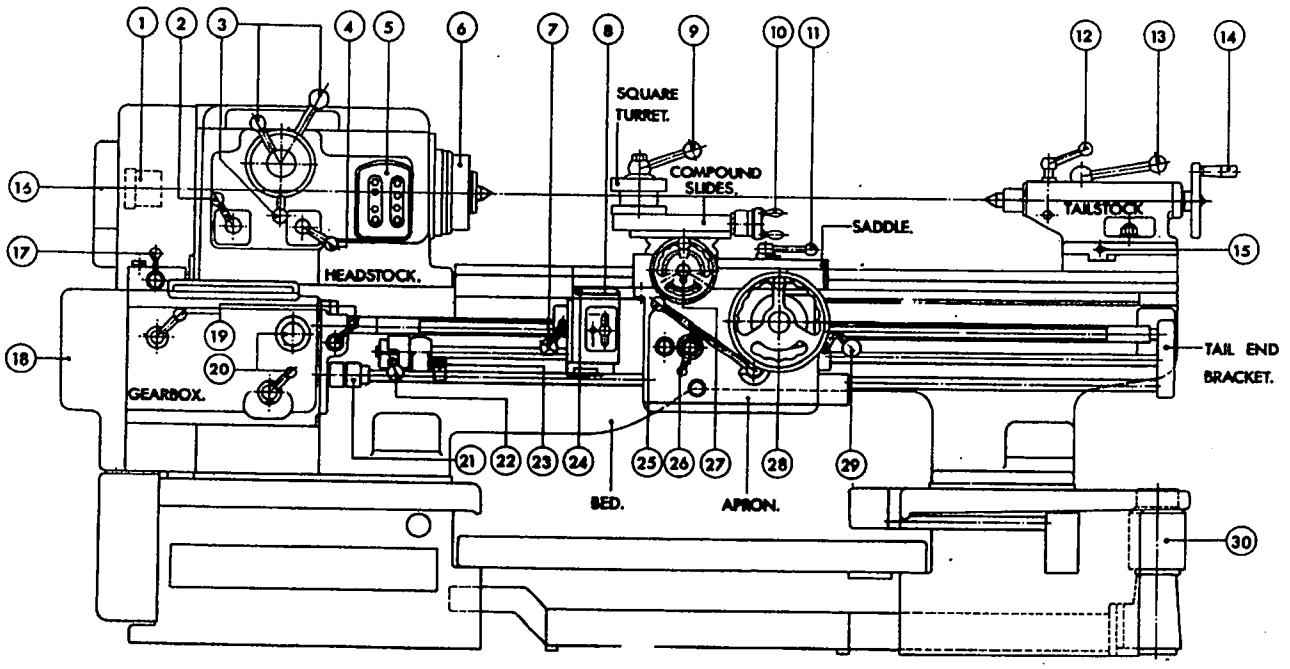
The lathe is bolted to the base of the crate through some of the normal fixing holes. These bolts are clearly indicated by arrows and letter 'B' painted on the crate base.

IMPORTANT.

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

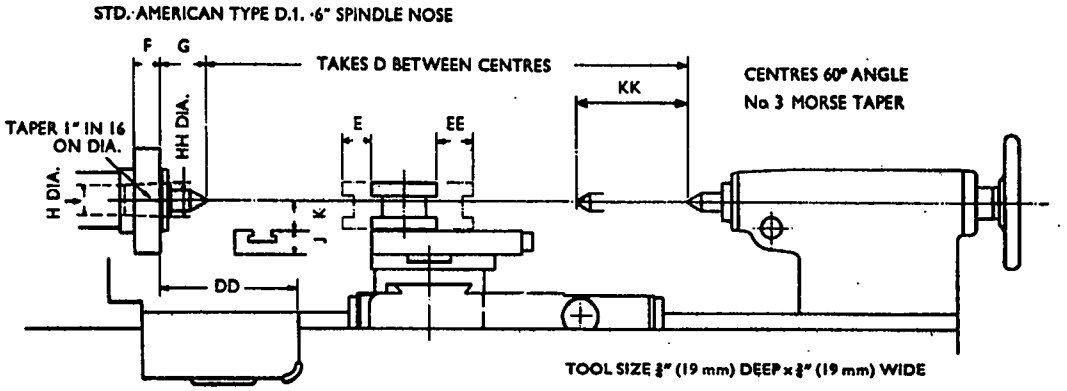
1.3 GENERAL DESCRIPTION

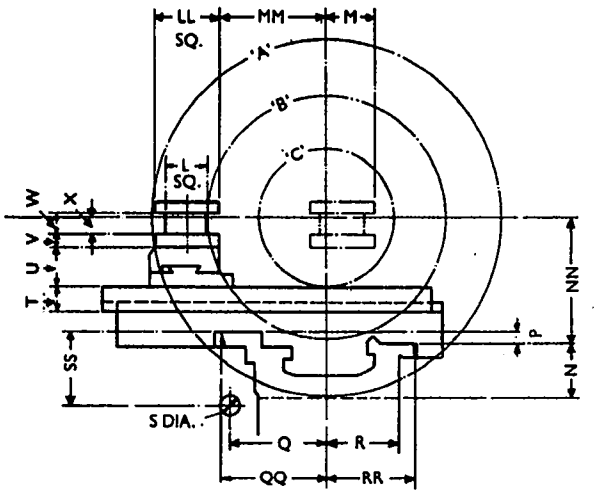
PLEASE DO NOT USE THIS SECTION WHEN ORDERING SPARES. SEE SECTION 11



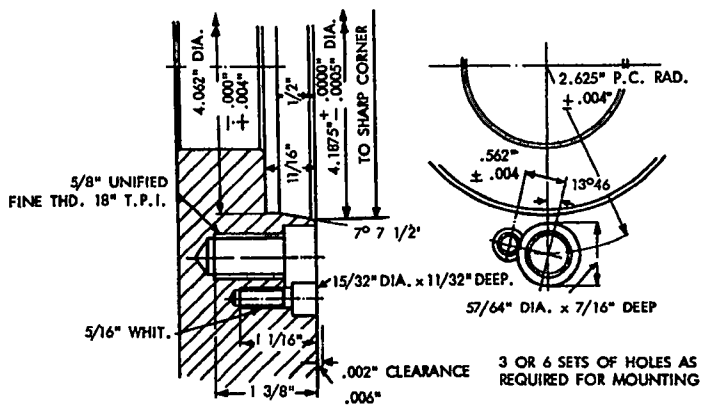
1. Work steady.
2. Feed reverse and R.H. or L.H. thread selecting lever.
3. Spindle speed change levers.
4. Coarse pitch and fine feed lever.
5. Pushbutton unit.
6. American DI-6" Camlock Spindle nose.
7. Leadscrew nut operating lever.
8. Longitudinal or cross feed selector lever.
9. Square turret locking handle.
10. Tool slide handwheel.
11. Saddle locking lever.
12. Tailstock spindle locking lever.
13. Tailstock locking lever.
14. Tailstock handwheel.
15. Setting screws for taper work.
16. End cover for work steady.
17. Feed change lever on end gearbox.
18. Change gear cover.
19. Thread change.
20. Feed change lever and knob.
21. Slip coupling for feed shaft.
22. L.H. Clutch, brake and reverse lever.
23. Clutch centre position stop.
24. Screwcutting dial.
25. Feed engage and trip lever.
26. Feed reverse lever.
27. Cross slide handwheel.
28. Apron handwheel.
29. R.H. Clutch, brake and reverse lever.
30. Coolant pump.

1.4 CAPACITY CHART

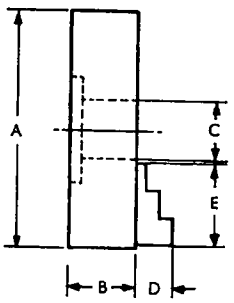




	A	B	C	D	DD	E	EE	F	G	H	HH	J	K	KK	L	LL	M	MM	N	NN	P	Q	QQ	R	RR	S	SS	T	U	V	W	X
ins.	22	14	7	30	9½	1¾	2¾	1¾	3 1/16	2 1/16	2¼	1 7/16	1 11/16	8	3¼	5	3⅜	7½	4½	7 1/16	7/16	6¾	6¾	4 7/16	5½	1⅜	5⅞	1⅜	2 1/16	1 11/16	1½	⅜
mm	559	356	178	762	241	44	70	44	78	52	57	36	43	203	89	127	98	184	108	179	11	168	168	106	133	35	149	35	56	21	32	22

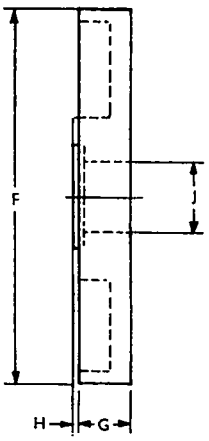


chucks



Type	A	B	C	D	E		Max. speed r.p.m.
10" (254 mm.) dia. 4-jaw ind. chuck	10 254	3¼ 83	2⅛ 54	1 13/64 38	3⅜ 86	in. mm.	1600
12" (305 mm.) dia. 3-jaw scroll chuck	12 305	3⅜ 86	3 76	1 17/32 47	4⅛ 105	in. mm.	1600
10" (254 mm.) dia. 3-jaw scroll chuck	10 254	3 3/16 81	2⅛ 54	1½ 38	3½ 89	in. mm.	1600
8¼" (210 mm.) dia. 3-jaw scroll chuck	8¼ 210	3 3/16 81	2⅛ 54	1⅜ 35	3 76	in. mm.	2240

faceplates



Size	F	G	H		Max. speed r.p.m.
12" dia.	12 305	2⅛ 54	2¼ 57	in. mm.	690
16" dia.	16 406	2½ 63	2¼ 57	in. mm.	560
22" dia.	22 559	2½ 63	2¼ 57	in. mm.	400

NOTE: The above are the maximum recommended speeds for the chuck or faceplate only and do not take into account the workpiece size. Where workpiece is eccentric or bulky (*i.e.* having a large projection from the face of the chuck or faceplate, or the weight exceeds half that of the chuck) these speeds must be reduced.

maximum weight of workpiece

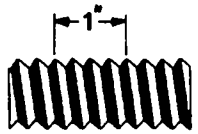
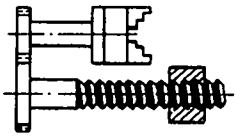
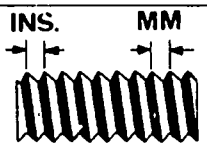
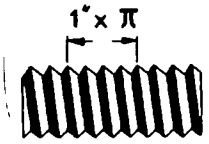
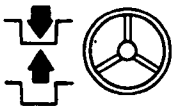
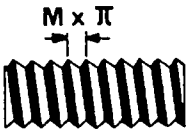
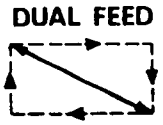
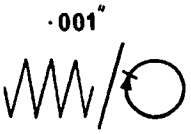
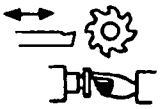
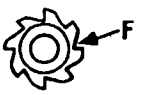
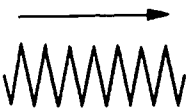
The following table lists the approximate maximum weights of workpieces which can be supported in the machine based on the load carrying capacity of the headstock spindle and tailstock.
Where workpieces are eccentric, vibration can result due to the out of balance load, and this may adversely affect the cutting performance of the lathe. This is particularly applicable at the higher spindle speeds and it may be necessary for these maximum weights to be reduced to ensure satisfactory performance.

	Maximum weight of workpiece	
	lb	kg
In Chuck (with centre of gravity up to 3" (76 mm.) from chuck face)	224	102
Between solid centres	550	250
For built-in revolving centre	364	165

Maximum capacity drilling from the saddle

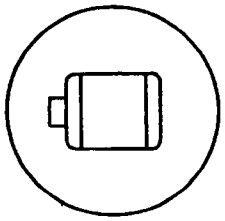
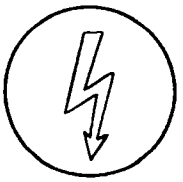
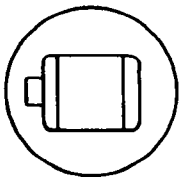
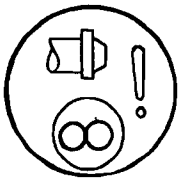
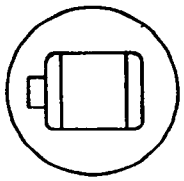
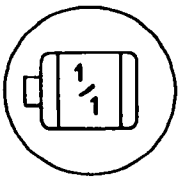
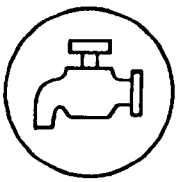
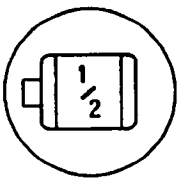
For general duty, it is recommended that thrust loads from the saddle be limited to approximately 1000 lb (450 kg). For occasional use, these can be increased by approx. 50%.

1.5 EXPLANATION OF SYMBOLS

	THREAD PITCHES IN T.P.I.		DIRECT DRIVE FOR SCREWCUTTING
	ENGLISH & METRIC PITCHES IN INCHES PITCHES IN MILLIMETRES		CROSS OR LONGITUDINAL RAPID TRAVERSE ENGAGED INDEPENDENTLY
	DIAMETRAL PITCH THREAD T.P.I. x π		HANDWHEEL ENGAGED DIS-ENGAGED
	MODULE THREAD PITCHES IN MODULE x π e.g. 3.5 x 3.14 11 mm		SPEED OF TURNING CUT IN FEET PER MINUTE
	CROSS & LONGITUDINAL FEEDS ENGAGED SIMULTANEOUSLY		SPEED OF TURNING CUT IN METRES PER MINUTE
	FEED IN THOU'S OF AN INCH FOR ONE REV. OF WORKPIECE		CHANGE SPEED ONLY IN STOPPED POSITION
	FEED IN MILLIMETRES FOR ONE REVOLUTION OF WORKPIECE		PUSH TO ENGAGE RELIEVING MECHANISM PULL TO DIS-ENGAGE
	CROSS FEED		F No. OF FLUTES
	LONGITUDINAL FEEDS		
	CROSS OR LONGITUDINAL FEED ENGAGED INDEPENDENTLY		

The above symbols conform to B.S.I. No. B.S. 3641 : 1963

1.51 EXPLANATION OF SYMBOLS continued

	LARGE RED BUTTON STOP BUTTON FOR MOTOR		RED LIGHT ELECTRIC SUPPLY TO MACHINE
	GREEN BUTTON START MOTOR		AMBER WARNING LIGHT SPINDLE BEARING OIL SUPPLY
	GREEN LIGHT ELECTRIC SUPPLY TO MOTOR		GREEN ILLUMINATED BUTTON TO START COOLANT RUNNING
	GREEN ILLUMINATED BUTTON MOTOR RUNNING AT FULL SPEED		RED BUTTON TO STOP COOLANT RUNNING
	GREEN ILLUMINATED BUTTON MOTOR RUNNING AT HALF SPEED		

The above symbols conform to B.S.I. No. B.S. 3641 : 1963

INSTALLATION
AND INSPECTION

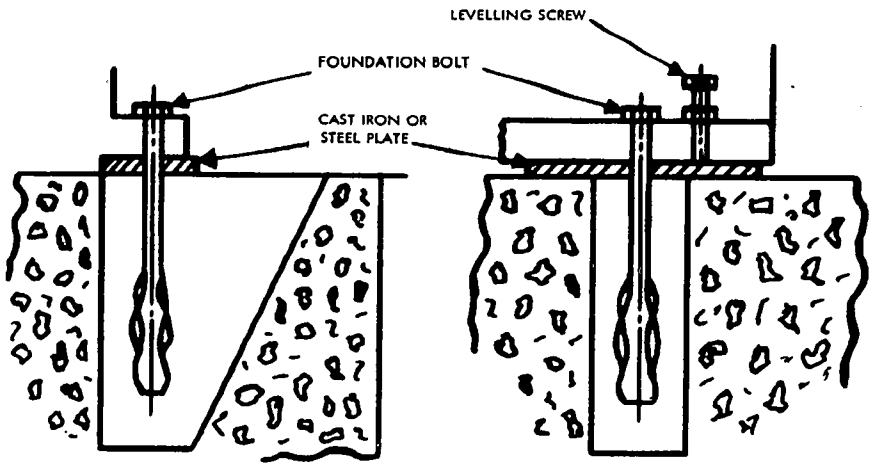
If out of balance components are not anticipated, the rigid construction of the machine eliminates the need for bolting down. The floor must however be firm and preferably of concrete. Cast iron or steel plates should be provided under each levelling screw as shown below.

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.

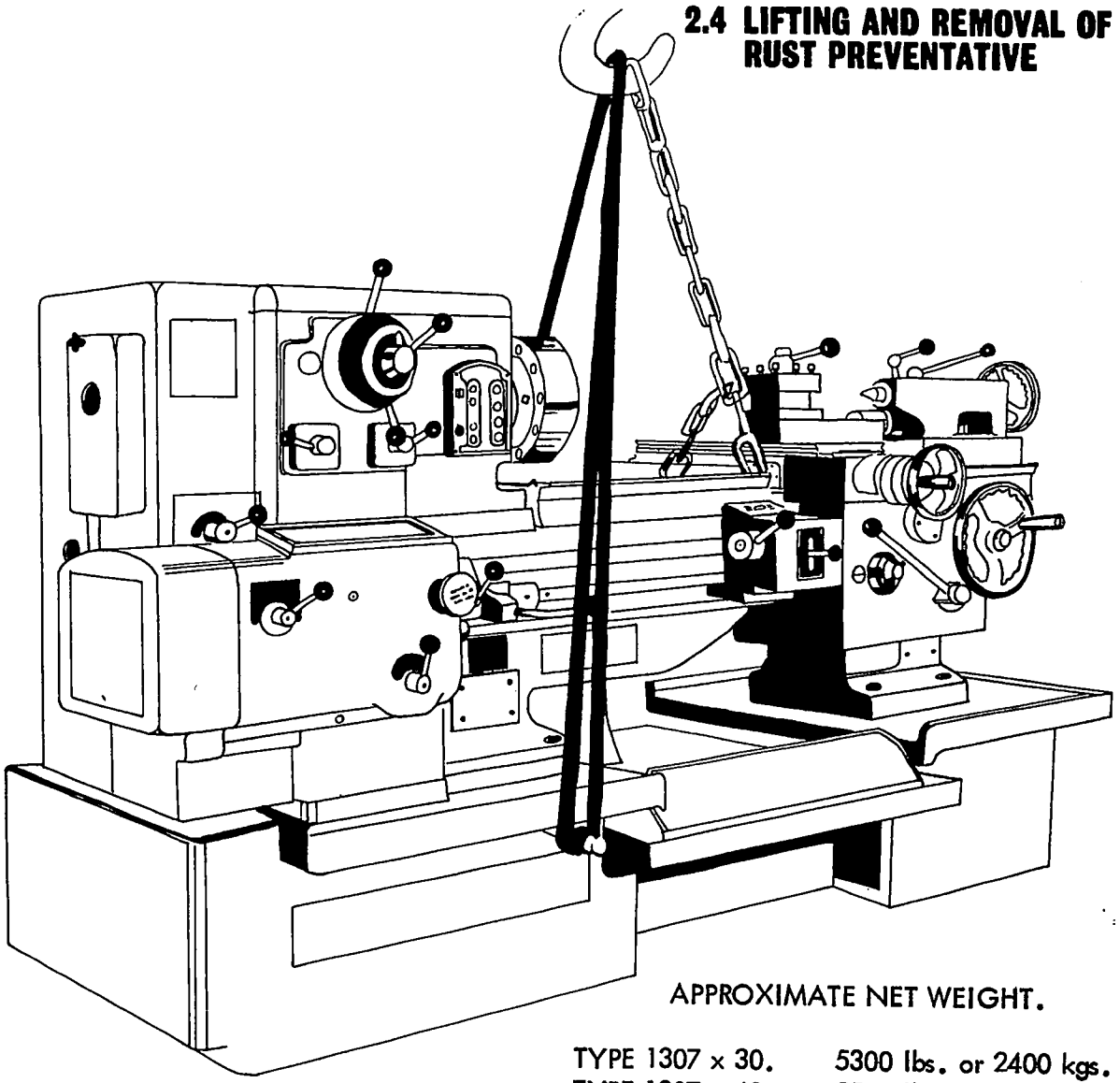
Ensure that concrete foundations have aged before placing the lathe in position. Never grout round the base of the machine as this prevents subsequent re-levelling.

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" wide bolt holes as shown above and position as shown in the foundation plan. When positioning lift the lathe and suspend a foundation bolt in each of the 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.

2.4 LIFTING AND REMOVAL OF RUST PREVENTATIVE



APPROXIMATE NET WEIGHT.

TYPE 1307 x 30.	5300 lbs. or 2400 kgs.
TYPE 1307 x 40.	5500 lbs. or 2520 kgs.
TYPE 1307 x 50.	5800 lbs. or 2630 kgs.

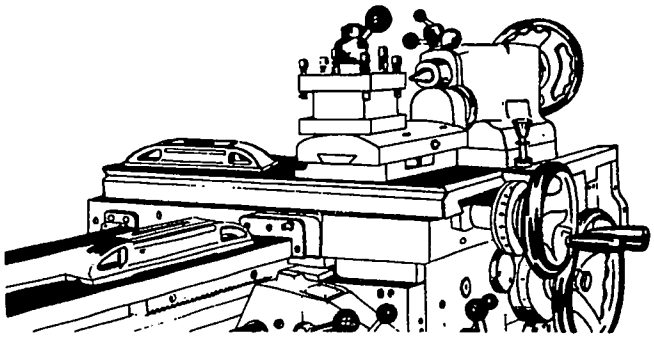
LIFTING.

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.

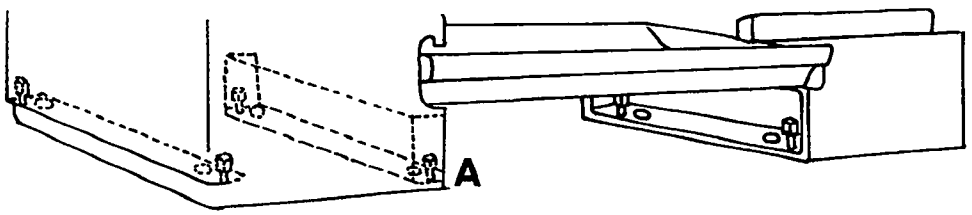
REMOVAL OF RUST PREVENTATIVE. (See Section 1.1)

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.



Your lathe will only turn accurately if attention is given to accurate levelling. Use only a precision spirit level reading 0.0005" in 10" or for metric, to read 0.05 mm per div. in 1 metre.
The level should be placed crosswise on saddle top and lengthwise on the back way of the bed, the saddle 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 - division if level reads 0.0005" per division in 10" or 0.013 mm in 250 mm.) 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 and 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" (0.010 mm) on diameter in 9" (230 mm). 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.

F. PRATT & Co Ltd, HALIFAX 2.53 CHUCK ACCURACY

GEARED SCROLL 3-JAW CHUCKS MODEL Nº 278D

Guarantee

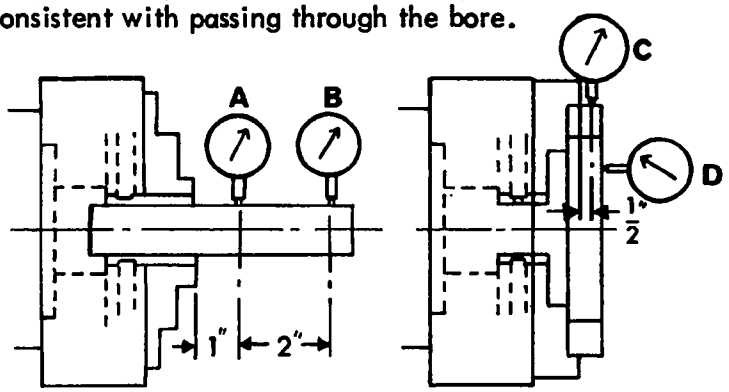
We hereby authorise accredited stockists of Pratt Chucks to replace this Chuck free of all charge should failure occur, due either to faulty material or workmanship, within a period not exceeding two years from date of purchase. In cases where a reasonable doubt exists the Chuck must be returned for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

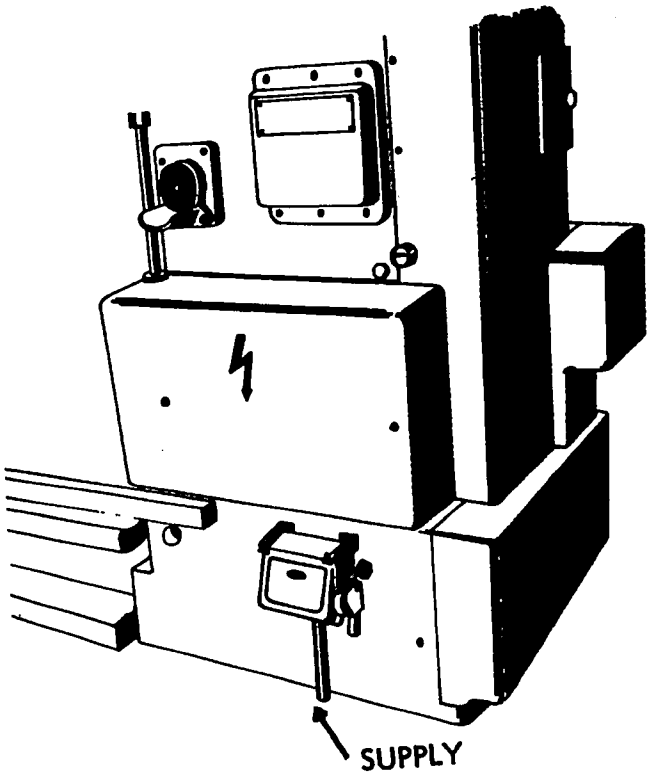


Permissable error total indicator reading.

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

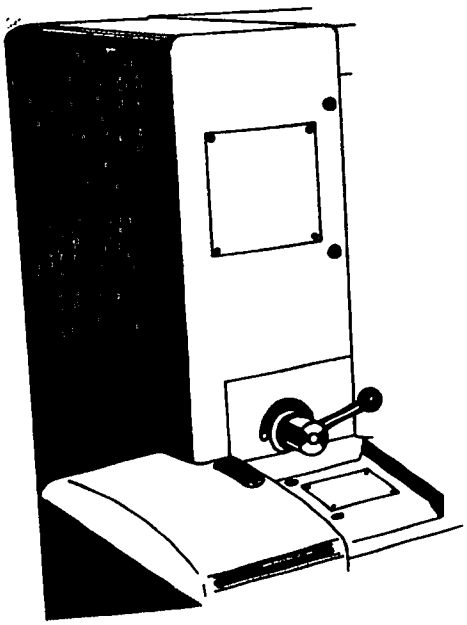
2.6 ELECTRICAL INSTALLATION

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.



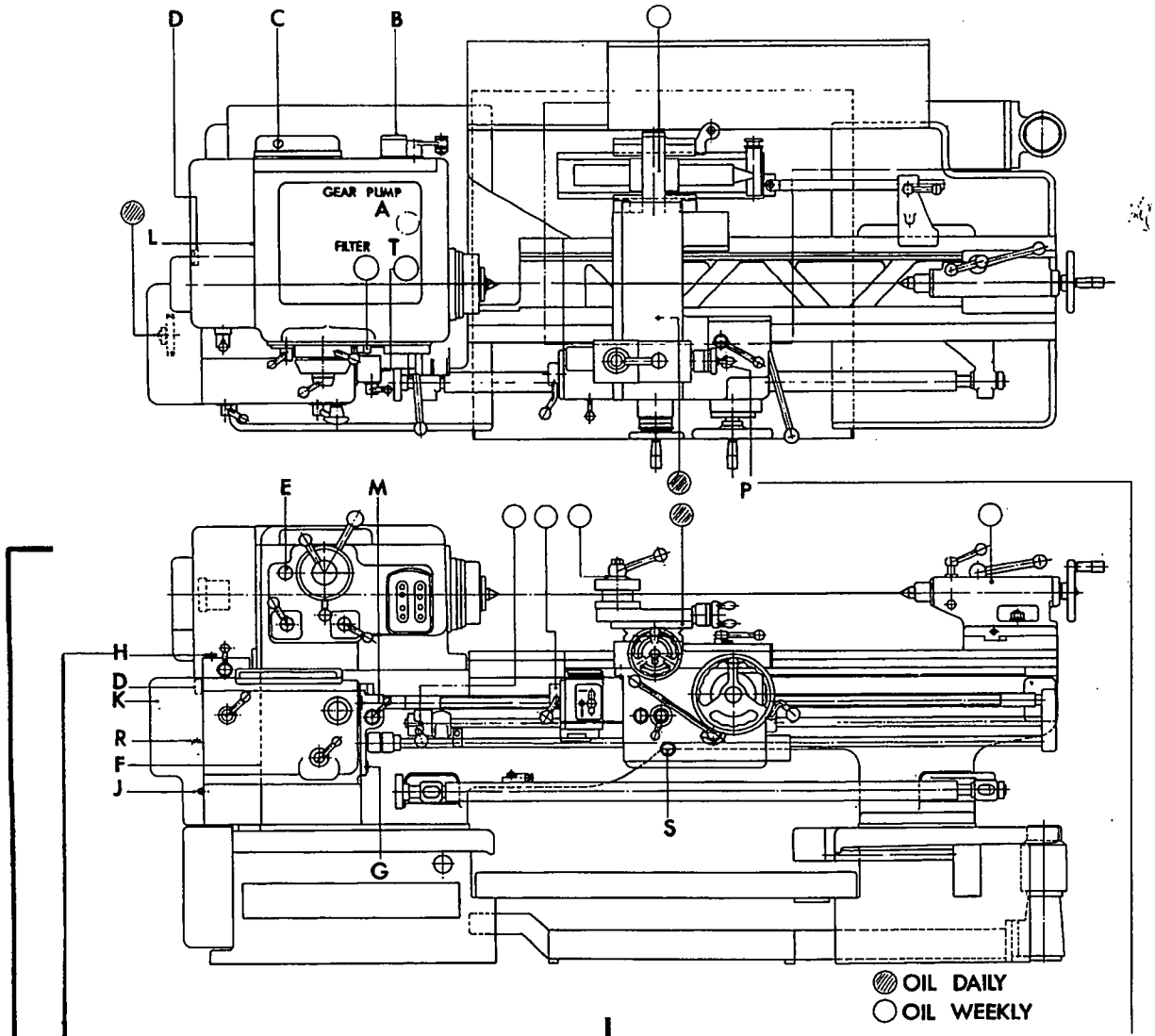
Check direction of motor rotation as indicated by arrow on pulley guard at the headstock end of the lathe.

LUBRICATION AND CARE OF MACHINE

HEADSTOCK OIL

Use Shell Vitrea 27 or equivalent oil Specification as follows } Specific gravity .86 Flash Point closed 400° F. Viscosity at 100° F. { 150 Redwood Sec. (36.5cs.) 170 Saybolt Viscosity at - { 95

CHANGE OIL IN HEADSTOCK EVERY 1000 WORKING HOURS - QUANTITY IN HEADSTOCK 22 PINTS - 12·3 LITRES



TABLEWAY OIL FOR APRON, GEARBOX AND OIL GUN

Use Shell Tonna 33 or equivalent oil. Specification as follows } Specific Gravity .875 Flash point closed 400°F. Containing non drip, anti-wear and oiliness additives Viscosity at 100 °F. { 280 Redwood Sec.(69 cs.) 320 Saybolt Viscosity index - 95

CHANGE OIL IN GEARBOX EVERY 1000 WORKING HOURS - QUANTITY 3 PINTS (1.7 LITRES)

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

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 oilsight 'G' with the lathe at rest. The quantity of oil required is 3 pints (1.7 litres)
To drain remove plug 'J'.
The oil should be changed every 1000 working hours.

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 automatically from the apron pump. A check must be kept on the oil sight 'S' situated at the bottom of the apron and should be topped up to level through cap 'P' on saddle.

APRON.

The apron is lubricated by means of a plunger pump but the leadscrew nut operating lever requires lubrication by oil gun at weekly intervals.

SADDLE AND COMPOUND SLIDES.

Saddle cross slide is lubricated automatically. Oil other slideways daily through the nipples provided. The cross slide screw nut is oiled through the nipple at the centre of the cross slide.

TOP SLIDE NUT.

Oil daily through the nipple at the side of the swivel slide.

GENERAL.

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

HEADSTOCK.

Oil is fed from a sump by means of a gear pump 'A' and through magnetic filters situated in an housing at 'B', a pressure relief valve is placed in the feed line between magnetic filters 'B' and a tee junction. From this junction, oil is fed to the lubrication spider and a separate line incorporating a magnetic filter 'T' supplies further filtered oil to the front and rear spindle bearings. As a safety factor an A.C. pressure switch is fitted between the gear pump and main filters 'B' and a warning light on the pushbutton panel will appear when the pump pressure fails.
If this happens the lathe must be stopped and the cause investigated.
The oil level 'D' can be seen at the fasthead end of the headstock, whilst an oil sight 'E' can be seen at the front indicating when the pump is functioning. The oil level is arranged to give splash lubrication to various gears oil being supplied from a reservoir built into the headstock.
NOTE: It is essential to top up at filler plug 'C'.

DRAINING HEADSTOCK.

To drain the headstock, remove the large end guard over the main drive to expose a flexible drain pipe 'L' remove this from its retaining spring clip and place end over suitable container (approx. 4 pints or $2\frac{1}{4}$ litres capacity) and remove cap from end. (A sealing washer is fitted inside the cap).

DRAINING HEADSTOCK SUMP.

To drain headstock sump remove the large end guard over the main drive to expose a flexible pipe and drain plug 'F' (approx. $2\frac{1}{4}$ galls or 10.1 litres) situated approx. 18 ins below the main spindle. Before removing plug 'F', it is advisable to remove the driving belts and then hold collecting vessel below drain plug.

CLEANING MAIN FILTERS.

To clean main magnetic filters at 'B' place tray or vessel below filter housing 'B' to catch surplus oil and remove small cover plate, the filters can now be removed for cleaning.

CLEANING SPINDLE BEARING FILTER.

Remove headstock cover, unscrew the fixing screw in the centre of filter 'T', lift cap out carefully to avoid damage to 'O' ring. The magnetic filter can now be lifted out for cleaning.
NOTE:- When flushing out the headstock sump, flushing oil only should be used NOT petrol or paraffin. Total oil required for headstock and sump approx. 22 pints or 12.3 litres.
It is recommended that the oil should be changed every 1000 working hours.

3.2 CARE OF MACHINE

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

Ample and correct lubrication, together with regular oil changes. See machine lubrication section 3.1

It is advisable to flush out the headstock and gearbox when changing the oil. Use a flushing oil and 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 and accuracy of the machine. Lubricate machine immediately after cleaning.

Ensure that all slide and 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 and faceplates etc., place a board on the bed to protect the guideways from bruising.

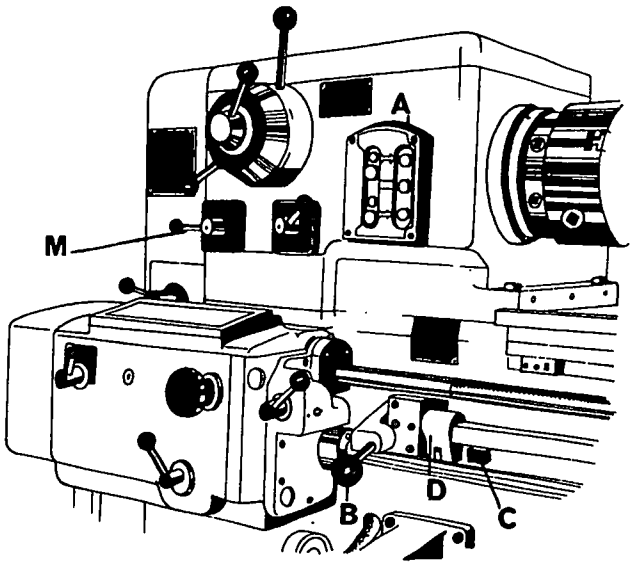
To prevent damage or scratching, hammers, spanners, tools etc., must NOT be place on the bed guideways.

Before fitting chucks etc., or attachments ensure mating parts are clean and 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.

HEADSTOCK AND TAILSTOCK

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 2 speed ranges giving 12 forward speeds and 12 reverse speeds.

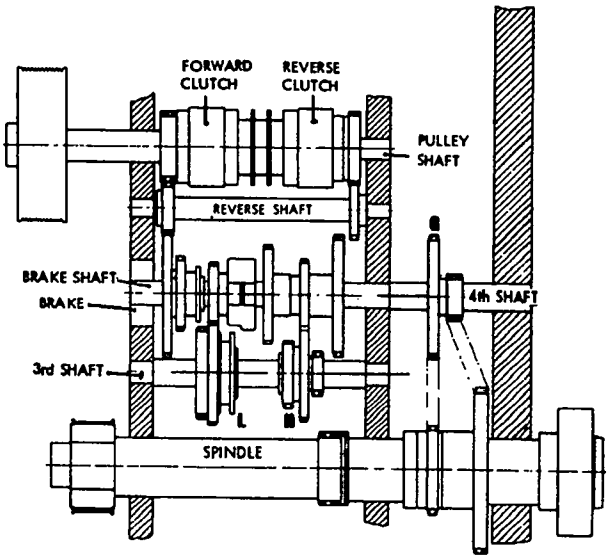
	FAST RANGE PULLEY SPEED 1080 R.P.M.						MEDIUM RANGE. PULLEY SPEED 770 R.P.M.					
Forward & Reverse	29	40	57	80	115	160	20	29	40	57	80	115
	175	240	345	480	690	960	120	175	240	345	480	690

HIGH SPEED HEADSTOCK.

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

		FAST RANGE PULLEY SPEED 1080 R.P.M.						MEDIUM RANGE PULLEY SPEED 770 R.P.M.					
Forward & Reverse	Belt	400	560	800	1120	1600	2240	280	400	560	800	1120	1600
	Gear	29	40	57	80	115	160	20	29	40	57	80	115
		175	240	345	480	690	960	120	175	240	345	480	690

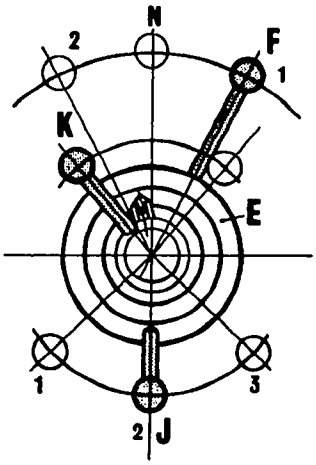
4.11 STARTING & SPEED SELECTION continued



STANDARD HEADSTOCK

Spindle speeds are indicated on the plastic cover 'E'. Two ranges are shown indicated by F.2. and F.1. All speeds can be obtained in either forward or reverse directions

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 6 : 1)



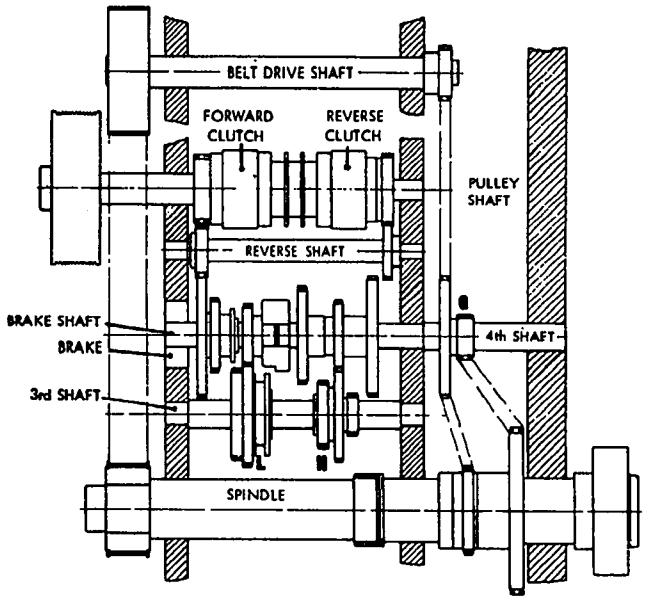
Gear 'H' is operated by lever 'J' which gives three speed changes and moves plastic cover 'E'. It will be seen that speeds are grouped in pairs, the left hand pair representing lower speeds, the right hand pair intermediate speeds and the central pair higher speeds. Position 1 and 3 of lever 'J' are 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.

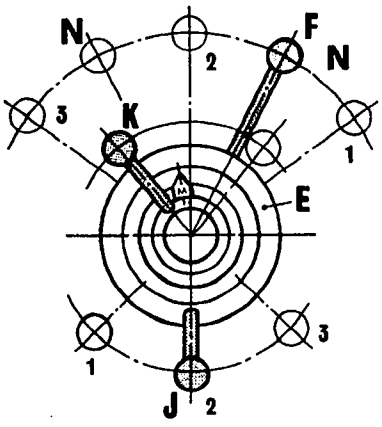
Move lever 'F' to appropriate range, position lever 'J' as for forward speeds. Engage clutch by moving lever 'B' downwards.



HIGH SPEED HEADSTOCK.

Spindle speeds are indicated on the plastic cover 'E'. Three ranges are shown indicated by F.3, F.2 and F.1.

The engagement of the 'High', 'Low' or 'Belt Drive' is by lever 'F' controlling gear 'G'. Position 1 is low gear, position N neutral, position 2 high gear, position N neutral and position 3 belt drive. The speed ratio between low and high is 6: 1 and between high and belt drive is 2.33 : 1



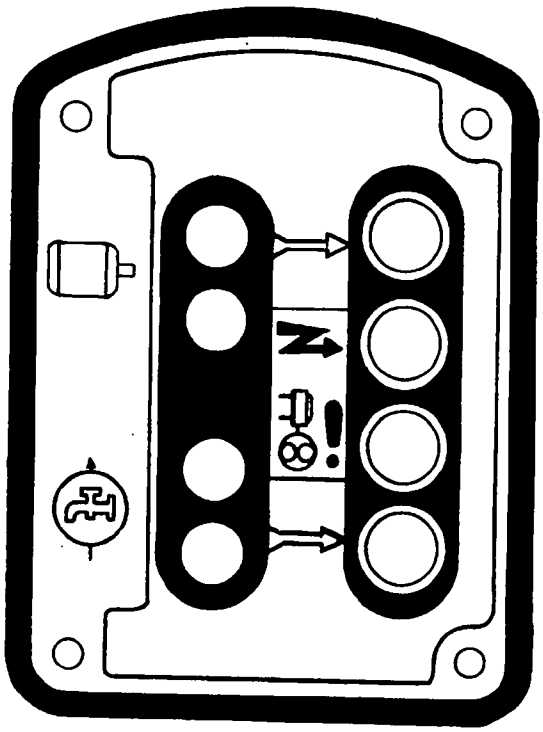
Gear 'H' is operated by lever 'J' giving three speed changes and moves plastic cover 'E'. It will be seen that speeds are grouped in pairs, the left hand pair representing lower speeds the right hand pair intermediate speeds and the central pair higher speeds. Position 1 and 3 of lever 'J' are extreme 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.



PUSH BUTTON PANEL.

A push button panel situated at the front of headstock will indicate when the electric current is switched on and also seperate indicators are provided for motor, coolant and main spindle bearings.
It will be noted that the indicator light for the main spindle bearings will only appear when the pump pressure fails, and in such an event the matter should be investigated immediately.

GENERAL CARE OF HEADSTOCK

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

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.

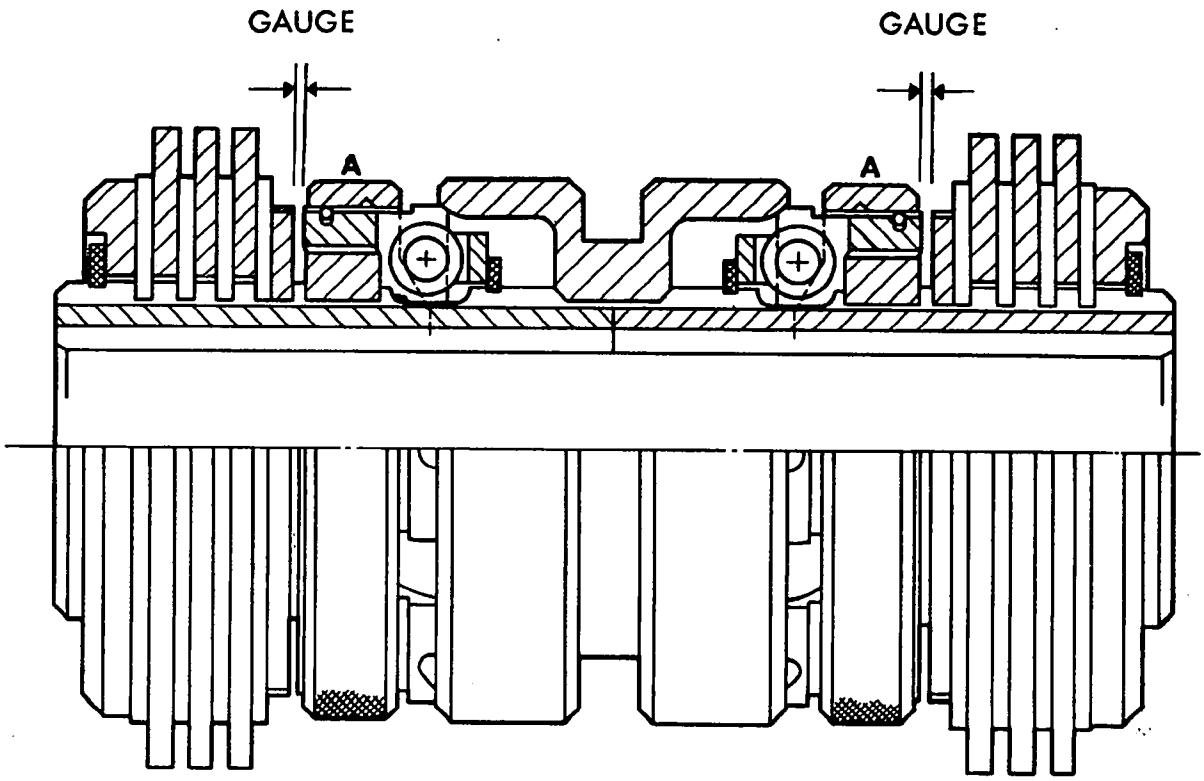
Do not attempt to change speeds under cut or with the spindle rotating at high speeds.

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 INS.	.045	.042	.042	.059	.059	.060	.060	.060	.060	.077
GAUGE M.M.	1.143	1.0668		1.4986		1.524				1.956

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

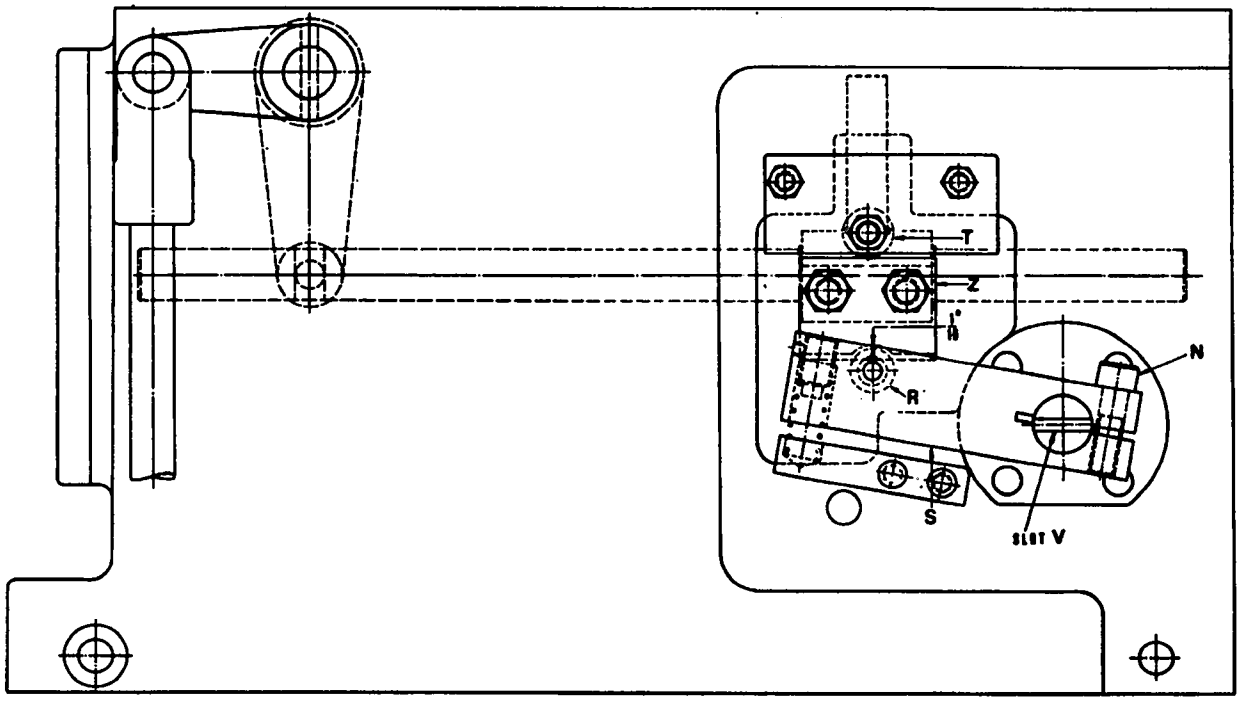
Isolate the lathe and remove the cover from the headstock.
Set the clutch operating lever in the brake position.
Slide back the knurled ring 'A' and insert the specified feeler gauge behind the splined plate.
Rotate the knurled ring to adjust the gap.
Remove the gauge and slide the knurled ring forward 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.

CLUTCH ADJUSTMENT MATRIX ZC40 CLUTCH.

To avoid over-adjusting this clutch the following procedure is recommended. Check the time to accelerate the chuck to maximum speed according to the following table. The time should not be less than that shown for the speed which is the maximum for the size of chuck, when the clutch is engaged smartly.

Speed range. R.P.M.	Chuck diameter Inches.	Spindle speed R.P.M.	Time to reach speed. Seconds.
29-2240.	14	1120	2.5
29-2240	12	1600	4.5
29-960	14	960	1.5
20-1600	14	1120	3.5
20-1600	12	1600	3.5
20-690	14	690	1.0

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 in. 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.

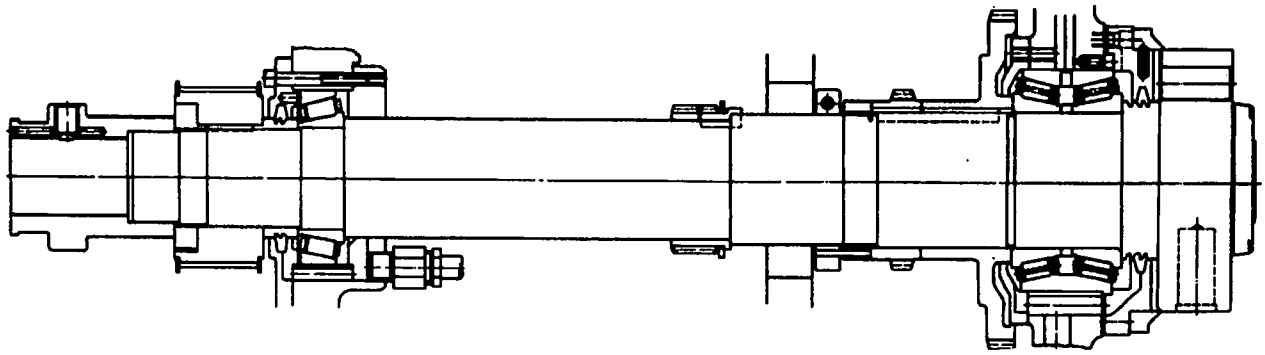
Remove the rear cover from the headstock, check that the clutch engagement lever 'B' (section 4.1) is in the braked position with the block 'C' (section 4.1) in the horizontal position, and the operating collar 14 (section 11.13) is central between forward and reverse clutch. Check that the top face 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 be means of the two small hex. head screws.

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.

4.4 SPINDLE BEARINGS

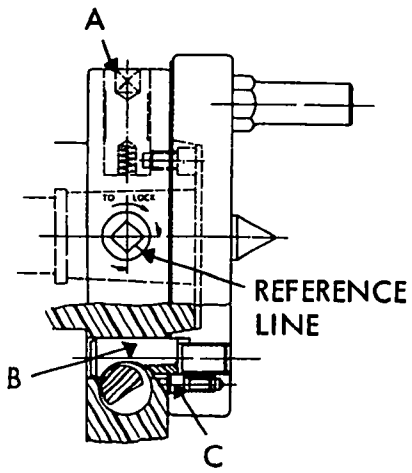


NOTE:-

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 be 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 Department should be sought to ensure no damage to the bearing occurs.

CAMLOCK SPINDLE NOSE

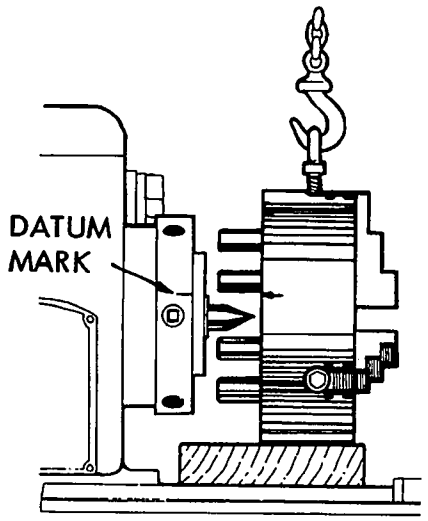


The spindle nose is American Standard type D1 it's construction and manufacture ensure precision mounting of chucks, fixtures etc., To mount a chuck or other equipment first clean thoroughly the locating taper and faces and also the spindle nose. NOTE: For accurate location of chucks etc., mount with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

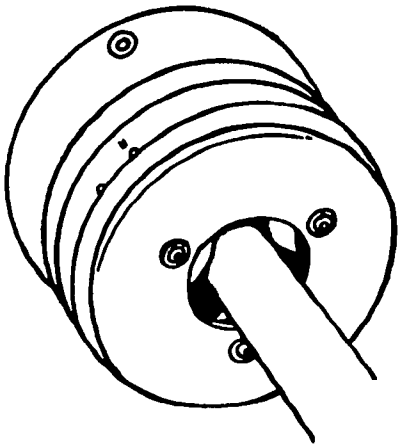
CHUCKS.

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.



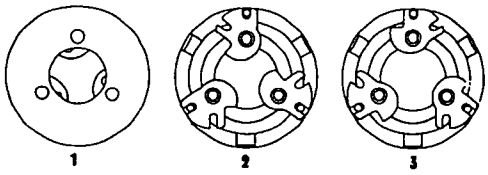
Size No. 1 with one set of jaws 5/16" - 1 3/8" dia work.
Max speed 1500 r.p.m.

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 3/8" - 3" dia work
(Set B $\frac{1}{2}$" - 2 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

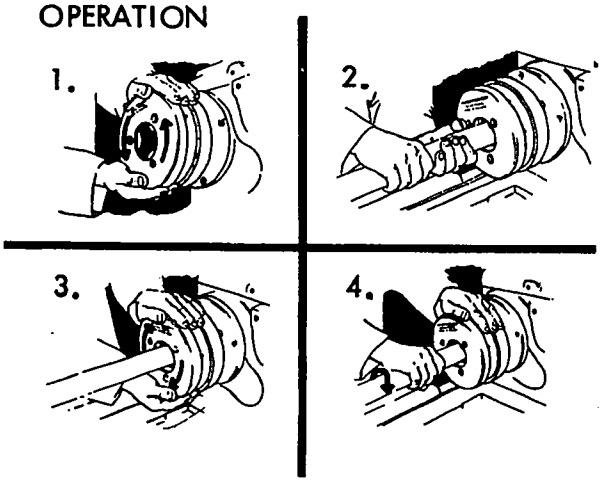


To adjust size range change jaws as follows:

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.

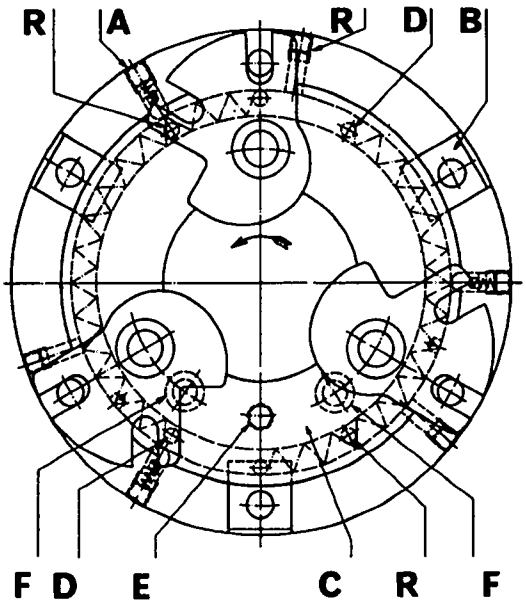
OPERATION



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'.

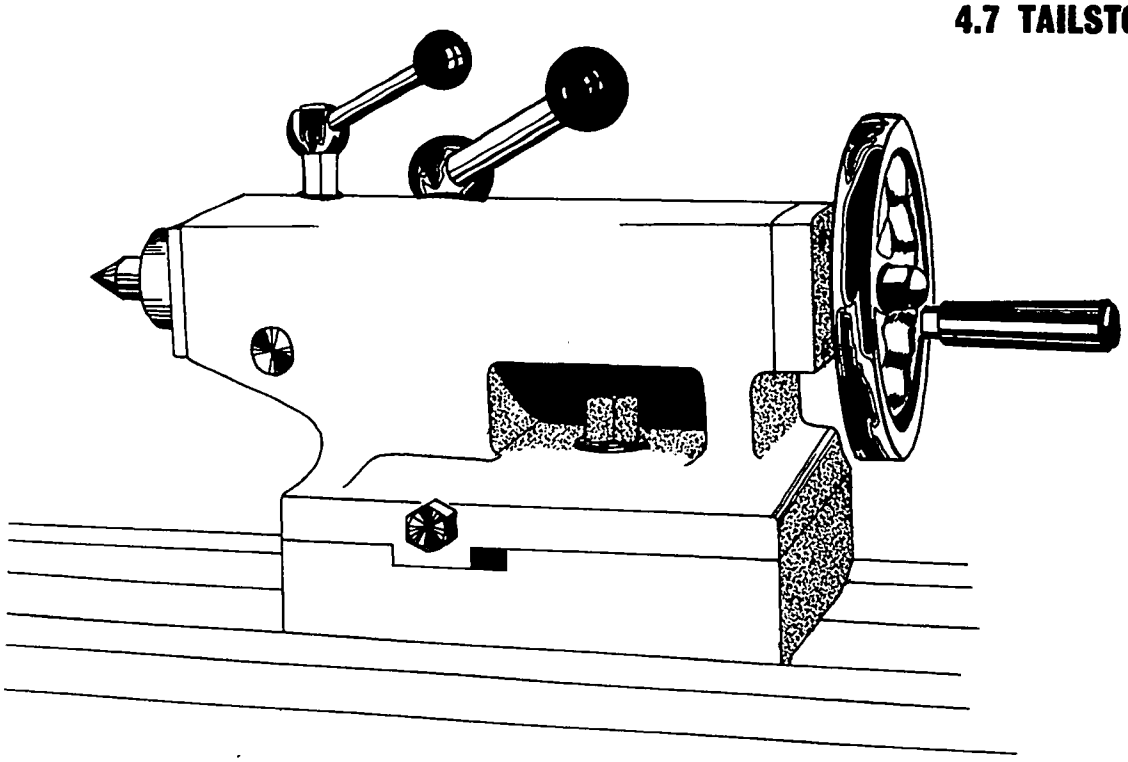
TO CHANGE DIRECTION OF DRIVE.

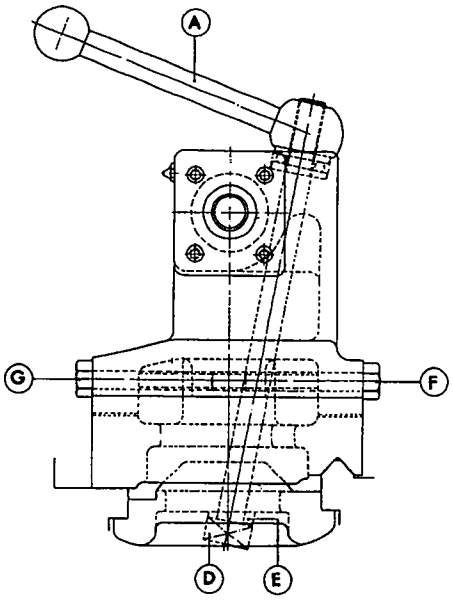
The driver will drive in either direction. It is supplied for forward spindle rotation. To change the direction of drive the procedure is as follows:-

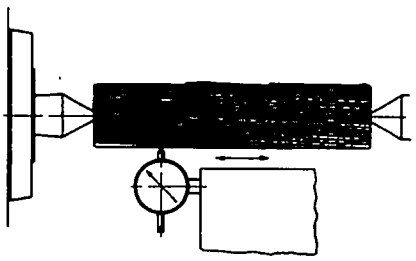


1. Place the driver flat with the cover uppermost.
2. Remove the cover and jaws as described previously.
3. Unscrew three screws and remove the three retaining plates 'B'.
4. Lift the floating ring 'C' clear of the body and detach the springs at the rear.
5. Remove the grub screws and spring plungers 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 the 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'.

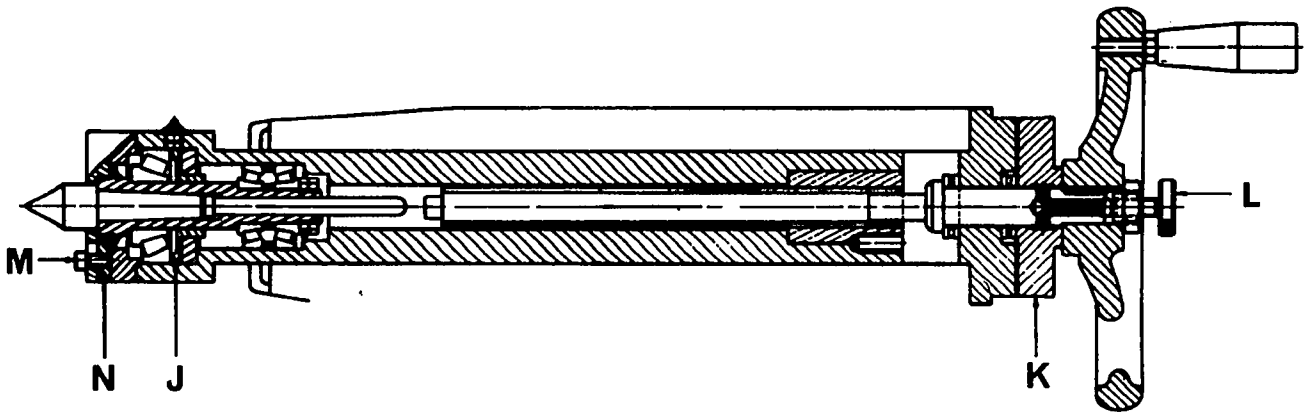
To remove the centre retract the spindle fully, when the centre will be automatically ejected.

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'.

Tailstock 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'. (Section 4.7)

Micrometer dial is locked by screw 'L'.

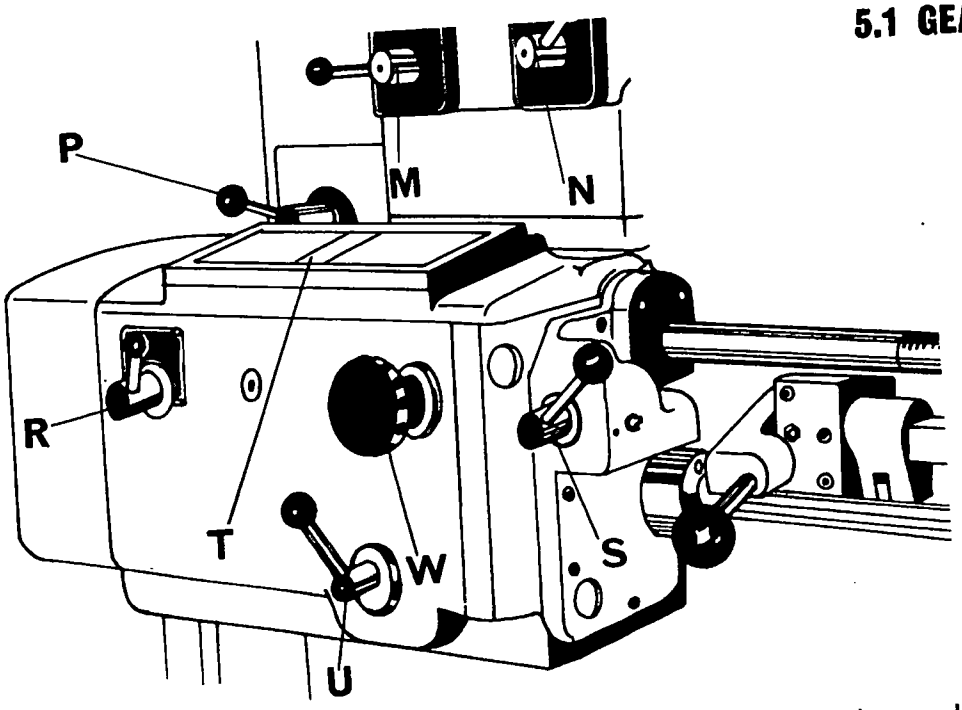
The centre can be locked for dead centre work by unlocking screw 'M' and engaging key 'N' in sleeve.

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.

GEARBOX

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.
An extra 35T change gear provides a full range of diametral and module pitches through the box.
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 SELECTION.

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.

Feeds coarser than those shown on the chart can be obtained by placing lever 'N' in the position which gives a 4 to 1 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.

Extra fine feeds as shown in the lower portion of the chart can be obtained by engaging the 4 to 1 coarse pitch ratio (lever 'N') and placing the rear speed selection lever 'F' in the "High Gear" position.

Similarly on lathes fitted with belt overdrive, extra fine feeds can be obtained as shown on chart by engaging coarse pitch and placing the rear speed selection lever in the 'Belt' position.

NOTE:- When lever 'R' (section 5.1) is set to cut module, millimeter or inch pitches, the feed shaft is still engaged and in this condition the lathe should not be used for normal turning.

For Normal Turning the lever 'R' should be put over to the extreme right hand "Feed" position.

TYPE 1307												LEVERS	
30T 60T 55T	1	2	3	4	5	6	7	8	9	A	D
	4	4·5	4·75	5	5·5	5·75	6	6·5	7	B	
	8	9	9·5	10	11	11·5	12	13	14	A	E
	16	18	19	20	22	23	24	26	28	B	
	32	36	38	40	44	46	48	52	56	C	
	64	72	76	80	88	92	96	104	112		
MM.	4	4·5	4·75	5	5·5	5·75	6	6·5	7	A	E
	2	2·25		2·5	2·75		3	3·25	3·5	B	
	1	1·125		1·25	1·375		1·5	1·625	1·75	A	D
	0·5						0·75		0·875	B	
	45	40		35·5		31·5		28	25	A	D
	22·4	20		18		16		14	12·5	B	
	11·2	10		9		8		7·1	6·3	A	E
	5·6	5		4·5		4		3·55	3·15	B	
	2·8	2·5		2·24		2		1·8	1·6	C	
=·5 x ·001"/											

	EXTRA FINE FEEDS ·001" PER REV.									
HIGH GEAR DRIVE AND COARSE PITCH 2/3 OF NORMAL				1·4			1·25	1·12	1·00	C	E
BELT DRIVE RANGE AND COARSE PITCH 2/7 OF NORMAL		1·4		1·25		1·12		1·00	0·9	B	
	0·8	0·71		0·63		0·56		0·5	0·45	C	

	EXTRA FINE FEEDS MM. PER REV.									
HIGH GEAR DRIVE AND COARSE PITCH 2/3 OF NORMAL				0·035			0·031	0·028	0·025	C	E
BELT DRIVE RANGE AND COARSE PITCH 2/7 OF NORMAL		0·035		0·031		0·028		0·025	0·022	B	
	0·020	0·018		0·016		0·014		0·012	0·011	C	

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

CHANGE GEARS. These are 12 D.P. $14\frac{1}{2}^{o}$ '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 instruction (section 11.51), relating to the removal of the leadscrew only.

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5.11 GEARBOX continued

METRIC LEADSCREW

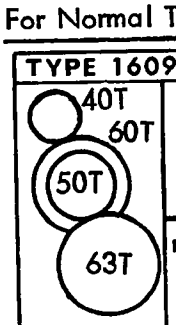
Feeds coarser than those shown on the chart can be obtained by placing lever "N" in the position which gives a 4 to 1 pitch ratio. The rear speed selection lever 'F' on the headstock should then be placed in the "Low Gear" position. Refer to section 4.1. These very coarse feeds should always be used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

Extra fine feeds as shown in the lower portion of the chart can be obtained by engaging the 4 to 1 coarse pitch ratio (lever 'N') and placing the rear speed selevtion lever 'F' in the 'High Gear' position.

Similarly on lathes fitted with belt overdrive, extra fine feeds can be obtained as shown on chart by engaging coarse pitch and placing the rear speed selection lever in the 'Belt' position.

NOTE:- When lever 'R' (section 5.1) is set to cut module, millimetre or inch pitches, the feed shaft is still engaged and in this condition the lathe should not be used for normal turning.

For Normal Turning the lever 'R' should be put over to the extreme right hand 'Feed' position.



TYPE 1609	1	2	3	4	5	6	7	8	9	LEVERS	
	4	4·5	4·75	5	5·5	5·75	6	6·5	7	A	D
	8	9	9 5	10	11	11 5	12	13	14	B	
	16	18	19	20	22	23	24	26	28	A	E
	32	36	38	40	44	46	48	52	56	B	
	64	72	76	80	88	92	96	104	112	C	
	4	4·5	4·75	5	5·5	5·75	6	6·5	7	A	E
	2	2·25		2·5	2·75		3	3·25	3·5	B	
	1	1·125		1·25	1·375		1·5	1·625	1·75	A	D
	0·5						0·75		0·875	B	
	1.12		1.0		0.9	0.8		0.71	0.63	A	D
	0.56		0.5		0.45	0.4		0.355	0.31	B	
	0.28		0.25		0.224	0.2		0.18	0.16	A	E
	0.14		0.125		0.112	0.1		0.09	0.08	B	
	0.07		0.063		0.056	0.05		0.045	0.04	C	

	EXTRA FINE FEEDS ·001" PER REV.										
HIGH GEAR DRIVE AND COARSE PITCH 2/3 OF NORMAL				1·4			1·25	1·12	1·00	C	E
BELT DRIVE RANGE AND COARSE PITCH 2/7 OF NORMAL		1·4		1·25		1·12		1·00	0·9	B	
	0·8	0·71		0·63		0·56		0·5	0·45	C	

	EXTRA FINE FEEDS MM. PER REV.										
HIGH GEAR DRIVE AND COARSE PITCH 2/3 OF NORMAL				0·035			0·031	0·028	0·025	C	E
BELT DRIVE RANGE AND COARSE PITCH 2/7 OF NORMAL		0·035		0·031		0·028		0·025	0·022	B	
	0·020	0·018		0·016		0·014		0·012	0·011	C	

ELECTRICAL INTERLOCK.

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

CHANGE GEARS.

These are 12 D.P. $14\frac{1}{2}^{o}$ '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 instruction (section 11.51), relating to the removal of the leadscrew only.

THREADING

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 plate, (Section 6.2) the inner dial cannot be used and use should be made of the outer dial as shown in Section 6.2 and 6.21.

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).

6.1 THREAD CUTTING
METRIC LEADSCREW.

When setting the change gears it is important that there should be 0.125 mm to 0.20 mm. 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 millimetres 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 millimetres 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 screcutting 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 1.3/8in. diameter, 6 mm. 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.

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

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

Example 1. Required 3.8mm. pitch.
Thread selected from chart. 4 mm. pitch.

$$\text{Ratio} = \frac{40}{60} \times \frac{50}{63} \times \frac{3.8}{4} = \frac{40}{60} \times \frac{50}{63} \times \frac{38}{40} = \frac{38}{60} \times \frac{50}{63}$$

Change gears. N = 38T. P = 60. R = 50. S = 63.
Set the gearbox to give 4 mm. and arrange the change gears as indicated.

Example 2. Required 5.25 mm. pitch.
Pitch selected from chart. 5 mm.

$$\text{Ratio} = \frac{40}{60} \times \frac{50}{63} \times \frac{5.25}{5} = \frac{35}{63}$$

To use std. gears - compound $\frac{35}{63} = \frac{42}{60} \times \frac{50}{63}$

Change gears. N = 42. P = 60. R = 50. S = 63.
Set the gearbox to give 5 mm. 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).

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.

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	
E	A	16	18	19	20	22	23	24	26	28	COARSE
	B	8	9	9·5	10	11	11·5	12	13	14	
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
D	A	1			1·25			1·5		1·75	
	B	0·5						0·75			

SCREW PITCHES IN INCHES											
E	A	1	1 1/8	1 3/16	1 1/4	1 3/8	1 7/16	1 1/2	1 5/8	1 3/4	COARSE
	B	1/2	9/16	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
	B	1/8			5/32			3/16		7/32	

CHANGE GEARS: END BOX N — 30; INTER — 55; SCREW S — 60

DIAMETRAL AND MODULE PITCHES

Arrange the change gears as shown and operate as above.

INDICATOR		1	2	3	4	5	6	7	8	9	
LEVERS		DIAMETRAL PITCHES									
D	A	2	2·25	2·375	2·5	2·75	2·875	3	3·25	3·5	COARSE
	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	
	B	16	18	19	20	22	23	24	26	28	
E	A	32	36	38	40	44	46	48	52	56	NORMAL
	B	64	72	76	80	88	92	96	104	112	
	C	128	144	152	160	176	184	192	208	224	

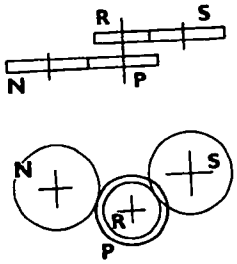
MODULE PITCHES											
E	A	8	9	9·5	10	11	11·5	12	13	14	COARSE
	B	4	4·5	4·75	5	5·5	5·75	6	6·5	7	
E	A	2	2·25		2·5	2·75		3	3·25	3·5	NORMAL
	B	1			1·25			1·5		1·75	
	C	0·5						0·75			

CHANGE GEARS: 55 END BOX; 30 INTER; 35 60 SCREW

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.

B.A. No.	PITCH M.M.	SET TO T.P.I.	CHANGE GEARS N	P	R	S
0	1	64	63	40		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



CHANGE GEARS

OTHER THREADS				
THREAD REQUIRED	THREAD SET FOR	CHANGE GEARS N	INTER	S
13½ T.P.I.	18 T.P.I.	40	55	60
27 T.P.I.	36 T.P.I.	40	55	60
33⅓ 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	½" PITCH	60	55	30

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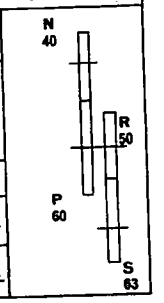
INCH AND MM. PITCHES

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 use the change gears.
N=50T, P=30, R=40, S=63.

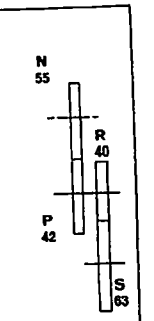
POS'N		1	2	3	4	5	6	7	8	9	TYPE 13-1 & 16 SB
LEVERS		SCREW PITCHES IN MILLIMETRES									FOR 32 TO 56 MM. SET. TO COARSE AND USE GEARS ◀ N 50, P30, R40, S63.
E	A	32	36	38	40	44	48	48	52	56	
E	A	16	18	19	20	22	23	24	26	28	COARSE
	B	8	9	9·5	10	11	11·5	12	13	14	
E	A	4	4·5	4·75	5	5·5	5·75	6	6·5	7	NORMAL
	B	2	2·25	·	2·5	2·75		3	3·25	3·5	
D	A	1	1·125		1·25	1·375		1·5	1·625	1·75	
	B	0·5						0·75		0·875	
		SCREW PITCHES IN INCHES									
E	A	1	$1\frac{1}{8}$	$1\frac{7}{16}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{7}{16}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$	COARSE
	B	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{7}{8}$	
E	A	$\frac{1}{4}$	$\frac{9}{32}$		$\frac{5}{16}$	$\frac{11}{32}$		$\frac{3}{8}$	$\frac{13}{32}$	$\frac{7}{16}$	NORMAL
	B	$\frac{1}{8}$			$\frac{5}{32}$			$\frac{3}{16}$		$\frac{7}{32}$	



DIAMETRAL AND MODULE PITCHES.

Arrange the change gears as shown and operate as above.

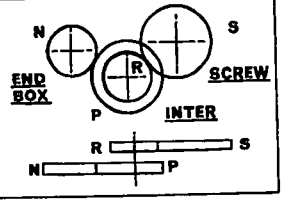
		DIAMETRAL PITCHES									
D	A	2	2·25	2·375	2·5	2·75	2·875	3	3·25	3·5	COARSE
	B	4	4·5	4·75	5	5·5	5·75	6	6·5	7	
D	A	8	9	9·5	10	11	11·5	12	13	14	
	B	16	18	19	20	22	23	24	26	28	NORMAL
E	A	32	36	38	40	44	46	48	52	56	
	B	64	72	76	80	88	92	96	104	112	
	C	128	144	152	160	176	184	192	208	224	
		MODULE PITCHES									
E	A	8	9	9·5	10	11	11·5	12	13	14	COARSE
	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	
	B	1			1·25			1·5		1·75	NORMAL
	C	0·5						0·75			



OTHER THREADS.

Arrange the change gears to suit the chart.
Set to the pitch or T.P.I. shown on the chart and operate the other levers in the ordinary way.

OTHER THREADS					
THREAD REQUIRED	THREAD SET FOR	CHANGE GEARS			
		N	P	R	S
2" PITCH	1" PITCH	50	30	40	63
13½ T.P.I.	18 T.P.I.	40	45	50	63
27 T.P.I.	36 T.P.I.	40	45	50	63



6M.M. LEADSCREW					
OTHER M.M. PITCHES					
PITCH REQ. IN M.M.	PITCH SET FOR IN M.M.	CHANGE GEARS			
		N	P	R	S
0·6	1·000	40	60	30	63
0·7	0·875	40	60	40	63
0·8	1·000	40	60	40	63
0·9	0·75	40	50		63
1·1	1·375	40	60	40	63
1·2	1·000	40	50		63
1·3	1·625	40	60	40	63
1·4	1·750	40	60	40	63

Maximum pitch available from the gearbox is 2" or 56 mm.

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

Arrange the change gears to suit the chart below.
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						
A	B	A	B	C	N	P	R	S
1	2	4	8	16	40	50		40
		4½	9	18	40	50		45
		4¾	9½	19	44	38	40	55
	2½	5	10	20	40	45		50
	2⅝	5¼	10½	21	60	50	40	63
		5½	11	22	40	45		55
		5¾	11½	23	40	50	40	46
	3	6	12	24	40	45		60
		6½	13	26	40	45		65
		6¾	13½	27	40	45	40	60
	3½	7	14	28	45	50	40	63
		7½	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						
A	B	A	B	C	N	P	R	S
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	66	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.

METRIC PITCHES WITH DIRECT DRIVE

SET LEVERS TO DIRECT DRIVE

METRIC PITCHES OBTAINED					CHANGE GEARS			
COARSE		NORMAL						
A	B	A	B	C	N	P	R	S
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						
A	B	A	B	C	N	P	R	S
2	1	½	¼	⅛	60	55		30
1⅞	15/16	15/32			60	40	50	40
1¾	⅞	7/16	7/32		63	40	50	45
1⅝	13/16	13/32			65	45		40
1½	¾	⅜	3/16	3/32	60	45		40
1⅜	11/16	11/32			55	50		40
1¼	⅝	5/16	5/32		50	55		40
1⅛	9/16	9/32			45	50		40

DIAMETRAL PITCHES (DIRECT DRIVE)

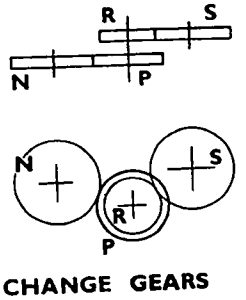
SET LEVERS TO DIRECT DRIVE

DIAM. PITCHES OBTAINED					CHANGE GEARS			
COARSE		NORMAL						
A	B	A	B	C	N	P	R	S
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
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

DIRECT DRIVE FOR T.P.I. INCHES PITCH, METRIC & MODULE 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						
A	B	A	B	C	N	P	R	S
1	2	4	8	16	50	45	40	42
		4½	9	18	64	54	50	63
		4¾	9½	19	64	57	50	63
	2½	5	10	20	64	60	50	63
		5¼	10½	21	64	63	50	63
		5½	11	22	50	63	64	66
	3	6	12	24	50	63	40	45
		6½	13	26	50	39	32	63
		7	14	28	40	42	40	63
		7½	15	30	40	45	40	63
		8	16	32	40	60	50	63
				36	40	54	40	63
				40	40	45	30	63

MODULE PITCHES WITH DIRECT DRIVE

SET LEVERS TO DIRECT DRIVE

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

METRIC PITCHES WITH DIRECT DRIVE

SET LEVERS TO DIRECT DRIVE

M.M. PITCH OBTAINED					CHANGE GEARS			
COARSE		NORMAL						
A	B	A	3	C	N	P	R	S
52	26	13	6.5	3.25	65	50	60	36
50	25	12.5	6.25		50	40	60	36
48	24	12	6	3	60	50	60	36
44	22	11	5.5	2.75	55	50	60	36
40	20	10	5	2.5	60	55		36
36	18	9	4.5	2.25	63	40		42
32	16	8	4	2	40	50	60	36
30	15	7.5	3.75		45	55		36
28	14	7	3.5	1.75	42	55		36
24	12	6	3	1.5	40	55		40
20	10	5	2.5	1.25	50	40		60
16	8	4	2	1	40	55		60
8	4	2	1	0.5	40	60	30	60

INCHES PITCH WITH DIRECT DRIVE

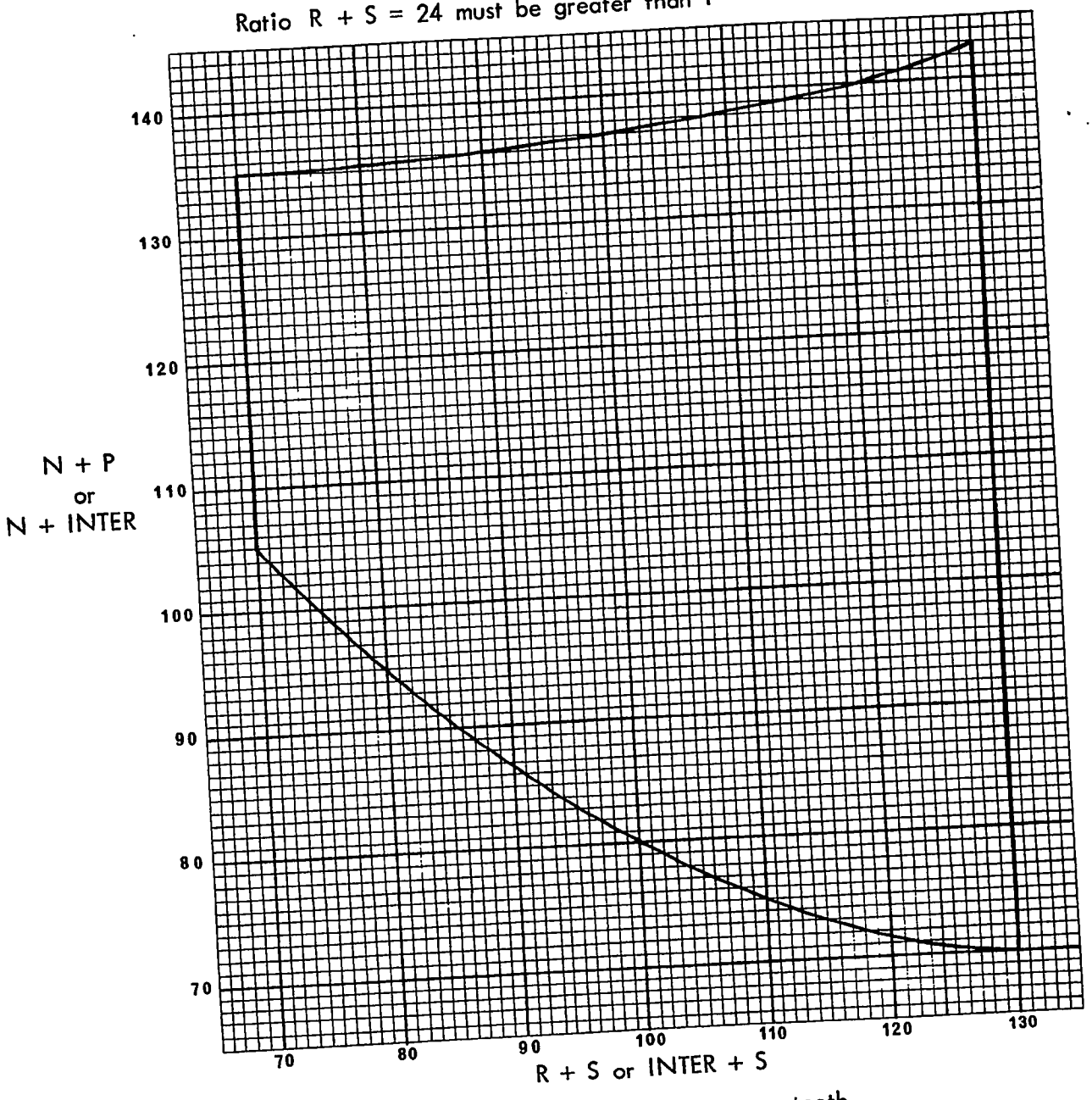
SET LEVERS TO DIRECT DRIVE

INCHES PITCH OBTAINED					CHANGE GEARS			
COARSE		NORMAL						
A	B	A	B	C	N	P	R	S
2	1	½	¼	⅛	64	42	50	36
1¾	7/8	11/20			50	42	60	36
1½	¾	7/16	7/20		50	45	60	36
1¼	5/8	11/32			65	36	60	63
1¼	⅝	⅜	7/16	3/20	50	45	50	35
1⅛	9/16	11/32			55	63	60	36
1¼	½	7/16	5/20		50	63	60	36
1⅛	7/16	9/32			50	60	50	35

Always check that the change gears calculated, fall within the range of the change gear plate. The following graph shows the extreme limits of the change gear stud centre positions, all ratios calculated must fall within this area to be acceptable.
In conjunction with the graph, two formulae must be observed to ensure that the gears do not interfere with the change gear stud.

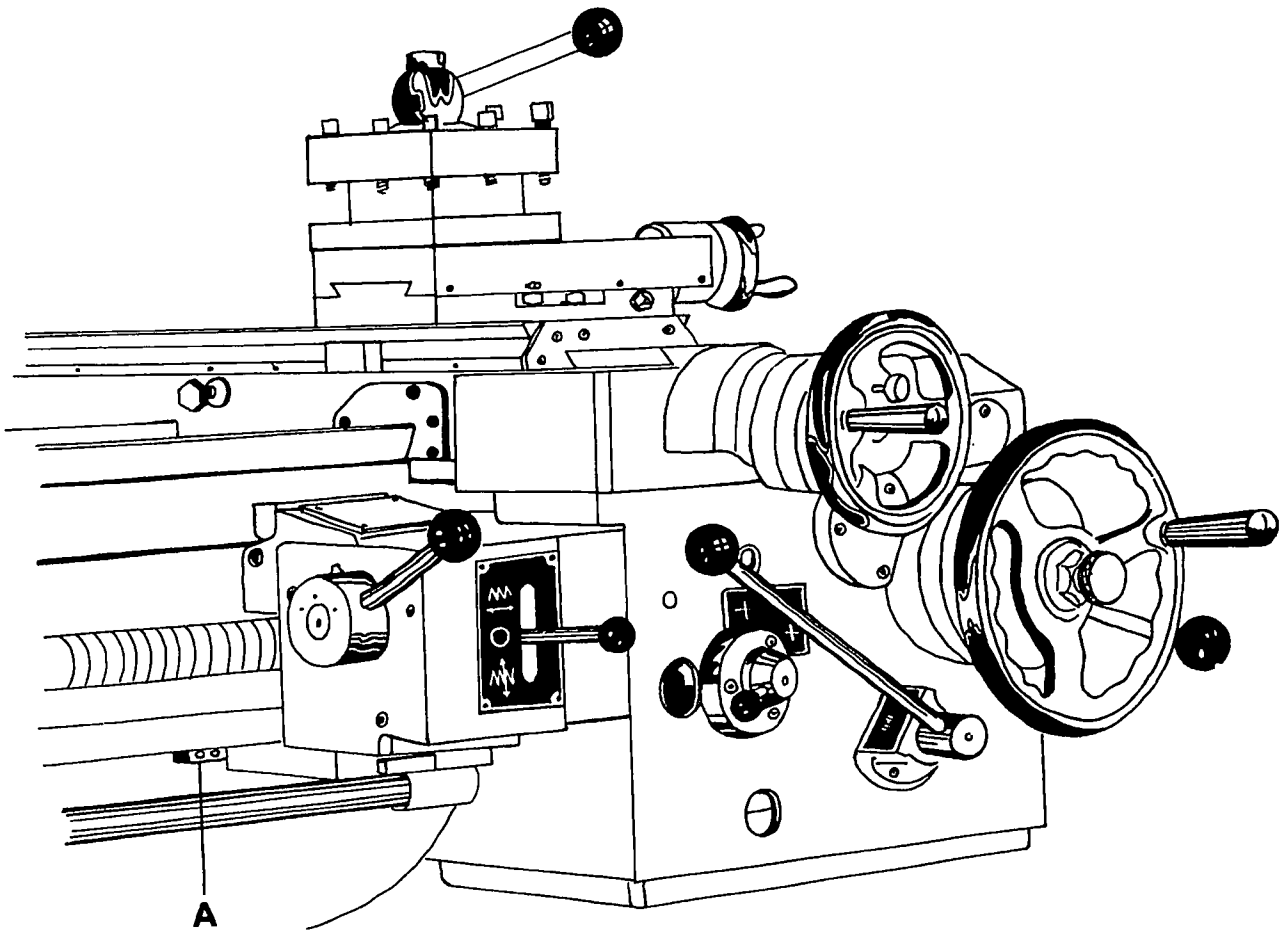
Ratio N + P = 24 must be greater than R

Ratio R + S = 24 must be greater than P



Each square represents one tooth

6.15 THREADING TRIP



An arrangement for automatically tripping the leadscrew nuts is incorporated in the apron design. This consists of a bar which is fixed to the bed casting below the front bed shear and is slotted to carry a sliding trip stop 'A'. This trip stop which can be set at any position along the bar, carries a roller, which on contact with a sliding pawl dis-engages the leadscrew nuts.

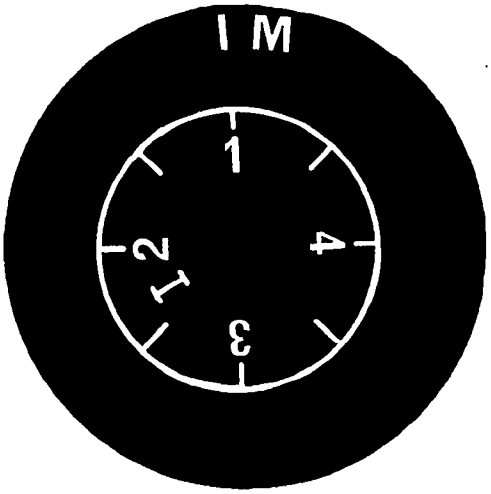
It must be noted that the stop is always positioned at the L.H. side of the apron, with the roller facing towards the tailstock end. R.H. threads can be cut using the stop and normal spindle turning direction; for L.H. threads using the stop, the spindle must be set to turn in a reverse direction.

E.G. the tool is always travelling towards the spindle flange, when cutting R.H. or L.H. threads.

6.2 SCREWCUTTING DIAL
$\frac{1}{4}$" PITCH LEADSCREW

PATENT APPLIED FOR

1 = x/1"		
1	1	1
–	–	2
–	3	3
–	–	4
X $\frac{1}{4}$	X $\frac{1}{2}$	X

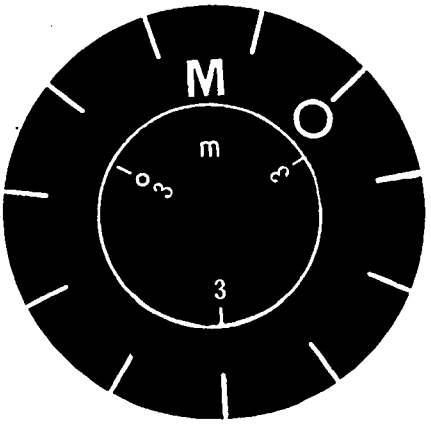


M MM PITCHES	
0.5	10
1	20
1.25	25
2	40
2.5	50
4	80
5	
8	100

The inch/metric screwcutting dial is a most useful aid to screwcutting enabling the nuts to be engaged without danger of cross threading. The inner dial may be used when cutting any pitch which is contained 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. One revolution of the dial 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 every half revolution of the dial and threads ending in quarters at every revolution. For linear inch pitches, convert the pitch to an equivalent number of threads per inch (viz. $\frac{1}{3}$ inches pitch = 3 t.p.i.) and follow the above rules. If the number of t.p.i. is neither a whole number nor one ending in $\frac{1}{2}$ or $\frac{1}{4}$ then the inner dial cannot be used and use should be made of the outer dial.

The outer dial can be used in the normal manner for m.m. pitches of any length of thread, where the pitch required is indicated on the dial instruction plate, the leadscrew nuts being engaged at the single mark on the outer dial.
The nuts can be tripped and re-engaged at the single mark. Further use of the outer dial can also be made for cutting (inch, m.m. module, d.p. etc) threads.

6.2 SCREWCUTTING DIAL



THE INNER DIAL may be used when cutting any millimetre pitch that will divide equally into 90 (90 is the matching length in millimetres of the dial travel from 0 to 0), from this it will be noticed that all the pitches shown at the bottom of the screwcutting dial plate can be cut using the dial at position 'O'. The dial is also divided into 3 positions, marked '3' and pitches that will divide equally into 30, can be cut engaging the leadscrew nuts at these positions.

MM PITCHES

M.	0	.45 .9 1.8 4.5 9 18 45 90
	0.3	.4 .5 .6 .75 1 1.2 1.25 1.5 2
	0.3	2.5 3 3.75 5 6 7.5 10 15 30

	M
▬	.35 .7 1.75 3.5 7 14 21
O▬	5.5 11 22 33

THE OUTER DIAL. Other m.m. pitches can be cut using the outer dial, the matching length for one complete revolution from 0 to 0 equalls 462mm. This dial is also divided into 11 equal spaces to give a matching length of 42mm. from one division to the next and therefore pitches that will divide equally into 42mm. of 462mm. can be cut, (see top dial plate) engaging the leadscrew nuts at the corresponding positions.

AN ADDITIONAL USE OF OUTER DIAL FOR INCH, MM. MODULE AND D.P. THREADS:-

Use method as follows:-

1. Set tool to starting position, engage leadscrew nuts with mark 'O' against index – Take first cut.
2. Trip the nuts and stop the spindle.
3. After withdrawing the tool, traverse the saddle back to the beginning of the thread, using apron handwheel or Q.P.T.
4. Run the spindle in reverse direction, until the mark 'O' on the outer dial is back at the datum arrow.
5. Stop spindle and advance tool to depth.
6. Start spindle in forward direction and engage leadscrew nuts (check mark 'O' on outer dial is in register with datum arrow for second and succeeding cuts).

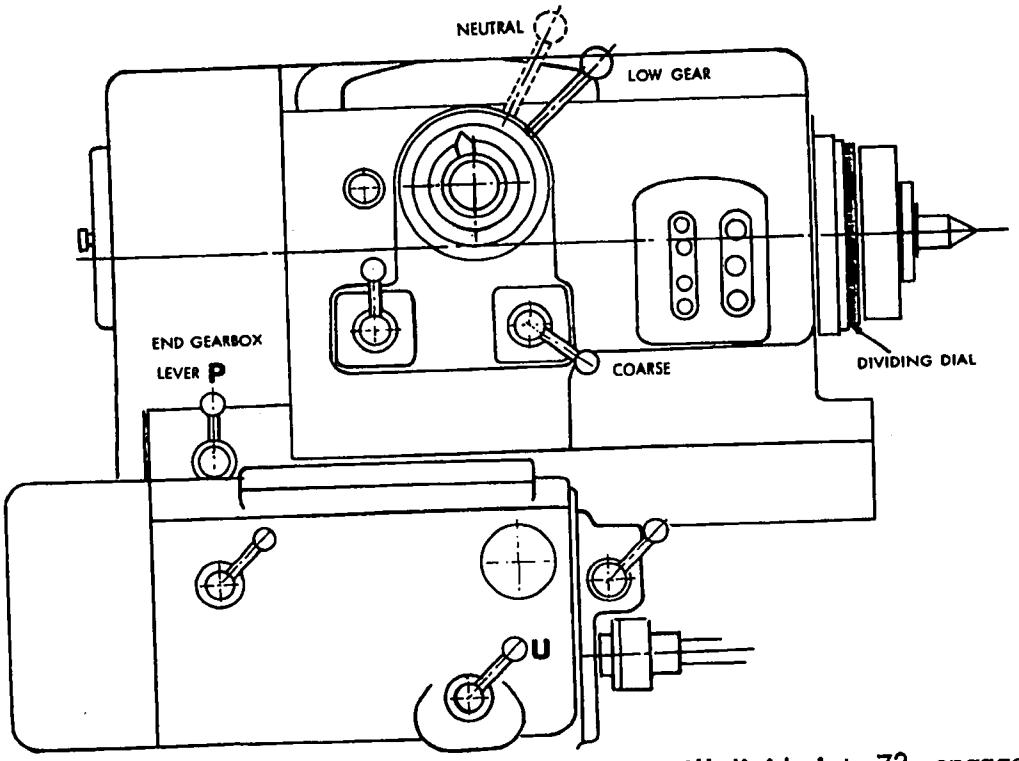
NOTE :- For any pitch not on the dial instruction plate and having a thread length longer than 462 mm. proceed as above method, but notice must be taken of the number of revolutions the outer dial makes in traversing back to the beginning of the cut thread. The dial must then be run backwards to cancel the number of forward revolution, by reversing the spindle. The leadscrew nuts can then be re-engaged at the outer dial mark 'O' for further cuts.

METHOD.

1. Set tool to starting position, engage nuts with mark on outer dial against index, and cut first required length of thread.
2. Trip the nuts and stop the spindle.
3. After withdrawing the tool traverse saddle back to beginning of thread, using apron handwheel or Q. P. T.
4. Run the spindle in reverse until the mark on the outer dial is back at the datum arrow.
5. Stop the spindle and advance tool to depth.
6. Start spindle in forward direction and engage nuts (check mark on outer dial is registering with datum) to take second and succeeding cuts.

NOTE: For any pitch not on the dial instruction plate and having a thread length longer than $15\frac{3}{4}$" or 400 mm. proceed as above method, but notice must be taken of the number of revolutions the outer dial makes when being traversed back to the beginning of the cut thread. The dial must then be run backwards to cancel the number of forward revolutions, by reversing the spindle.
e.g. Cutting length of thread 39.3/8 ins. long,dial would revolve $2\frac{1}{2}$ times, it must therefore be run backwards $2\frac{1}{2}$ revs. to bring index mark to correct position, for 2nd cut etc., the leadscrew nuts may then be re-engaged.

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 front 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 N, 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 front end of the spindle to zero. Move the lever 'P' on the end gearbox into an adjacent neutral position andset 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

METRIC LEADSCREW.

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 oflever '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 $3\frac{1}{2}$ module 3 starts.

Lead = Module x No. of starts = $3\frac{1}{2} \times 3 = 10\frac{1}{2}$ module.

$$\text{Change gear ratio} = \frac{\text{Change gear ratio on Chart} \times \text{Module required}}{\text{Module Selected.}}$$

Select say 6 Module

Then $\frac{55}{42} \times \frac{40}{63} \times \frac{10\frac{1}{2}}{6} = \frac{55}{42} \times \frac{50}{45}$

Set gearbox to cut 6 Module and use $\frac{55}{42} \times \frac{50}{45}$

N = 55, P = 42, R = 50, S = 45.

SHORT LEADS

For Inch, Metric or Module pitches normally cut using the normal ratio, the gearbox levers should be set to a $\frac{1}{4}$ the lead required and levers on headstock to coarse pitch and slow speed.

Example 3. To cut 2 mm. 3 starts.

Lead = 2 mm. pitch x No. of starts = 6 mm.

Set gearbox to cut $\frac{6 \text{ mm.}}{4}$ = 1.5 mm. pitch.

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

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.

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

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

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

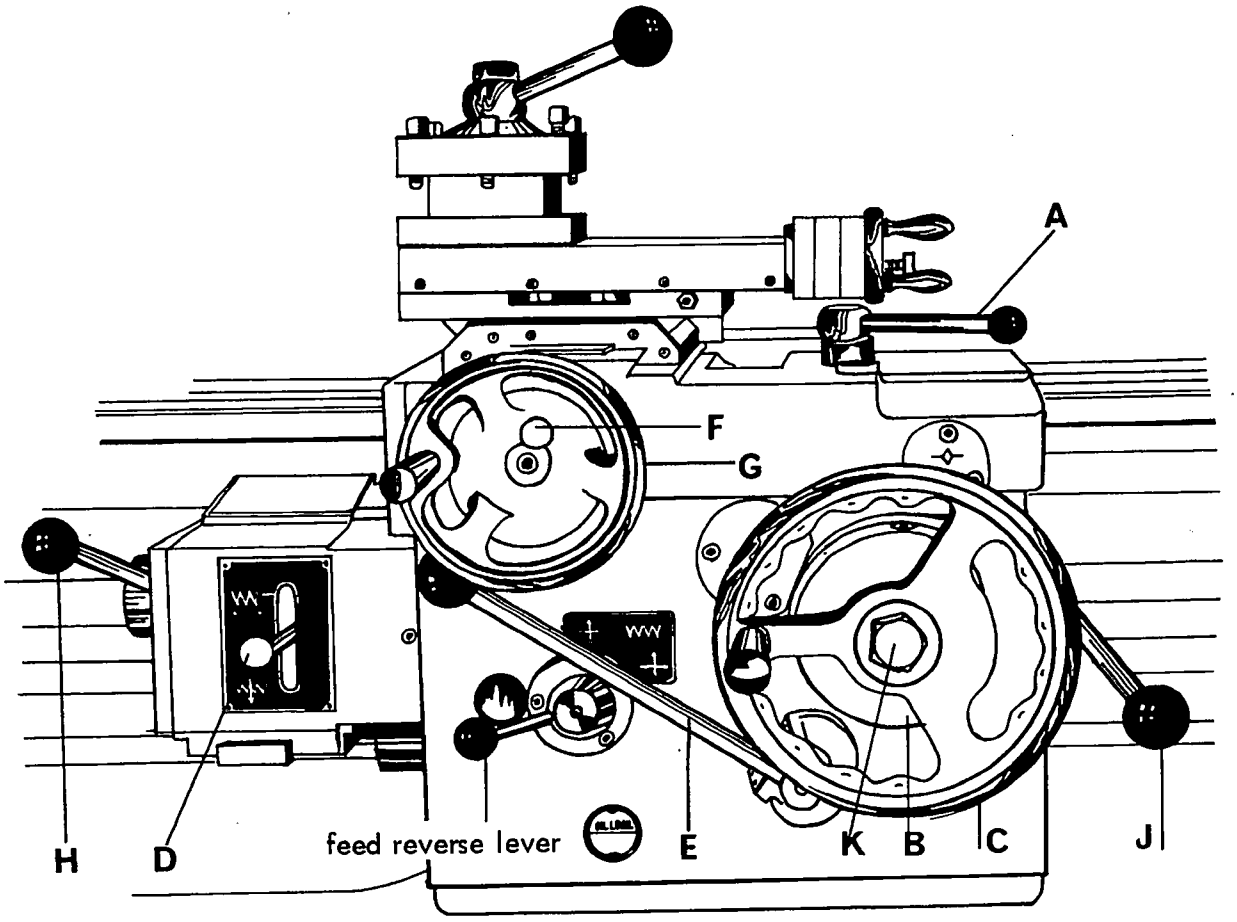
$$\text{Change gears} = \frac{3}{8} = \frac{45}{60} \times \frac{30}{60}$$

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

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

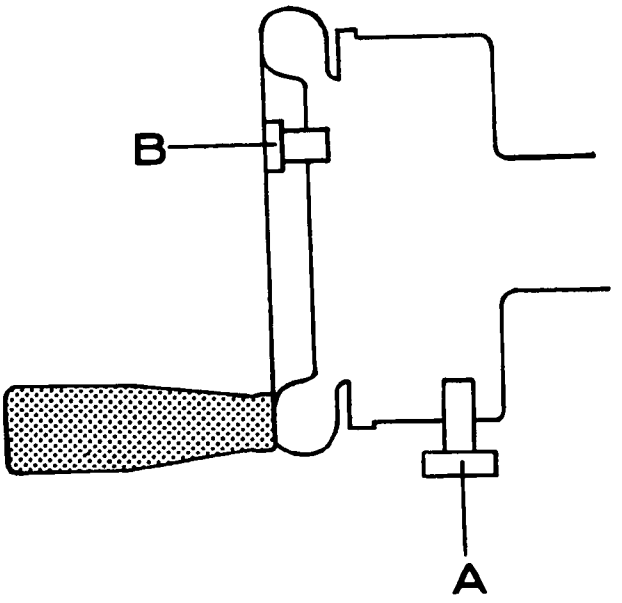
Information on any particular case will be supplied on request by our technical department.

SADDLE AND 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 dis-engaged position.
For length measurement the apron handwheel 'C' is fitted with dual dials 'B' one reading in inches the other in millimetres, they can be set to zero and locked in position by screw 'K'. The inch dial is divided into 64 divisions, each division represents 1/64" of travel, whilst the metric dial is divided into 250 divisions, each one representing 0.1 mm. of travel.

The cross slide is traversed by handwheel 'G' and is also fitted with dual dials one reading inches the other millimetres, they can be set to zero and locked in position by screw 'F'. The inch dial is divided into 200 divisions each division representing .001" movement of tool or .002" alteration to workpiece diameter, whilst the metric dial is divided into 250 divisions each division equals .02mm. movement of tool or 0.04mm alteration to workpiece diameter.
Longitudinal or cross feed selection is made by lever 'D'. 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

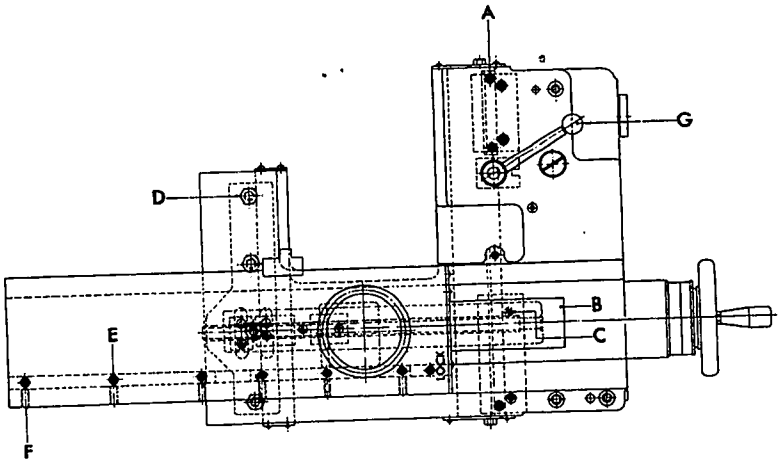


NOTE:-
Approximate movement of extreme stop position = 1.3/4 turns.

TO OPERATE THREADING DEPTH STOP.

1. Turn finished diameter of workpiece in normal way.
2. Put threading tool in position and touch work diameter with tool tip, release screw 'B' set dial to zero and re-lock screw 'B' but DO NOT lock screw 'A'.
3. Retract at least two turns of saddle handwheel and lock screw 'A'.
4. Turn saddle handwheel slowly in a clockwise direction until a stop is felt, at this point the tool will be clear of the workpiece.
5. Un-lock screw 'A', move handwheel till zero reading is obtained at which point of tool should just be touching the workpiece. Re-lock screw 'A'. (A trial pass can now be made, but if not required un-lock screw 'A' and set handwheel to first cut e.g. .010" depth of cut.
6. Re-lock screw 'A' and take first cut.
7. Retract handwheel (max. is $1\frac{3}{4}$ turns) just clear of workpiece and move saddle back to starting point of cut.
8. Wind saddle handwheel in carefully until stop is engaged (which is the previous cut position). For further cuts release screw 'A' and move saddle handwheel required amount for additional cut and lock screw 'A'.
9. Repeat operation 8 until desired depth of cut is obtained and then to disengage stop, un lock screw 'A'.

Work can now commence using set depth. (Care must be taken when contacting stop, as excessive force will cause slip).



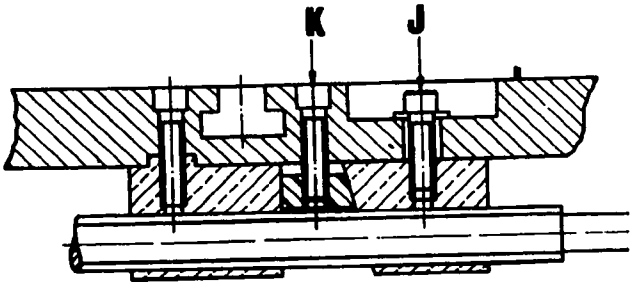
The saddle should not be moved before reading the lubricating instructions, Section 3. Wipers are fitted on the end of the saddle wings and on the front of the cross slide, it is advisable to remove these periodically to clean them. To re-assemble, use a light pressure to force the springing edge of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

Wedge type slips are provided for saddle guide adjustment. To effect this adjustment the slips must be removed and ground on the top face. Removal of the slips can be accomplished without lowering the apron by the withdrawal of four screws 'A'. To gain access to the screws in the saddle well, it is necessary to traverse the cross slide to the rear. Remove wiper plate and wiper from front of cross slide; guard 'B' can then be withdrawn leaving the screws exposed.

Gib plates are fitted under the front and rear bed guideways. These can also be removed for re-scraping without lowering the apron, the front plates by the withdrawal of five screws 'C' and the rear plates by the withdrawal of four screws 'D' situated beneath the rear of the saddle.

A slip is provided for the adjustment of the cross slide guideways. To effect this adjustment release the screws 'E' on the top of the slide, adjust the slip by means of the screws 'F' then re-lock the screws 'E'.

When the cross feed is engaged the saddle should be clamped to the bed by lever 'G'.

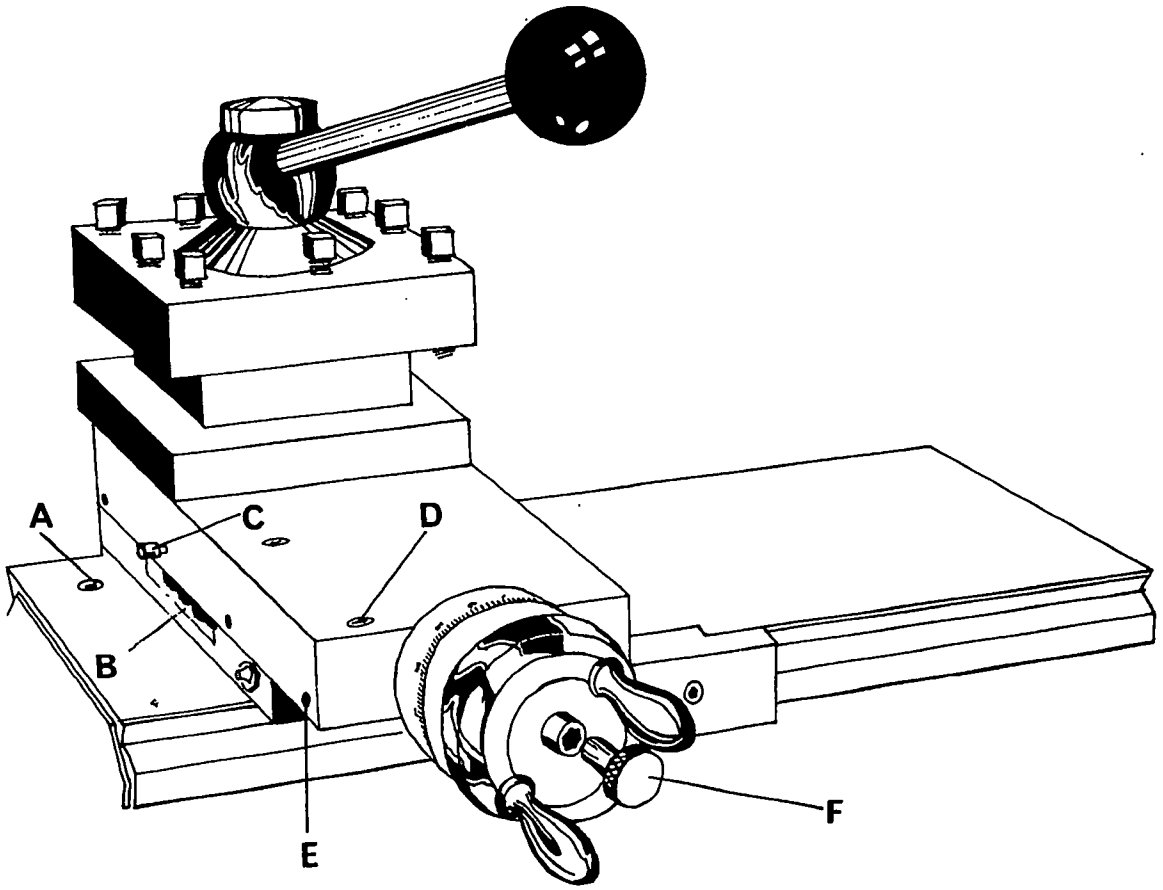


The cross slide nut consists of two parts which can be adjusted relative to one another to minimise backlash. This adjustment being carried out as follows:- Remove the compound rest, release the screw 'J' then re-tighten until the nut will just slide. Tighten the screw 'K' until the cross screw can still be turned without undue force. Subsequently tighten the screw 'J' fully.

When taper turning attachment is fitted, the clearance between the key and key-way of the telescopic joint must be taken into account when checking the backlash.

TOOL SLIDES

8.1 COMPOUND SLIDES

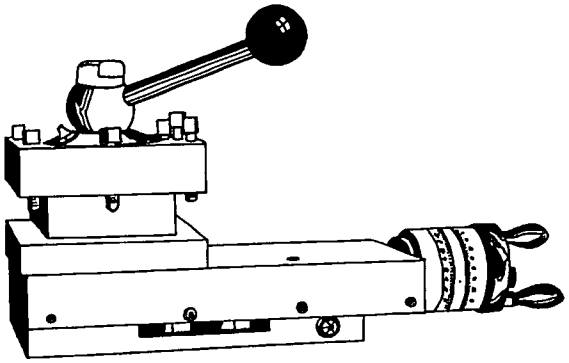


The tool slide can be swivelled to any angle by releasing the four hexagon nuts 'B'. The angle being indicated on the top of the cross slide.
The tool slide can be fitted with dual dials, one reading in inches the other millimetres. They can be set to zero and locked in position by screw 'F'. The inch dial is divided into 200 divisions, each one represents .001" movement of tool or .002" alteration to workpiece diameter, whilst the metric dial is divided into 250 divisions each one represents .02mm. movement of tool or .04 mm. alteration to workpiece diameter.

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 the square headed 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.

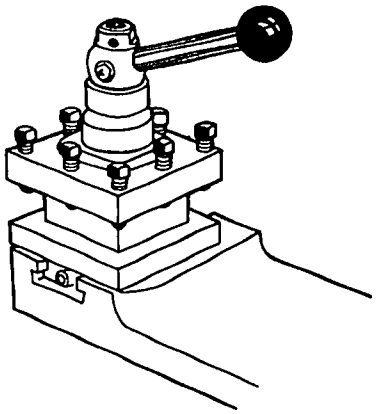
Release the screws 'D' on the top of the slide, adjust the slip be means of the screws 'E' then re-lock the screws 'D'.
Replace the square turret.



SQUARE TURRET.

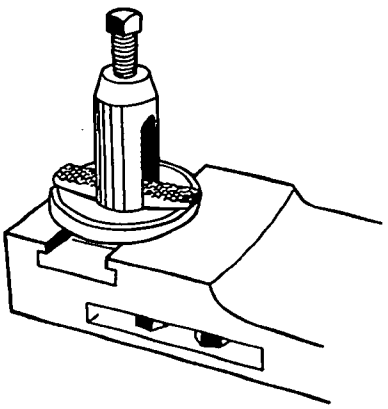
The square turret is designed to operate on four stations, but it can also be locked in intermediate positions if required.
To rotate the turret move the lever in an anti-clockwise direction, this will unlock and lift the turret from its locating notches. It can then be rotated by hand in either direction 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 toolsize and dimensions of the turret are given on the capacity chart section 1.4.



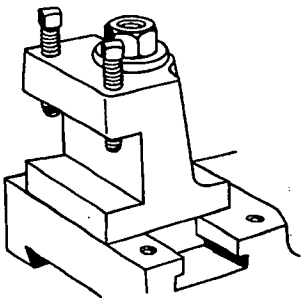
DETACHABLE SQUARE TURRET.

This type of square turret is mounted on a tee slotted tool slide and is designed to operate on four stations but it can also be locked in a further twelve positions if required.
To rotate the turret move the lever in an anti-clockwise direction, this will unlock the turret and release the locating notches. It can then be rotated by hand to the required tool position.
To lock the turret move the lever in a clockwise direction.



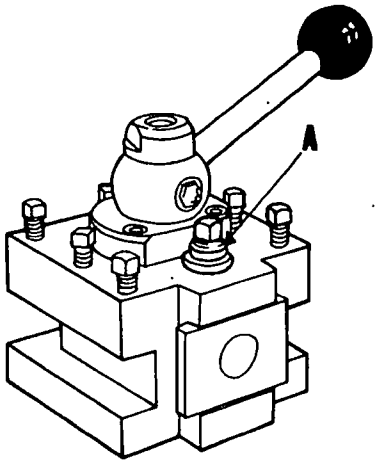
SINGLE TOOL POST.

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.



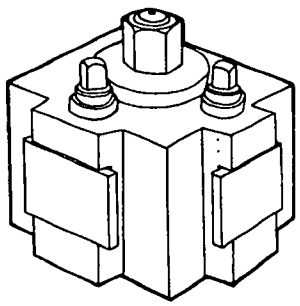
SWIVELLING TOOLHOLDER.

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.



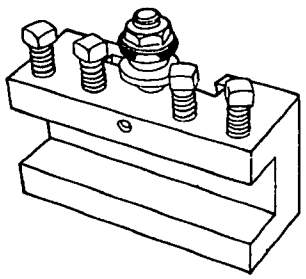
SQUARE TURRET WITH ONE FACE FOR INTERCHANGEABLE TOOLHOLDERS.

This type of square turret gives four stations and provides three normal tool positions with one face to suit interchangeablet 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



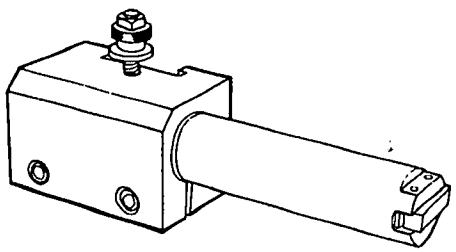
TOOLBLOCK FOR INTERCHANGEABLE TOOLHOLDERS.

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 locknuts.
The toolholder for drilling is positioned by a fixed stop.
Three types of toolholder are available.

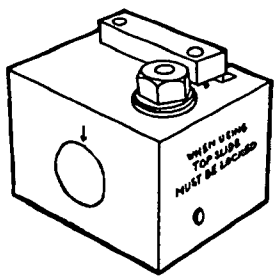


TOOLHOLDER FOR TURNING AND FACING TOOLS.

Tool size 3/4" deep x 3/4" wide x 4.1/2" long.

TOOLHOLDER FOR BORING BARS.

Bore size 1.250" dia.

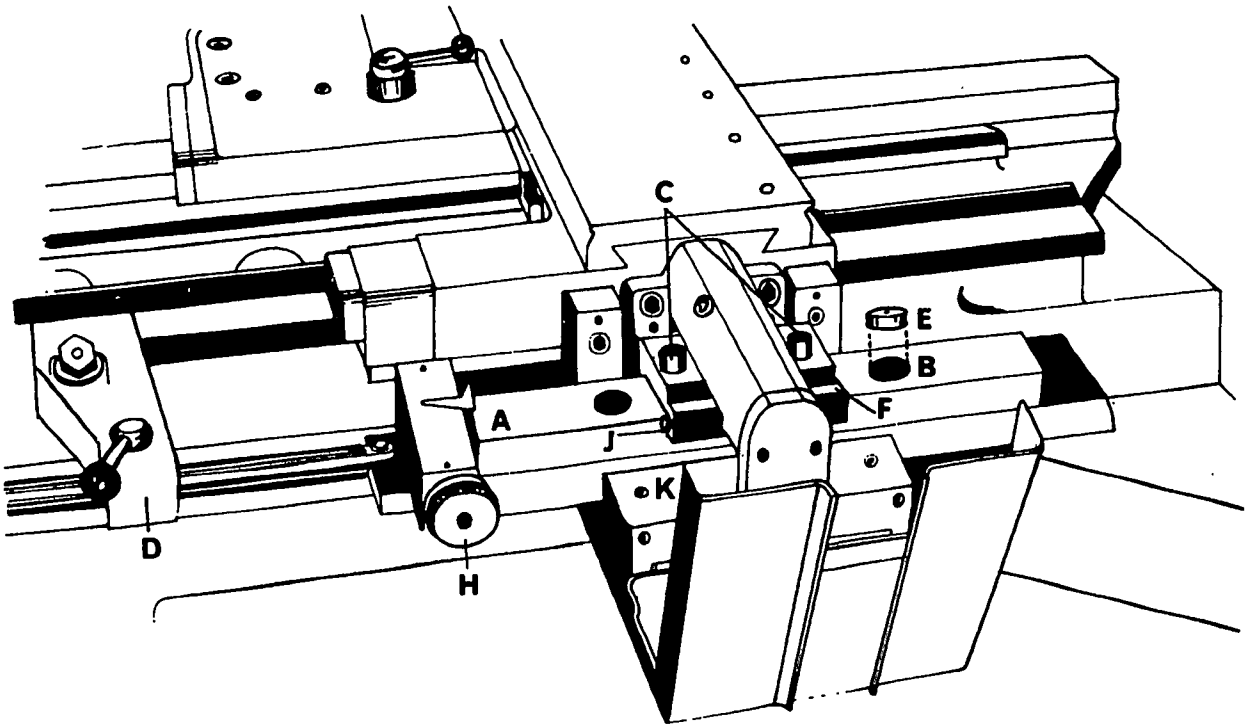


TOOLHOLDER FOR DRILLING.

When using this type the tool slide must be locked. See section 8.1
Bore size 1.250" dia.

AUXILIARY EQUIPMENT

9.1 TAPER TURNING ATTACHMENT

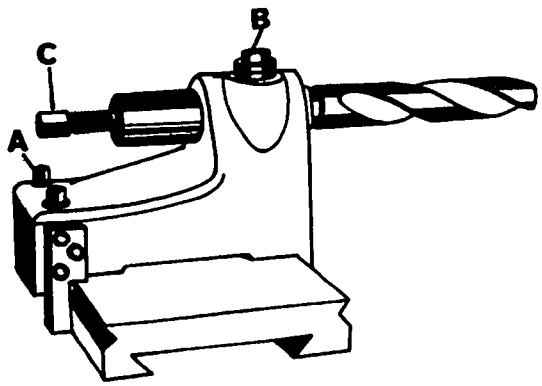


The attachment will turn tapers up to 20° included angle (4 inches per foot on dia.) and up to 12 inches (304 mm.) in length.

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.

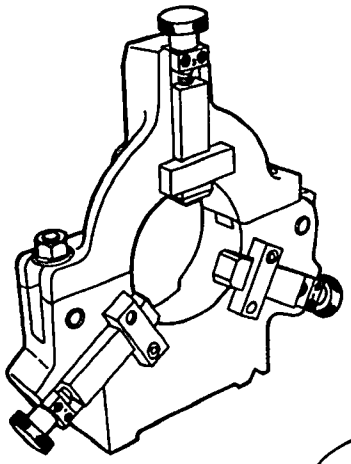
To set for a required taper tighten nut 'D' and position saddle so that guide block 'F' is approximately central on guide bar 'A'. Remove two caps 'E' and release nuts 'B' at each end of the guide bar. Also release cap screws 'C'. Adjust guide bar to correct taper by thimble 'H'. It is important to note 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 screw '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.

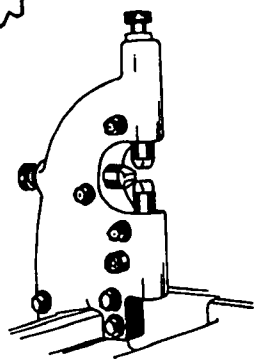
Any wear on the slide bars can be taken up by the adjustment of the slips 'J' and 'K'. When taper turning it is advisable to keep the backlash in the saddle screw nuts to a minimum.
For adjustment instructions see Section 7.2



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 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'.



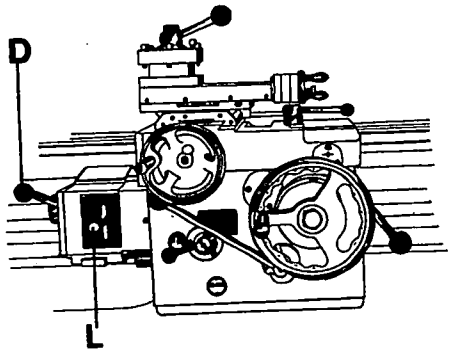


STATIONARY STEADY

The stationary steady is of rigid design, having a maximum capacity of 5" (127 mm) 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" (178 mm) bar diameter is available if specially ordered.

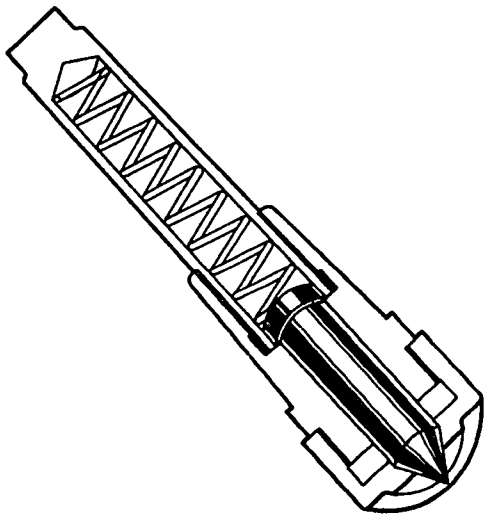
TRAVELLING STEADY.

The travelling steady is of rigid design, having a maximum capacity of 3" (76 mm) bar diameter. The steady has 3 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.

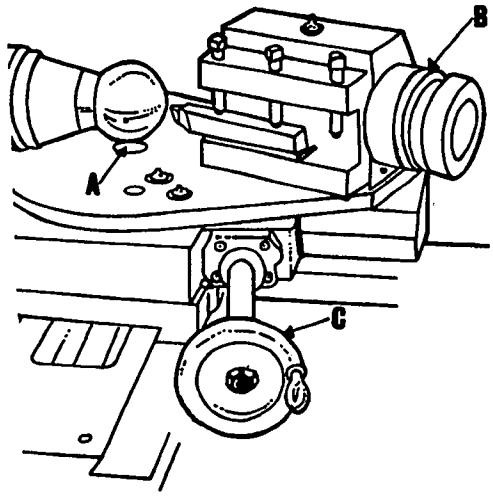


SPRING LOADED HEADSTOCK CENTRE.

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, remove 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" diameter measuring rod; supplied with the attachment. The radius can then be set by using the measuring blocks and the dial 'B'. The dial is graduated 200 division each division representing .001" movement of the tool, or, with metric screw, 100 divisions each div = .05 mm.
The radius being produced by turning the hand-wheel 'C'. The maximum ball radius is 2" (50 mm).

FAULT FINDING AND PRACTICAL INFORMATION

INACCURATE WORK

CAUSE.	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 (Section 7.2)
3. Excessive play in cross slide and compound slides.	3. Adjust slips on cross slide (Section 7.2) and on compound slide (Section 8.1)
4. Tailstock spindle out of line with headstock spindle.	4. Check and adjust (Section 4.7)
5. Foreign matter preventing correct location of chucks, faceplate and centres.	5. Remove and clean requisite parts.
6. Centres running out.	6. Check centres for bruising. For built in roller bearing centre follow instructions on tailstock. (Section 4.7l)
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 pre-load (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 and adjust for correct backlash (Section 6.1)
5. Bent feed shaft or cross slide screw giving regular pitch markings.	5. Remove and straighten.
6. Levelling screws not correctly set and locked.	6. Re-level machine (Section 2.5)
7. Inefficient clamping of work piece.	7. Check clamping on chucks and 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 and regrind accordingly.
10. Tool not set to correct centre height.	10. Re-set correctly. Any packing used should be parallel and flat.
11. Tool inadequately clamped.	11. Re-clamp.
12. Unsuitable feeds and speeds.	12. Try adjacent feeds and 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 spindle bearing sump causes roughness in spindle bearings.	15. Change oil and clean magnetic filters (Section 3.11)

WEIGHT OF WORK PIECE CAPACITY.

Maximum weight between solid centres 550 lbs. 250 kgs.

Maximum weight for built-revolving centre 364 lbs. 165 kgs.

MAXIMUM SPEEDS OF CHUCKS AND FACEPLATE.

DIAMETER OF STEEL CHUCK.		MAXIMUM SPEED.
8¼" (209 mm)	3 jaw	2240 R.P.M.
10" & 12" (254 & 305 mm)	3 jaw	1600 R.P.M.
10" (254 mm)	4 jaw	1600 R.P.M.

DIAMETER OF C.1 FACEPLATE.	MAXIMUM SPEED.
12" (305 mm)	690 R.P.M.
16" (406 mm)	560 R.P.M.
22" (559 mm)	400 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 960 R.P.M. Max. feed is .020 in (0.50 mm)
At 1120 R.P.M. Max. feed is .016 in.(0.40 mm)
At 1600 R.P.M. Max. feed is .0125 in (0.31 mm)
At 2240 R.P.M. Max. feed is .010 in (0.25 mm)

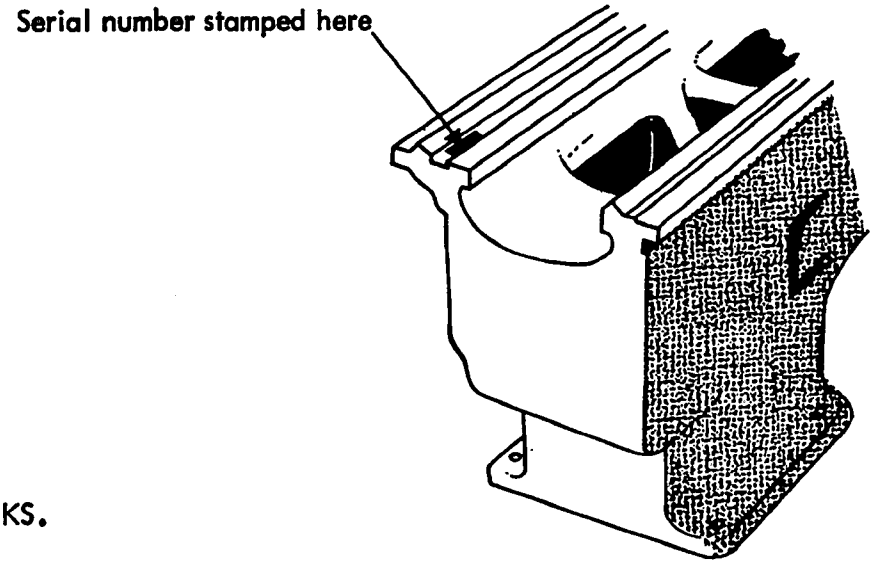
SPARE PARTS LIST AND ASSEMBLY DETAILS

SPARE PARTS

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

The following spare parts lists shows 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.



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. S12½ Item 11. Sheet No. 2559. Lathe No. 38816. Type 1307.

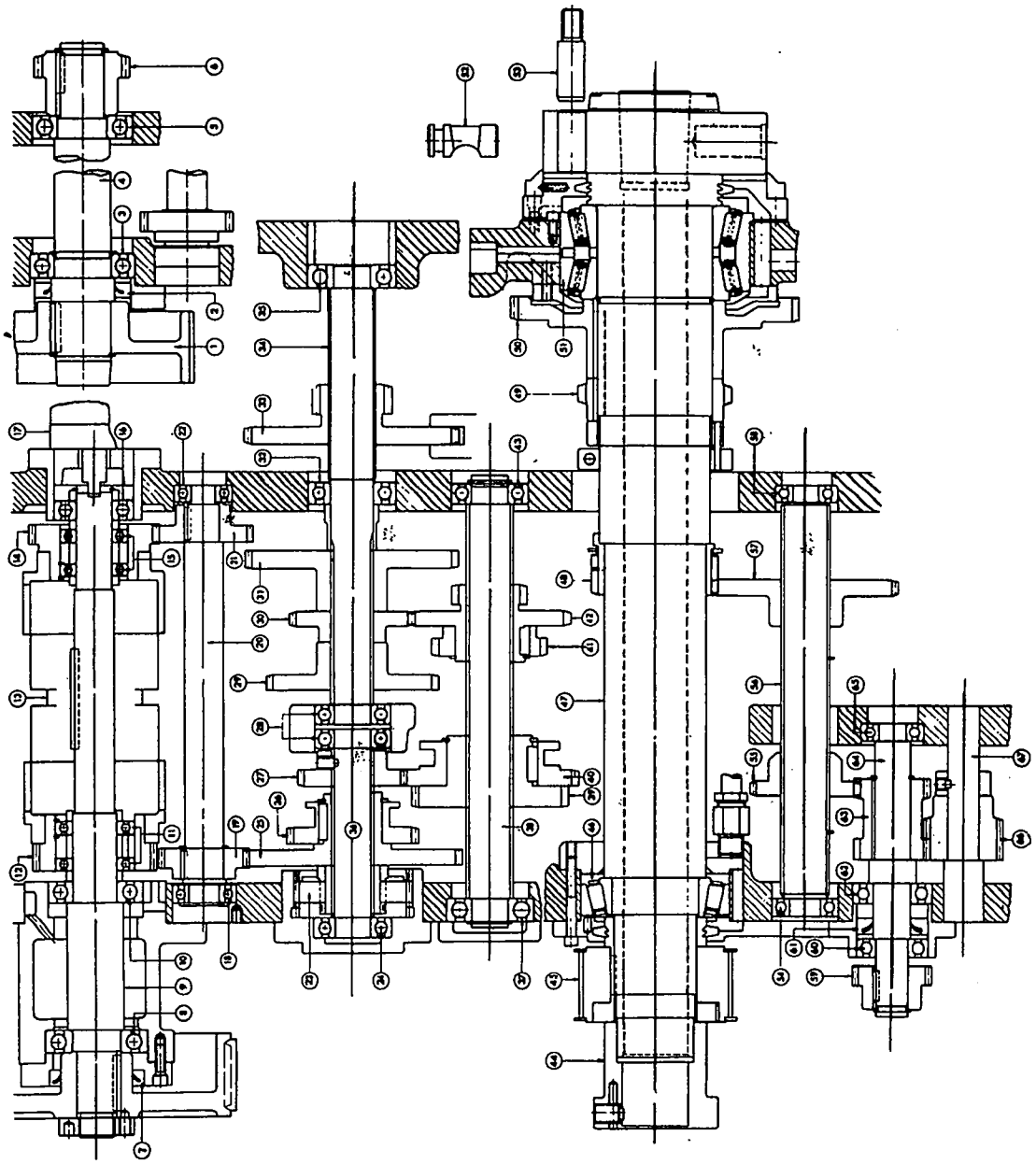
It will be appreciated that all parts of the lathe cannot be shown. Therefore where such a part is required it is advisable to relate this to one already listed.

EXAMPLE:- Gear Shifter for 18/54T Double Gear Item No. 33. Sheet No. 2559
Lathe No. 38816. Type 1307.

11.12 SPARE PARTS LIST FOR HEADSTOCK continued

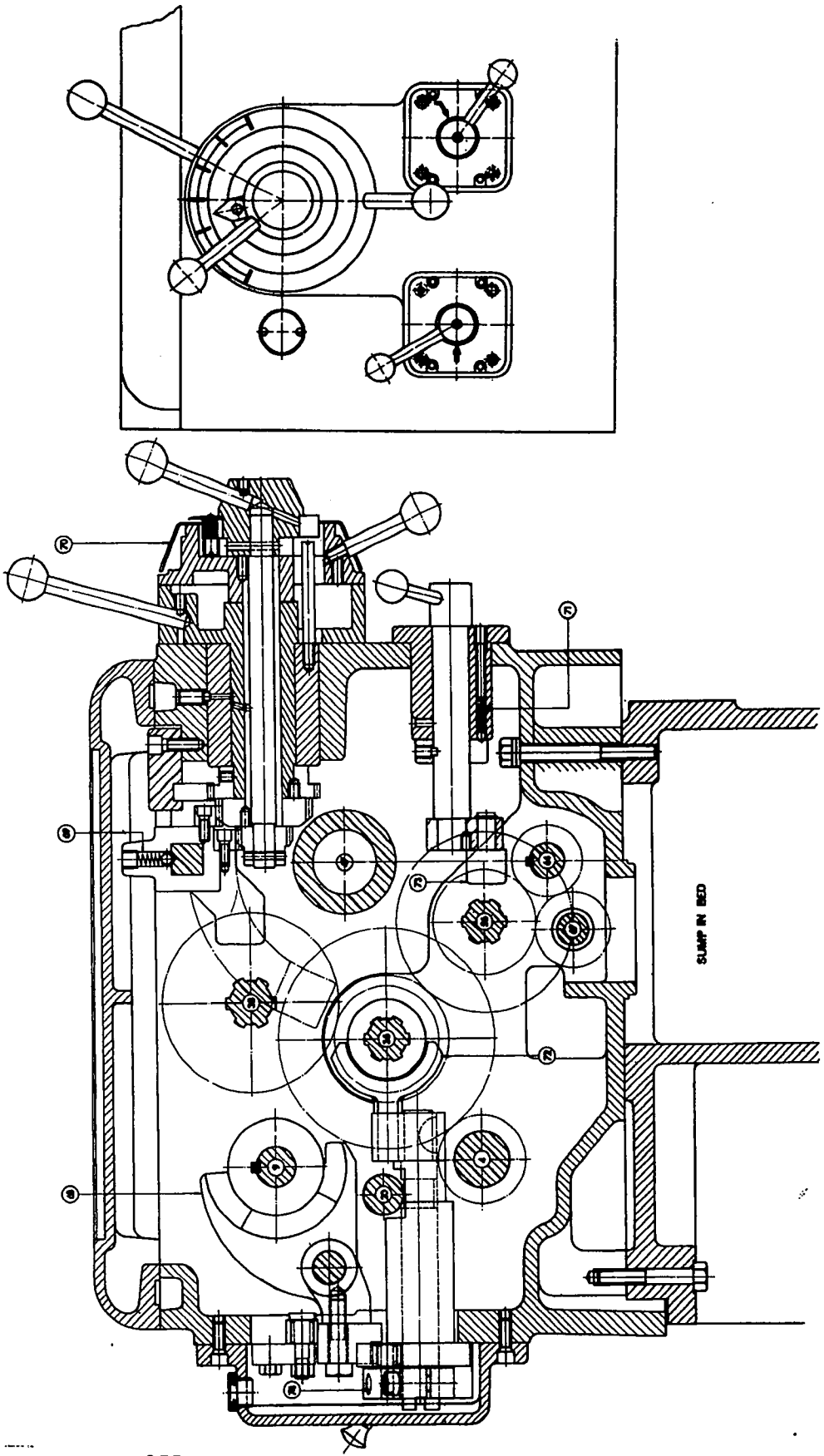
1. Belt drive shaft pulley.
2. Oilseal 300,200,50.
3. Hoff 145 or R. & M. LJ45.
4. Belt drive shaft.
5. Hoff 140 or R.& M.LJ40.
6. 22T 8DP Gear on belt drive shaft.
7. Oilseal 300,250,50.
8. Hoff.LS 13 or R. & M. LJ1$\frac{1}{2}$.
9. Pulley Shaft.
10. Hoff.L.S.12$\frac{1}{2}$ or R. & M. LJ 1.3/8.
11. Hoff.S.12$\frac{1}{2}$ or R. & M. KLNJ. 1.3/8
12. 37T Gear on L.H. clutch driver.
13. Matrix ZC.40 Wet type duplex clutch.
14. 39T Gear on R.H. clutch driver.
15. Hoff. S11 or R & M. KLNJ 1.1/8.
16. Hoff. LS.11 or R.& M.LJ1.1/8.
17. Geared oil pump.
18. Hoff. 125 or R. & M. LJ25.
19. 27T Gear on reverse shaft.
20. Reverse shaft.
21. 30T Gear on reverse shaft.
22. Hoff. 120 or R. & M. LJ20.
23. Croft No. 2 plates 7 outer 7 inner. and backplate.
24. Hoff. LS.11 or R. & M. LJ 1.1/8.
25. 68T Gear on Brake shaft.
26. 40T Gear on brake shaft.
27. 33T Gear on brake shaft.
28. Hoff. 130 or R. & M. LJ30.
29. 53T Gear on 4th shaft.
30. 38T Gear on 4th shaft.
31. 66T Gear on 4th shaft.
32. Hoff. 135 or R. & M. LJ35.
33. 18/54T Double gear on 4th shaft.
34. 4th shaft.
35. Hoff. 330 or R. & M. MJ30.
36. Brake shaft.
37. Hoff. 330 or R. & M. MJ30.
38. 3rd shaft.
39. 48T Gear on 3rd shaft.
40. 55T Gear on 3rd shaft.
41. 35T Gear on 3rd shaft.
42. 22/50T Double gear on 3rd shaft.
43. Hoff. 130 or R. & M. LJ30.
44. Work steady.
45. Spindle Pulley.
46. Gamet rear bearing 130069X-D130120.
47. Spindle.
48. 38T Gear on spindle.
49. 36T Gear on spindle.
50. 72T Gear on spindle.
51. Gamet front bearing. 131092X-131152 x H.E.
52. Spindle nose cam.
53. Studs for chucks etc..
54. Hoff. 125 or R. & M. LJ25.
55. 33T Gear on 6th shaft.
56. 6th shaft.
57. 57T Gear on 6th shaft.
58. Hoff. 120 or R. & M. LJ.20.
59. Feed Gear.
60. Hoff. LS.10 or R. & M. LJ1.
61. Oilseal 225, 118, 50.
62. Hoff. 130 or R. & M. LJ30.
63. 22T Double gear.
64. Feed drive shaft.
65. Hoff. LS9 or R. & M. LJ7/8.
66. 23T Reverse gear.
67. Feed reverse shaft.
68. Clutch operating fork.
69. Gear shifter spring.
70. Speed indicator plate.
71. Spring for operating die.
72. Brake operating fork.
73. Operating die.
74. Brake adjustment spring.

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 CAM 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.

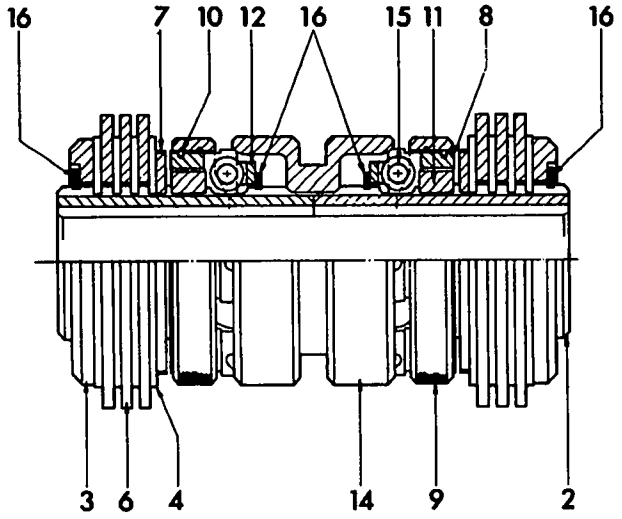
ALL FIXING SCREWS ARE STD. WHITWORTH OR B.S.F. THREAD

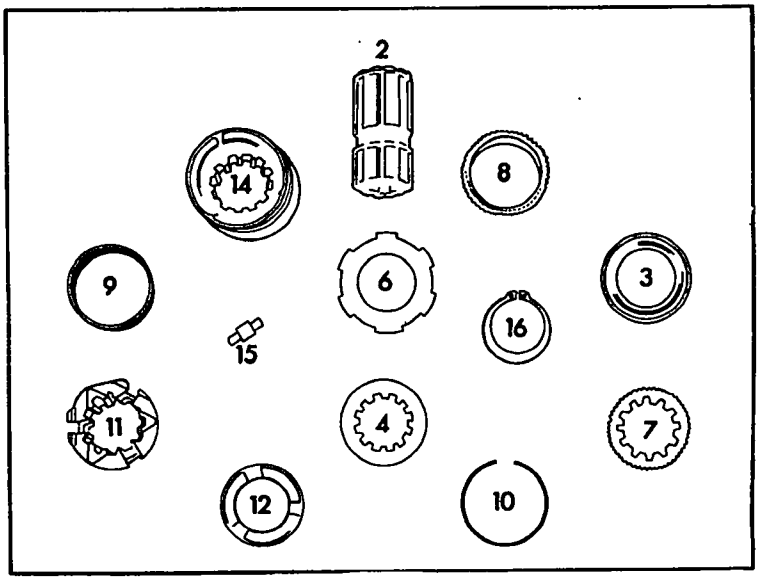
11.13 ASSEMBLY & SPARE PARTS LIST FOR MATRIX CLUTCH

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. Circli p.

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 illustrations onsheet No. 2560 Section 11.13)

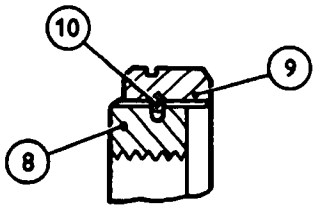
Disengage the clutch, slide collar 14 off the hub 2 and place each half of the clutch on end with friction plates downwards.
Remove the circlip 16.
Slide off the thrust washer 12.
Slide off the track ring 11 together with bearing assemblies 15 and adjusting mechanism, 8, 9 and 10.
Slide off the lock 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:-

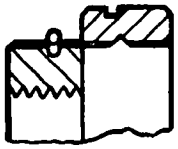
Remove bearing assemblies 15.
Unscrew adjusting mechanism 8, 9 and 10 from track ring 11.
Slide locking ring off adjusting nut 8 and remove the spring 10 from the groove.

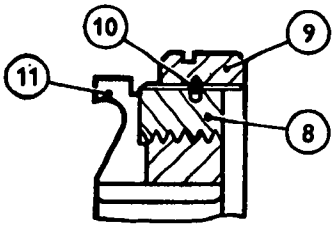
Clean or renew parts as necessary.

11.132 ASSEMBLY OF MATRIX CLUTCH

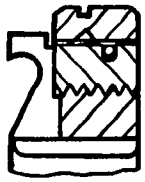


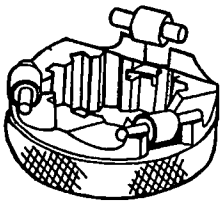
(a)

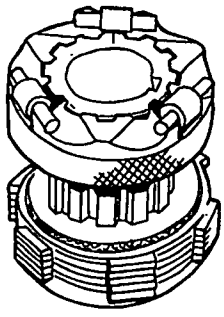

(b)



(c)


(d)


(e)


(f)

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 sub assembly 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).

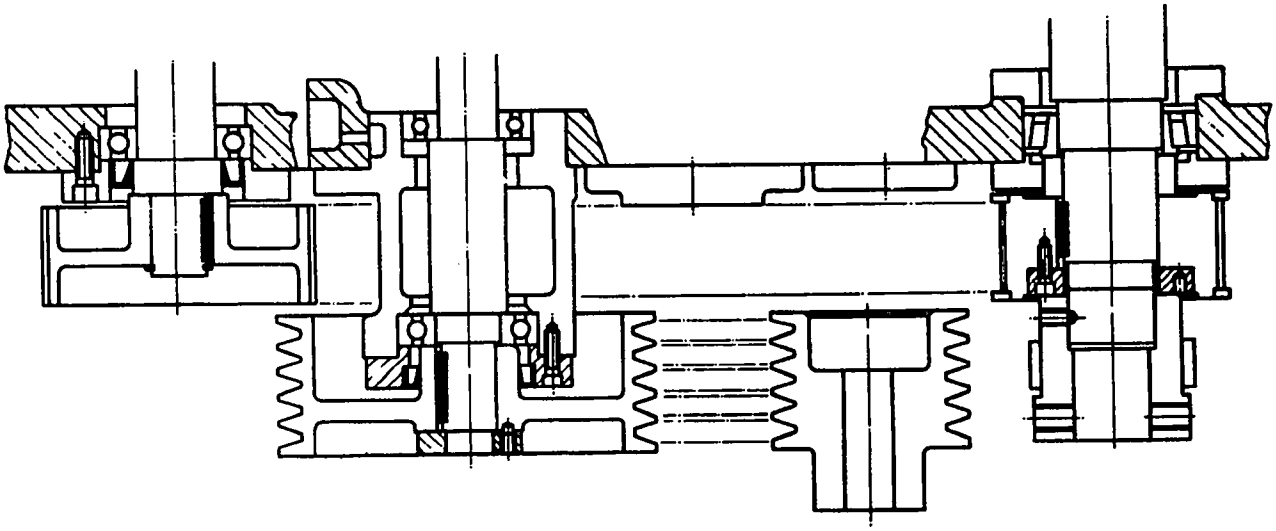
4. Locate the circlip 16 on hub 2 in the groove near to the end face. Place the hub on the bench, circlip end down and assemble the other components on the hub in the following order:-
   (a) End flange 3 recess face down.
   (b) Steel counterplate 4 and friction plates 6 alternately, finishing with a steel plate.
   (c) Lock plate 7.

5. Place the track ring sub assembly 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. 2525 (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.



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.

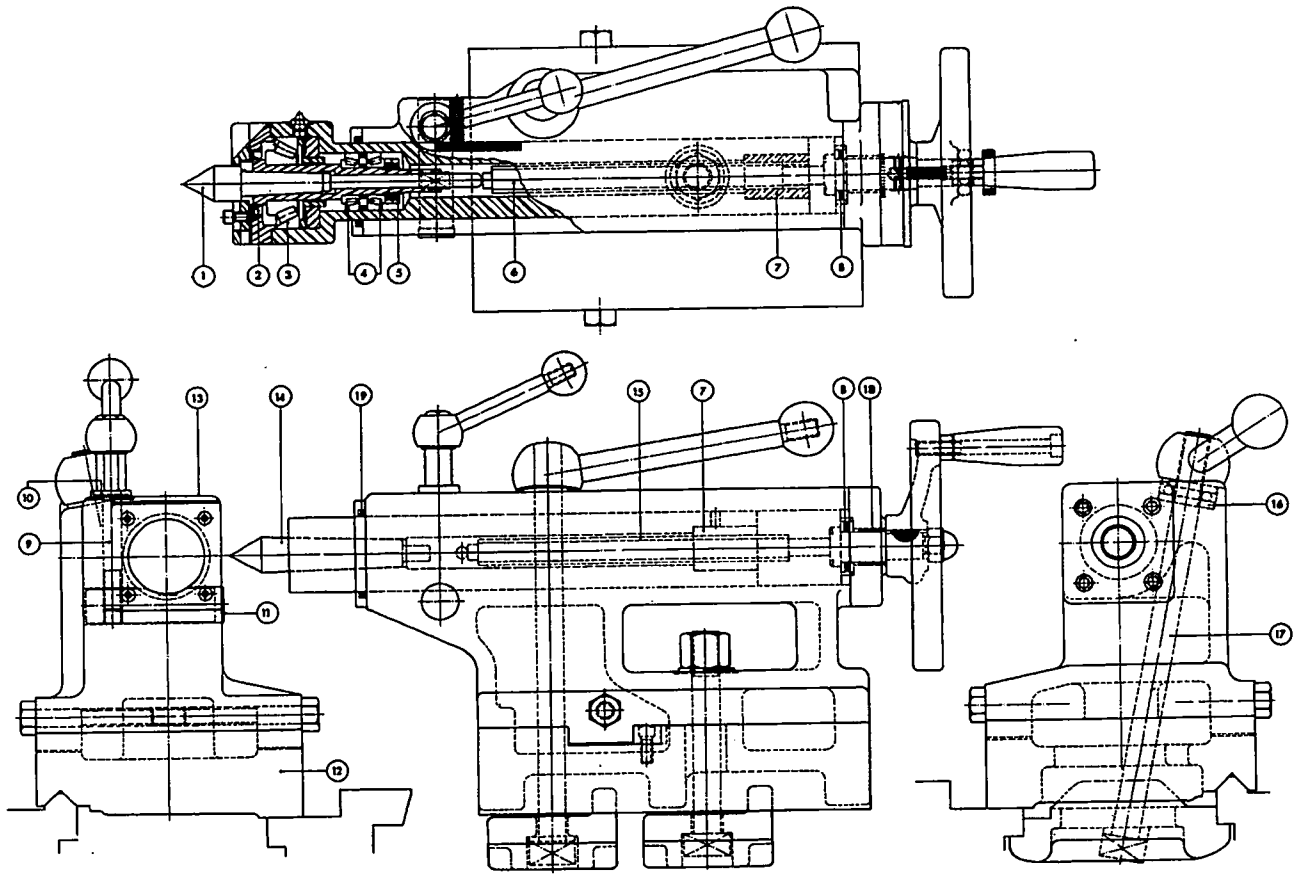
The work steady can be taken off the spindle end after easing back the allen grub screw.

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.

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

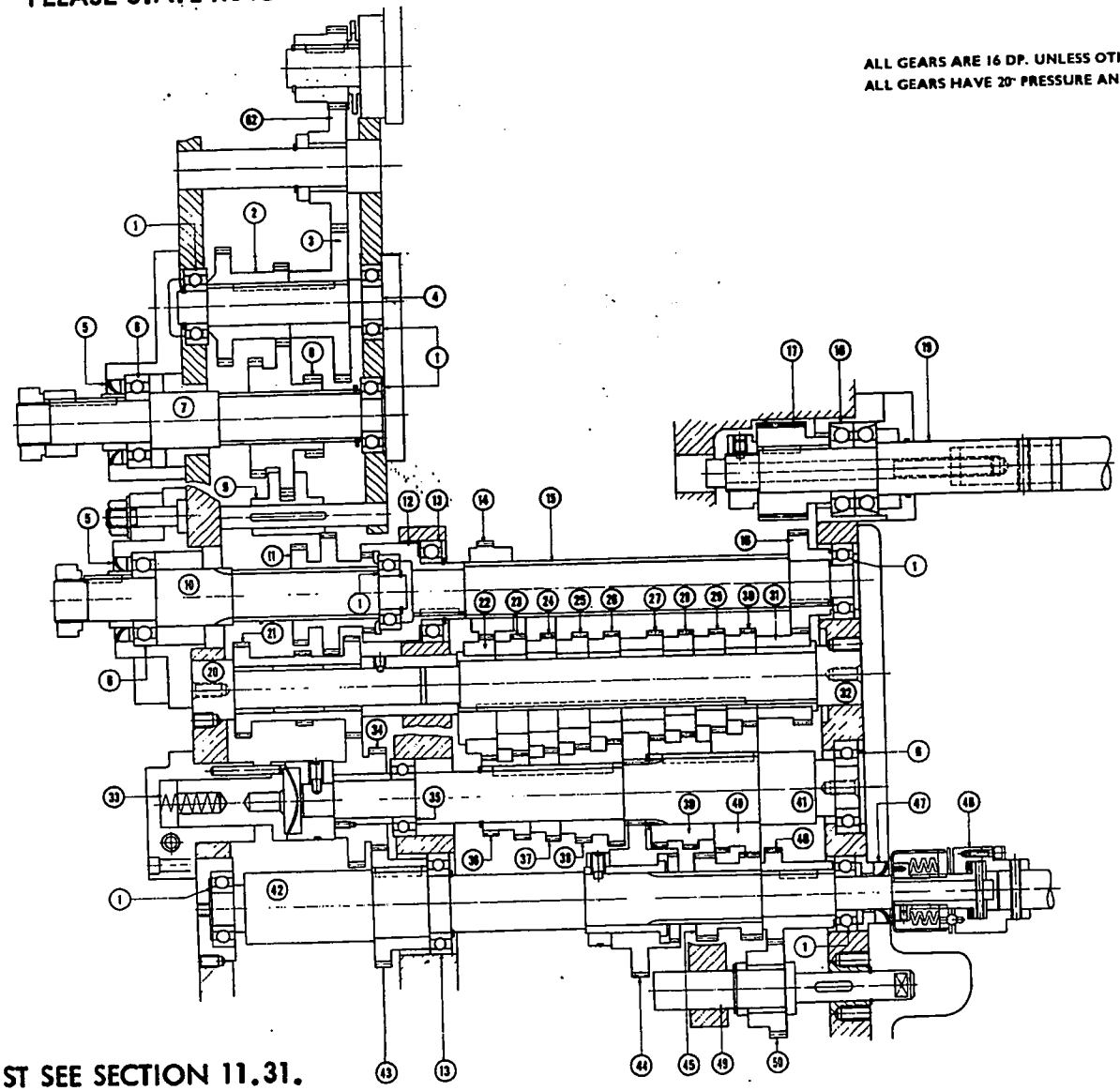


ALL FIXING SCREWS ARE STD. WHITWORTH OR B.S.F. THREAD.

1. Centre for built-in revolving centre.
2. Gitseal 187 125 31.
3. Timken brg. 23100 – 23256 prec. 3.
4. Timken brg. 05075 – 05185.
5. Locknuts.
6. Tailstock screw for dial.
7. Tailstock screw nut.
8. Torrington races T.R.D.1423 – Brg. N.T.A. 1423.
9. Locking screw for tailstock spindle.
10. Torrington races T.R.A. 1018. Brgs.N.T.A.1018.
11. Lock pad.
12. Tailstock shoe.
13. Tailstock body.
14. Standard centre.
15. Standard tailstock screw.
16. Thrust race hoff. W.¾.
17. Quick lockbolt.

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

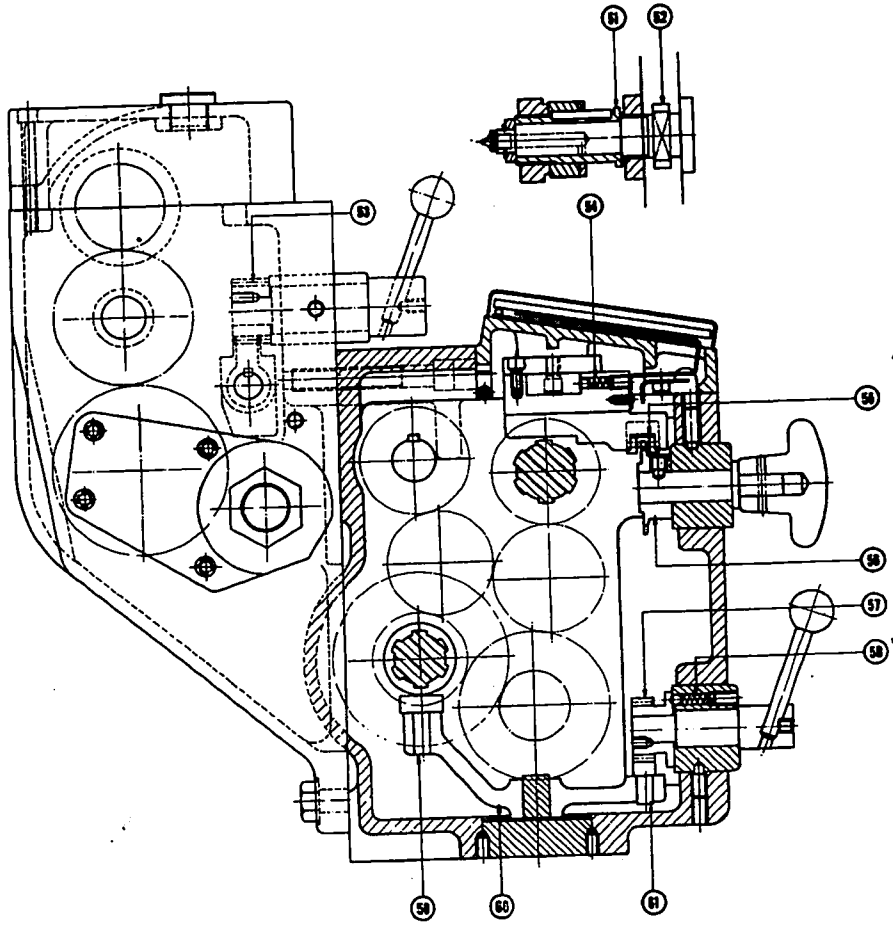
ALL GEARS ARE 16 DP. UNLESS OTHERWISE SHOWN.
ALL GEARS HAVE 20° PRESSURE ANGLE.



FOR PARTS LIST SEE SECTION 11.31.

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

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



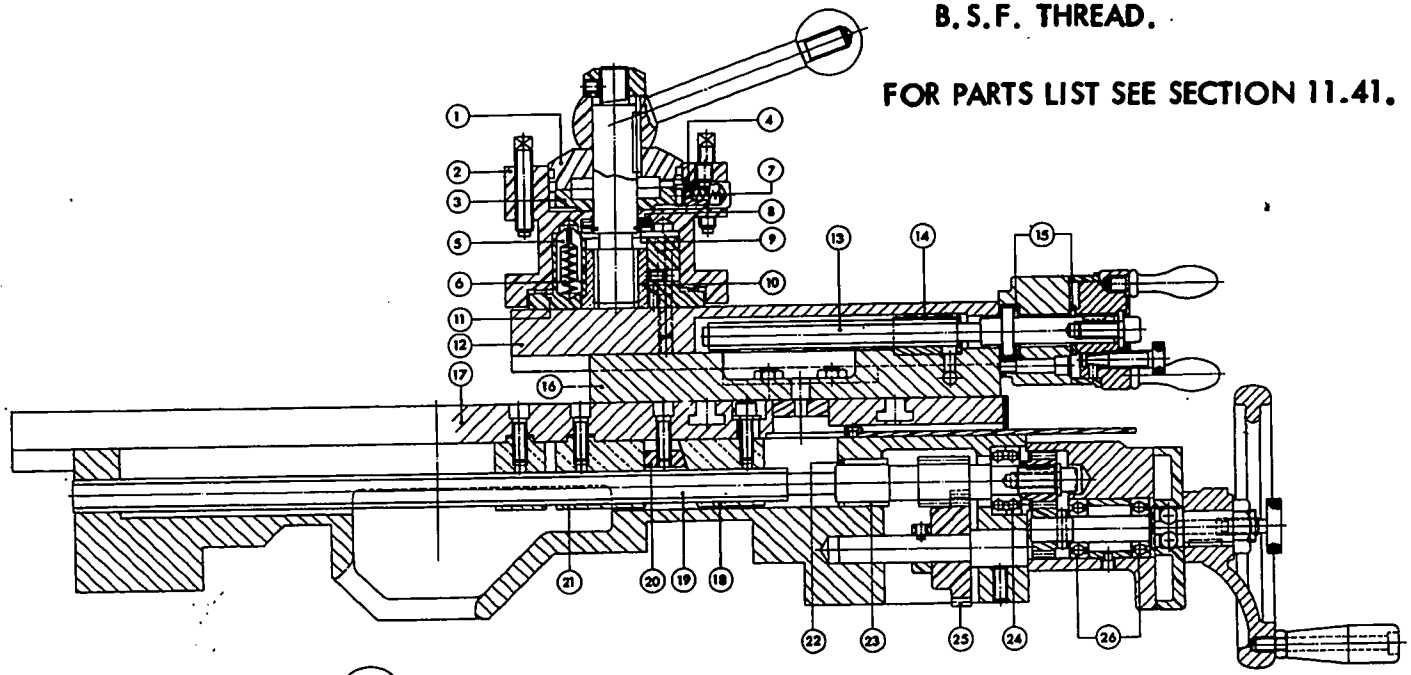
1. Hoff. L.S.9. – R & M. L.J.7/8.
2. 20/30T. 10 D.P. Gear on 1st Shaft in End G/Box.
3. 40T. 10 D.P. Gear on 1 st shaft in End G/Box.
4. 1 st Shaft in End G/Box.
5. Gitseal 22515037.
6. Hoff. L.S.11 – R. & M. L.J. 1.1/8
7. 2nd shaft in End G/Box.
8. 20, 30 & 40T 10DP Gear on 2nd shaft in End G/Box.
9. Gear shifter for Treble Gear on 2nd shaft in End G/Box.
10. 1st shaft.
11. 32, 42/41 & 50T Gear on 1 st shaft.
12. 32T Internal Gear on 1st shaft.
13. Hoff XLS 1½ – R. & M. XLJ 1½
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. LJT 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. Gitseal 16208737.
48. "Auto-Gard" slip coupling.
49. Slider shaft.
50. Special 40T Gear on slider shaft.
51. Change gear sleeve.
52. Change gear stud.
53. 16T 12-DP Operating Pinion.
54. ¼" Ball and spring.
55. Renold ½" Pitch chain 41 links closed ends No. 111044.
56. ½" pitch feed selector sprocket.
57. 16T 12 DP Operating Pinion.
58. ¼" Ball and spring.
59. Operating Die for 4th shaft.
60. Swinging arm.
61. Toothed Operating Die.
62. Inter. Gear.

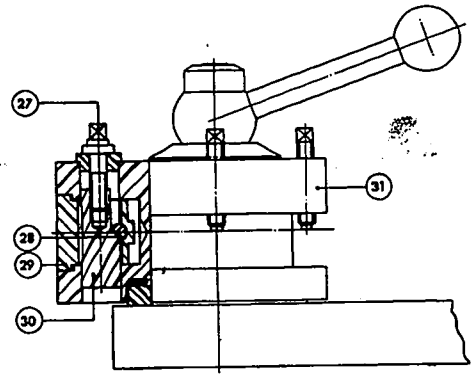
ALL FIXING SCREWS ARE STD. WHITWORTH OR B.S.F. THREAD

PLEASE STATE MACHINE SERIAL NUMBER, SHEET NUMBER AND ITEM NUMBER

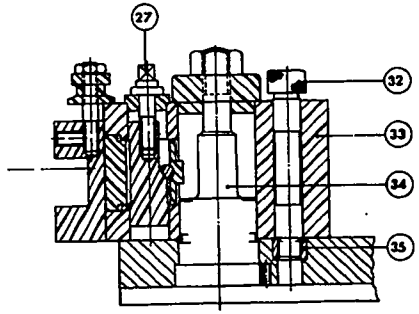
ALL FIXING SCREWS ARE STD. WHITWORTH B.S.F. THREAD.

FOR PARTS LIST SEE SECTION 11.41.

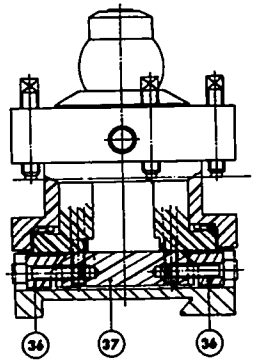




SQUARE TURRET WITH ONE FACE FOR INTERCHANGEABLE TOOLHOLDERS.



TOOL BLOCK FOR INTERCHANGEABLE TOOLHOLDERS.

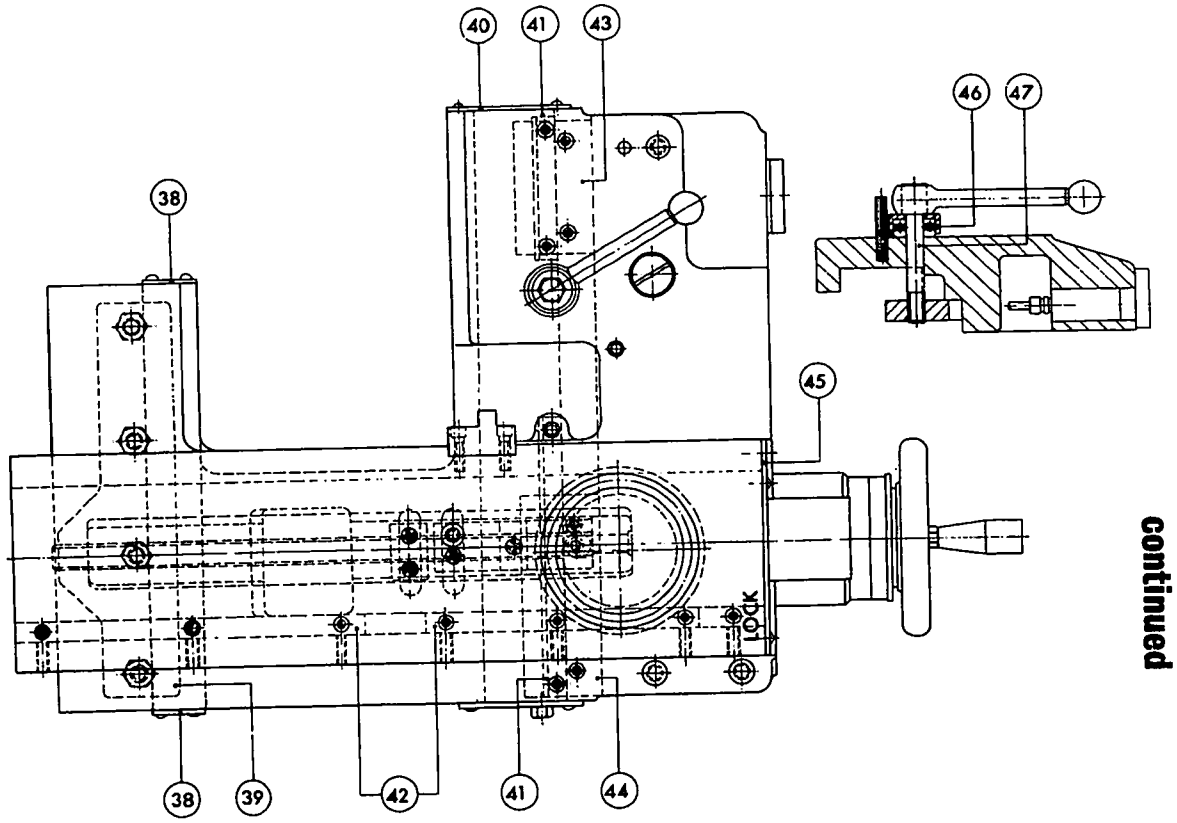


DETACHABLE SQUARE TURRET.

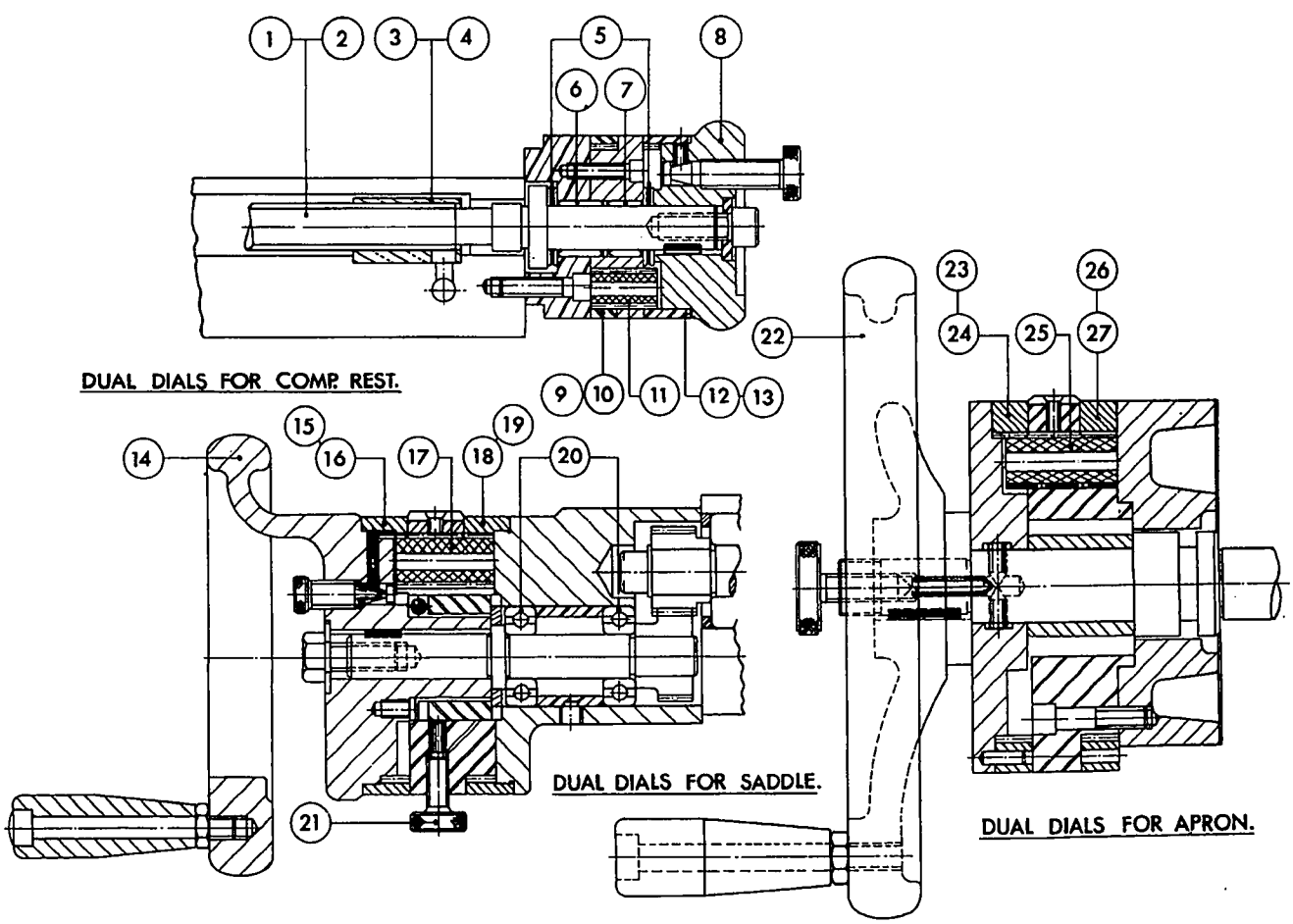
PLEASE STATE MACHINE SERIAL NUMBER, SHEET NUMBER AND ITEM NUMBER.

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

1. Dog Plate.
2. Square Turret.
3. Ratchet dog plate.
4. Ratchet plunger.
5. Locating plunger.
6. Spring No. 124.
7. Ratchet plunger spring No. 93.
8. Torrington Bearing NTA.1625 & TRB.1625.
9. Anderton's circlip No. 1400 x 1".
10. Nut for Turret lockscrew.
11. Turret lockscrew.
12. Turret slide.
13. Turret slide screw.
14. Turret slide screw nut.
15. Torrington Bearings NTA.1018 & TRA.1018.
16. Swivel slide.
17. Cross slide.
18. Cross slide screw adjusting nut.
19. Cross slide screw.
20. Cross slide screw nut adjusting slip.
21. Cross slide screw nut.
22. INA Seal G.S.C.14.
23. Compo Bush SN.010 x 1".
24. R. & M. Bearing LDJT.17.
25. Saddle Intermediate gear.
26. R. & M. Bearings LJ.15.
27. Screw for Lockpad.
28. Pin for locking pad.
29. Clamping plate.
30. Locking pad.
31. Turret type interchangeable toolholder block.
32. Locating plunger.
33. Toolholder block.
34. Locking screw.
35. Locating bush.
36. Clamping pieces.
37. Locating tongue.
38. Rear bed wiper.
39. Rear gib plate.
40. Front bed wipers.
41. Slip for bed shear.
42. Slip for cross slide.
43. R.H. Front Gib Plate.
44. L.H. Front Gib Plate.
45. Cross slide wiper.
46. Bearing Hoff. W½ or R. & M. LT. 1/2.
47. Locking bolt.

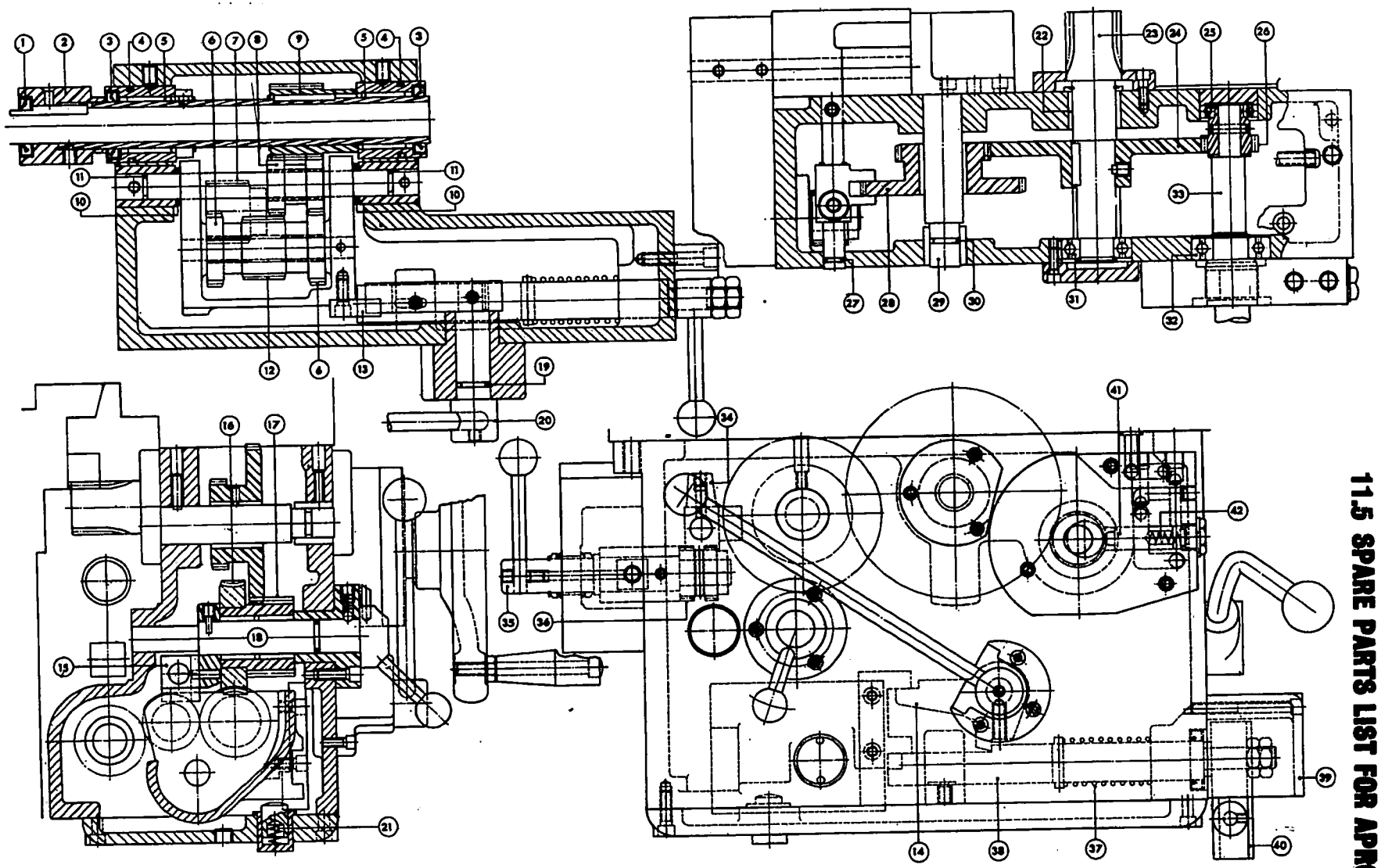


11.42 SPARE PARTS LIST FOR DUAL DIALS



1. English Turret Slide Screw.
2. Metric Turret Slide screw.
3. English Compound rest nut.
4. Metric compound rest nut.
5. Torrington Bearing NTA 1018 and races TRA.1018.
6. Glacier Bush 10 DU 10
7. Glacier Bush 10 DU 8.
8. Top slide handwheel.
9. Metric dial gearwheel for English screw.
10. English dial gearwheel for Metric screw.
11. 28T Pinion.
12. English dial gearwheel for English screw.
13. Metric dial gearwheel for metric screw.
14. Saddle handwheel.
15. Inch dial for English saddle screw.
16. Metric dial for metric saddle screw.
17. 26T Pinion.
18. Metric dial for English saddle screw.
19. English dial for metric saddle screw.
20. R. & M. Bearings. LJ.15.
21. Screw for Threading depth stop. Stock No. 538.
22. Apron handwheel.
23. English dial gearwheel for English rack.
24. Metric dial gearwheel for metric rack.
25. 20T Pinion.
26. Metric dial gearwheel for English rack.
27. English dial gearwheel for metric rack.

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

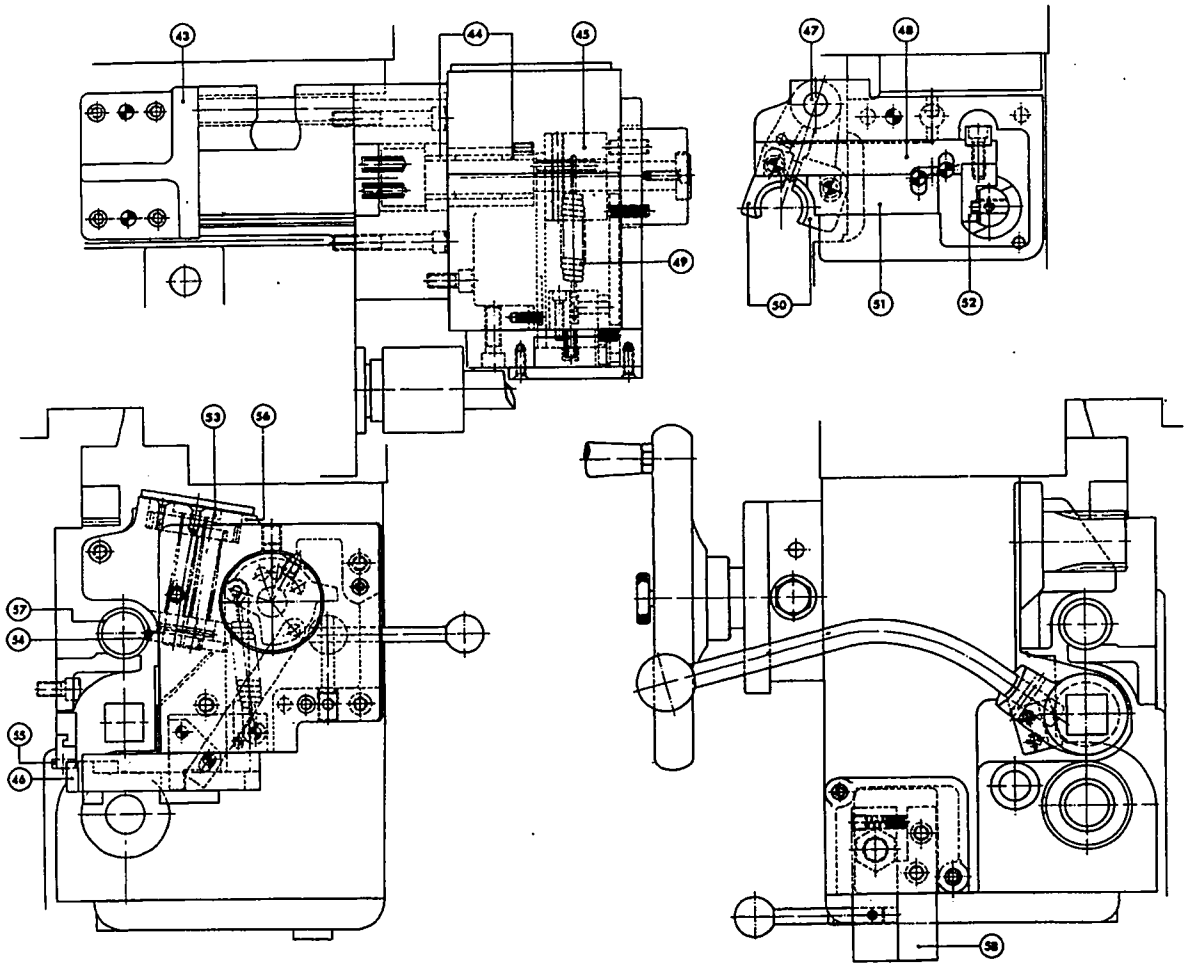


ALL FIXING SCREWS ARE STD. WHITWORTH OR B.S.F. THREAD.

11-50 SPARE PARTS LIST FOR APRON continued

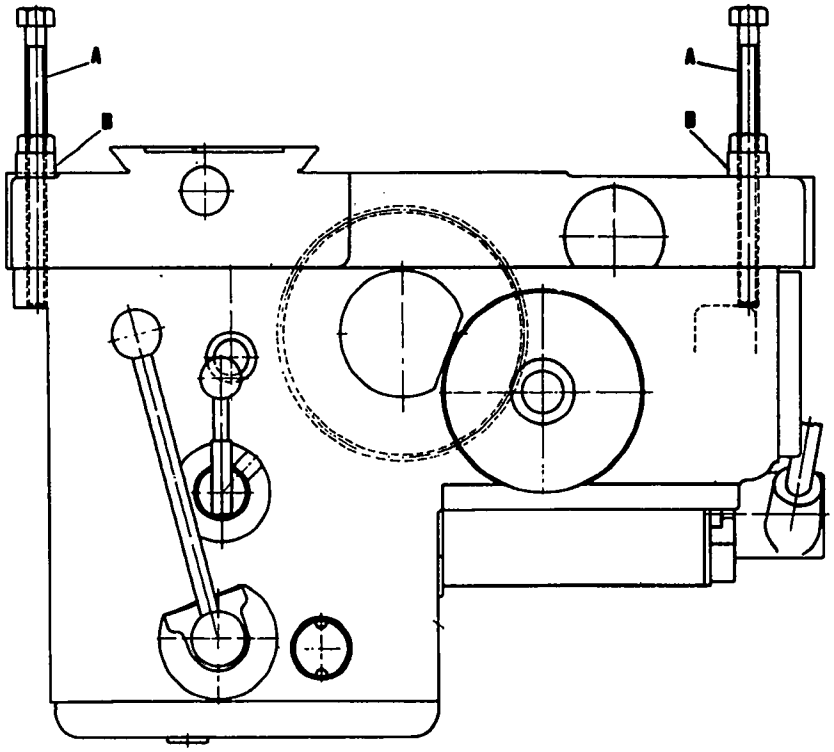
PLEASE STATE MACHINE SERIAL NO. SHEET NUMBER AND ITEM NUMBER.

1. Leather oilseal 175, 100, 37.
2. Oilseal carrier.
3. Oilseal W.200, 137,31,R4.
4. 'O' ring 200,2264475.
5. Torrington needle bearings B.2220.
6. 25T Gear on worm.
7. Intermediate gear in wormbox.
8. Sliding gear in wormbox.
9. Gear on feed shaft sleeve.
10. Torrington thrust races T.R.A.1220. bearingsNTA.1220.
11. 'O' ring 200, 113 4475.
12. Worm
13. Worm box stop.
14. Operating arm.
15. Feed change die.
16. Worm wheel.
17. Wormwheel pinion.
18. Feed change shaft.
19. 'O' ring 200, 210 4475.
20. Wormbox operating shaft.
21. Spring No. 115.
22. Torrington needle bearings B.2016.
23. Rack pinion shaft.
24. Gear on rack pinion shaft.
25. Hoff. Bearing L.20.N.
26. 20T Gear on Hand racking shaft.
27. 'O' ring 200,111 4475.
28. Sliding double gear.
29. Intermediate shaft.
30. 'O' ring 200,115 4475.
31. R. & M. Bearing LJ25.
32. R. & M. Bearing LJ25.
33. Hand racking shaft.
34. Feed selector die.
35. Feed selector shaft.
36. Feed selector gear.
37. Spring No. 123.
38. Sliding trip shaft.
39. Trip shaft cover (if long. stops fitted).
40. Longitudinal trip stop block.
41. Oil pump plunger.
42. Oil pump plunger spring.
43. Thrust bracket for leadscrew nuts.
44. Torrington needle bearings B.1412.
45. Trip rod arm.
46. Threading trip slide.
47. Pivot bar for leadscrew nuts.
48. Upper nut operating rod.
49. Spring No. 1303-077.
50. Leadscrew nuts.
51. Lower nut operating rod.
52. Interlock piece.
53. Screwcutting dial.
54. Screwcutting dial pinion.
55. Roller for Threading trip stop.
56. Thread indicator Bracket.
57. Leadscrew.
58. Longitudinal dead stop block.



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

11.51 APRON ASSEMBLY



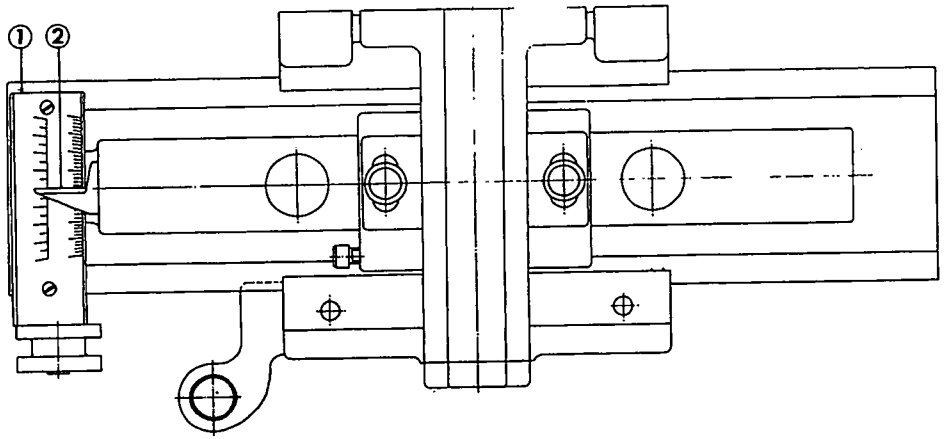
INSTRUCTIONS FOR LOWERING THE APRON.

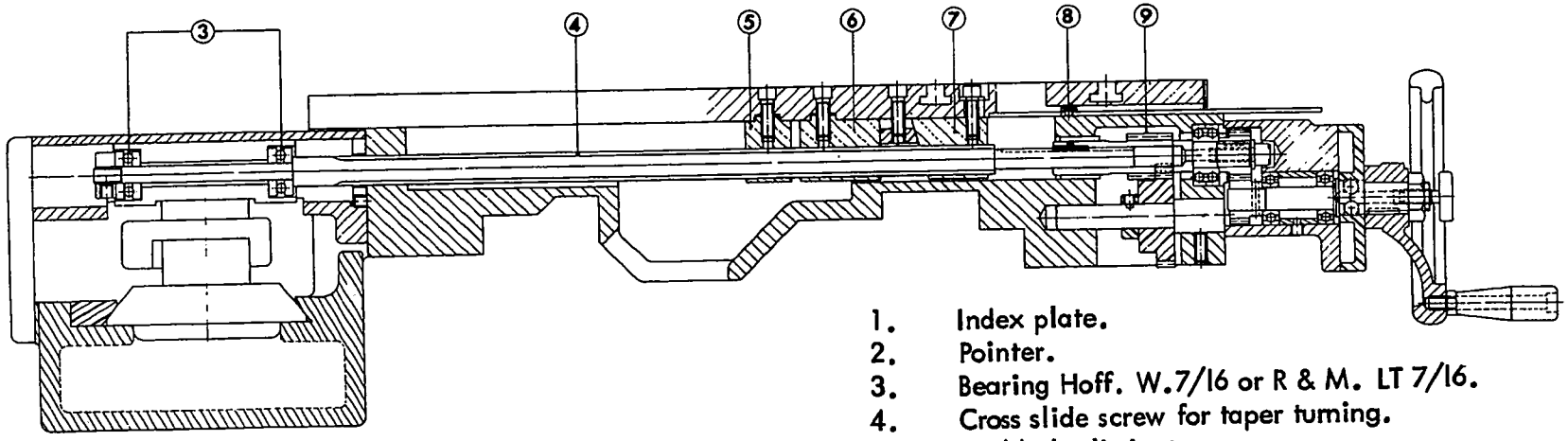
Remove the tail end bracket.
Disconnect the leadscrew, the feed shaft and the clutch operating shaft and withdraw the shafts towards the tailstock.

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 21.
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.

PLEASE STATE MACHINE SERIAL NUMBER, SHEET NUMBER AND ITEM NUMBER

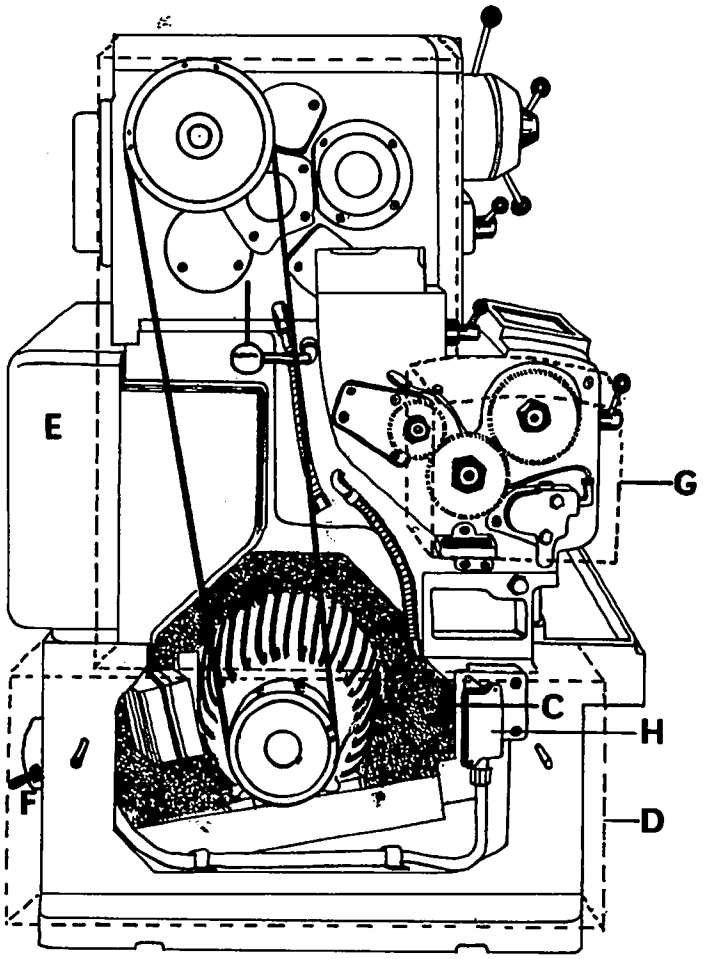




1. Index plate.
2. Pointer.
3. Bearing Hoff. W.7/16 or R & M. LT 7/16.
4. Cross slide screw for taper turning.
5. Backlash eliminator.
6. Tongued nut for cross slide.
7. Tapered nut for cross slide.
8. Stem key.
9. Pinion shaft.

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

ELECTRICAL EQUIPMENT AND MOTOR DRIVE



The machine is delivered completely wired in accordance wi th the wiring diagrams (section 12.2 or 12.3) and is ready for connection to the mains supply as previously described (section 2.6) The whole of the electrical equipment conforms to the B.S.I. requirements for machine tools No. BS 2771 1956.

The main drive motor is a totally enclosed type with ball bearings and requires no attention apart from cleaning and maintenance according to the manufacturers recommendations.

The drive motor 'A' is mounted on an anti-vibration hinged baseplate 'B' and is housed under the headstock in the base of the machine. The drive is transmitted from the motor to the headstock by vee belts, belt tensioning being obtained by means of the adjusting screw 'C'. Access to the motor and hinged baseplate is by removal of cover 'D'.

The automatic contactor control panel is housed in the rear of the bed. For access to the panel, first isolate the mains supply, which releases the interlock between cover 'E' and isolator switch 'F'. The cover can then be removed.

The change gear cover 'G' is fitted with an electrical interlock 'H' which on removal isolates the motor drive. On replacing the cover the motor drive can then be re-started.

CHARTS AND TABLES

Dia. in inches	METRES PER MINUTE: 6	7·5	9	12	15	18	21	24	27	30	33	36	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300
	FEET PER MINUTE: 20	25	30	40	50	60	70	80	90	100	110	120	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
	REVOLUTIONS PER MINUTE																													
¼	307	384	461	615	769	923	1070	1230	1384	1538	1692	1846	2307	3077	3846															
½	154	192	232	307	384	461	538	615	692	769	846	923	1153	1538	1923	2307	2692	3076	3461											
¾	102	128	153	205	256	307	359	410	460	512	564	615	769	1025	1282	1538	1794	2051	2307	2564	2820	3076	3335							
⅞	88	110	131	175	220	262	306	351	396	440	482	528	660	880	1101	1318	1541	1762	1982	2202	2422	2643	2863	3083	3304	3524				
1	76	96	115	150	190	230	269	308	346	384	423	461	576	769	961	1150	1346	1538	1730	1923	2115	2307	2500	2692	2884	3076	3269	3461	3654	
1⅛	68	85	102	136	170	204	238	273	307	341	375	410	510	683	851	1023	1194	1365	1537	1706	1877	2047	2284	2400	2559	2730	2901	3071	3242	3413
1¼	62	77	92	123	154	185	215	246	276	307	337	367	462	615	770	923	1077	1230	1384	1540	1692	1846	2000	2154	2308	2461	2615	2769	2923	3077
1⅜	56	70	84	112	140	168	196	224	252	280	308	336	420	560	700	840	980	1120	1260	1400	1540	1680	1820	1960	2100	2240	2381	2521	2661	2801
1½	52	64	77	103	128	154	179	205	231	256	282	307	384	513	641	770	900	1025	1154	1282	1410	1540	1666	1800	1923	2051	2179	2307	2436	2564
1¾	44	55	66	88	110	132	154	176	198	220	242	264	330	439	549	659	770	879	989	1100	1209	1318	1428	1538	1648	1758	1868	1978	2088	2197
2	38	48	57	76	96	115	134	154	173	192	211	231	288	384	481	577	672	770	865	961	1057	1154	1250	1346	1442	1538	1634	1730	1827	1923
2½	31	38	46	62	77	91	108	123	138	153	170	182	230	307	384	460	538	615	692	770	846	921	1000	1077	1153	1230	1307	1384	1460	1538
3	25	32	38	51	64	77	89	102	115	128	141	153	192	256	320	384	448	512	577	641	705	769	833	896	961	1025	1089	1153	1205	1282
3½	22	27	33	44	55	66	77	88	99	109	120	131	164	220	274	330	384	440	494	549	604	659	714	769	824	879	934	989	1044	1098
4	19	24	29	38	48	58	67	77	86	96	106	115	144	192	240	288	336	384	432	480	529	577	625	673	721	769	817	865	913	961
4½	17	21	25	34	42	51	59	68	77	85	94	102	128	171	213	256	299	342	384	427	470	512	555	598	641	683	726	769	812	854
5	15	18	23	30	38	46	53	61	69	76	84	92	115	153	192	230	269	307	346	384	423	461	500	538	577	615	654	692	730	769
5½	14	17	21	28	35	42	49	56	63	70	77	84	104	140	175	210	244	279	314	349	384	419	454	489	524	559	594	629	664	699
6	13	15	19	25	32	38	45	51	58	64	70	77	96	128	160	192	224	256	288	320	352	384	416	448	480	512	544	576	609	641
7	11	14	17	22	27	33	38	44	50	55	60	66	82	110	137	164	192	219	247	274	302	329	357	384	412	439	467	494	522	549
8	10	12	14	19	24	29	33	38	43	48	53	57	72	96	120	144	168	192	216	240	264	288	312	336	360	384	408	432	456	480
9	9	11	13	17	21	25	30	34	38	43	47	51	64	86	106	128	149	171	192	214	235	256	278	299	321	342	363	385	406	427
10	8	10	11	15	19	23	27	31	35	38	42	46	58	77	96	115	135	154	173	192	212	231	250	269	289	308	327	346	365	385
11	7	9	10	14	17	21	25	28	32	35	39	42	52	70	88	105	122	139	157	175	192	210	227	245	262	280	297	315	332	350
12	6	8	9	13	16	19	23	25	29	32	35	38	48	64	80	96	112	128	144	160	176	192	208	224	240	256	272	288	305	321
13	5	7	8	11	15	17	20	23	26	29	32	36	44	59	74	88	103	118	133	148	162	178	192	207	222	236	251	266	281	296
14				10	13	16	19	22	25	28	30	33	41	58	69	82	96	109	124	137	151	165	180	192	206	220	234	247	261	275
15					12	15	18	20	23	25	28	30	38	51	64	77	90	102	115	128	141	154	166	179	192	205	218	231	243	256
16						14	17	19	22	24	27	29	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240
18							15	17	19	22	24	26	32	43	53	64	75	86	96	107	118	128	139	150	161	171	182	193	203	214
20								15	17	19	21	23	29	40	48	58	68	77	87	96	106	116	125	135	145	154	164	173	183	193
22								14	16	18	20	21	26	35	44	53	61	69	79	88	96	105	114	123	131	140	149	158	166	175
24									15	16	18	19	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144	153	161

Dia. in inches	Dia. in Millimetres
¼	5
½	12
¾	19
⅞	22
1	25
1⅛	28
1¼	31
1⅜	35
1½	38
1¾	44
2	50
2½	62
3	76
3½	89
4	102
4½	114
5	127
5½	140
6	153
7	178
8	203
9	229
10	254
11	279
12	305
13	330
14	356
15	381
16	406
18	457
20	508
22	560
24	610

13.2 METRIC CONVERSION TABLES

1 METRE = 39·370113 INCHES

INCHES TO MILLIMETRES

FRACTIONS

Inch				M/m.	Inch				M/m.	Inch				M/m.
		1/64	·015625	·3969		11/32	23/64	·34375	8·7312			43/64	·671875	17·0656
	1/32	2/64	·03125	·7937			45/64	·359375	9·1281	11/16		45/64	·6875	17·4625
		3/64	·046875	1·1906	3/8		47/64	·375	9·5250		23/32	47/64	·703125	17·8594
1/16		4/64	·0625	1·5875		12/32	49/64	·390625	9·9219			49/64	·71875	18·2562
		5/64	·078125	1·9844		13/32	51/64	·40625	10·3187		24/32	51/64	·734375	18·6531
	2/32	6/64	·09375	2·3812			53/64	·421875	10·7156	3/4		53/64	·75	19·0500
		7/64	·109375	2·7781	7/16		55/64	·4375	11·1125			55/64	·765625	19·4469
1/8		8/64	·125	3·1750		14/32	57/64	·453125	11·5094		25/32	57/64	·78125	19·8437
		9/64	·140625	3·5719			59/64	·46875	11·9062			59/64	·796875	20·2406
	3/32	10/64	·15625	3·9687		15/32	61/64	·484375	12·3031	13/16		61/64	·8125	20·6375
		11/64	·171875	4·3656	1/2		63/64	·5	12·7000		26/32	63/64	·828125	21·0344
3/16		12/64	·1875	4·7625		16/32	65/64	·515625	13·0969			65/64	·84375	21·4312
		13/64	·203125	5·1594			67/64	·53125	13·4937		27/32	67/64	·859375	21·8281
	7/32	14/64	·21875	5·5562		17/32	69/64	·546875	13·8906	7/8		69/64	·875	22·2250
		15/64	·234375	5·9531	9/16		71/64	·5625	14·2875			71/64	·890625	22·6219
1/4		16/64	·25	6·3500		18/32	73/64	·578125	14·6844		28/32	73/64	·90625	23·0187
		17/64	·265625	6·7469			75/64	·59375	15·0812			75/64	·921875	23·4156
	9/32	18/64	·28125	7·1437		19/32	77/64	·609375	15·4781	15/16		77/64	·9375	23·8125
		19/64	·296875	7·5406	5/8		79/64	·625	15·8750		29/32	79/64	·953125	24·2094
5/16		20/64	·3125	7·9375		20/32	81/64	·640625	16·2719			81/64	·96875	24·6062
		21/64	·328125	8·3344		21/32	83/64	·65625	16·6687		30/32	83/64	·984375	25·0031

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

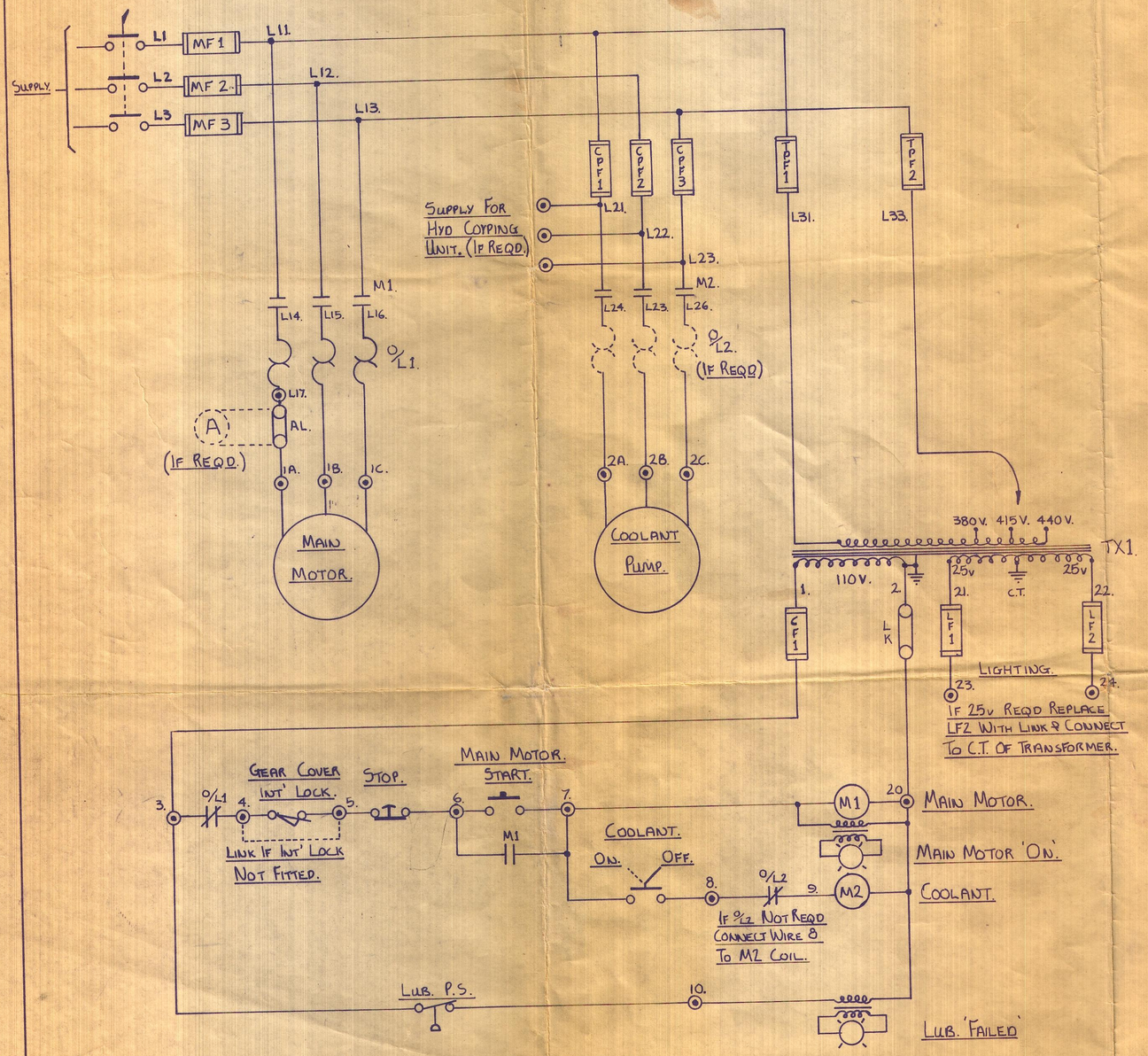
UNITS

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

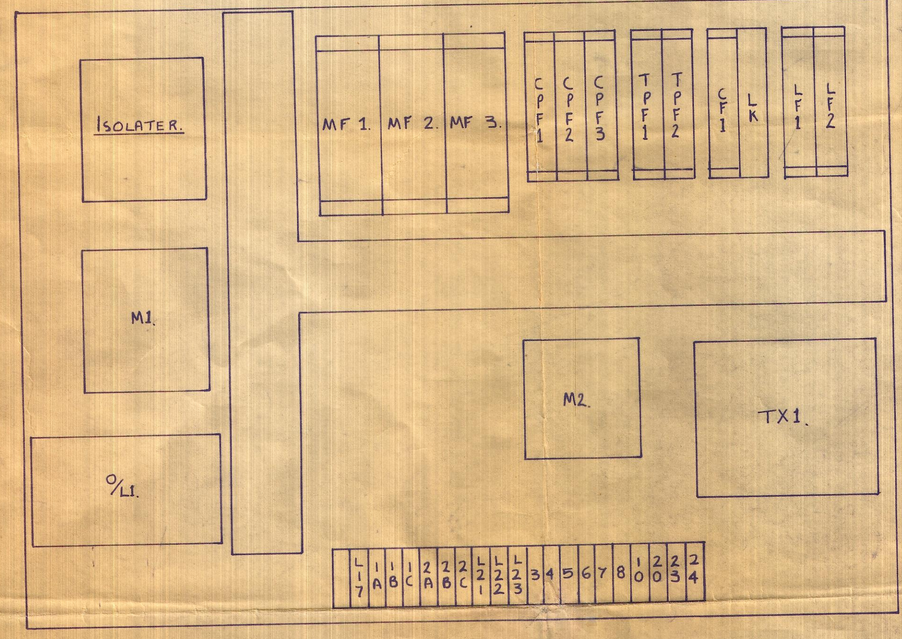
M/m.		100	200	300	400	500	600	700	800	900
0		3·93701	7·87402	11·8110	15·7480	19·6851	23·6221	27·5591	31·4961	35·4331
10	·39370	4·33071	8·26772	12·2047	16·1417	20·0788	24·0158	27·9528	31·8898	35·8268
20	·78740	4·72441	8·66142	12·5984	16·5354	20·4725	24·4095	28·3465	32·2835	36·2205
30	1·18110	5·11811	9·05513	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

Catchplate.
12" (305 mm.) dia. Faceplate.
16" (406mm) dia. Faceplate.
22" (559 mm) dia. faceplate.
10" (254) dia. 4-jaw Steel Chuck. 1600 r.p.m.
8.1/4" (210) dia. 3-jaw Steel Chuck 2240 r.p.m.
10" (254 mm) dia. 3-jaw Steel Chuck. 1600 R.P.M.
12" (305 mm) dia. 3-jaw Steel Chuck. 1600 R.P.M.
Blank backplates for D1-6 Spindle Nose.
Crawford Tru-grip and Hydraulic chuck.
Burnerd Multi-size Collet Chucks.
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" (305 mm) long.
Stationary steady. To take 5" (127 mm) dia. (Section 9.3)
Stationary steady. To take 7" (178 mm) dia. (Section 9.3)
Travelling steady. To take 3" (76 mm) dia. (Section 9.3)
Spherical Turning Attachment. Capacity 4" dia. (102 mm) (Section 9.31)
Swivelling Hydraulic Copying Unit.
Reducing Sockets for Drilling Attachment.
Micrometer Dead Stop.
Cross Stops. Tripping.
Longitudinal stops. (Section 9.3)
Lo-vo-lite lighting unit.
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
Ammeter.
Trav-a-dial for Longitudinal Traverse.
Dual Inch/Metric dials.
Chuck Guard.
Digital Readout Equipment.

MM | INCHES



PANEL ENCLOSURE, OUTSIDE DIMENSIONS H-16½", L-21"; DOOR HINGED AT R.H. SIDE.



WHEN HALOGEN WORK LIGHT FITTED SEE ALSO DRG Nº EL373.

No.	MODIFICATIONS	SIG.	DATE
	TERMINALS 5 & 10 ADDED	MW	

TOOLING

DRAWN	CHECKED	DATE	SCALE
MW		22-8-75	

MATERIAL

HEAT TREAT.

PART NAME KEY DIAGRAM.

LATHE TYPE 1307 SER Nº

PART No. DRG Nº EL 1307/1. 2

DEAN SMITH & GRACE LTD. KEIGHLEY, ENGLAND | THIRD ANGLE PROJECTION | CHAMFER SHARP EDGES .01" OR .25 MM. | MACH. TOLS. IF UNSTATED INCH DIM ± 1/64" METRIC DIM ± .5MM. | MACHINE — WHERE SHOWN ALL OVER | SUPERSEDES EL 350 DATE 22-8-75. | SUPERSEDED BY DATE