

COLCHESTER BANTAM



**INSTRUCTION AND
SPARE PARTS MANUAL**

THE COLCHESTER LATHE COMPANY LTD., COLCHESTER, ENGLAND

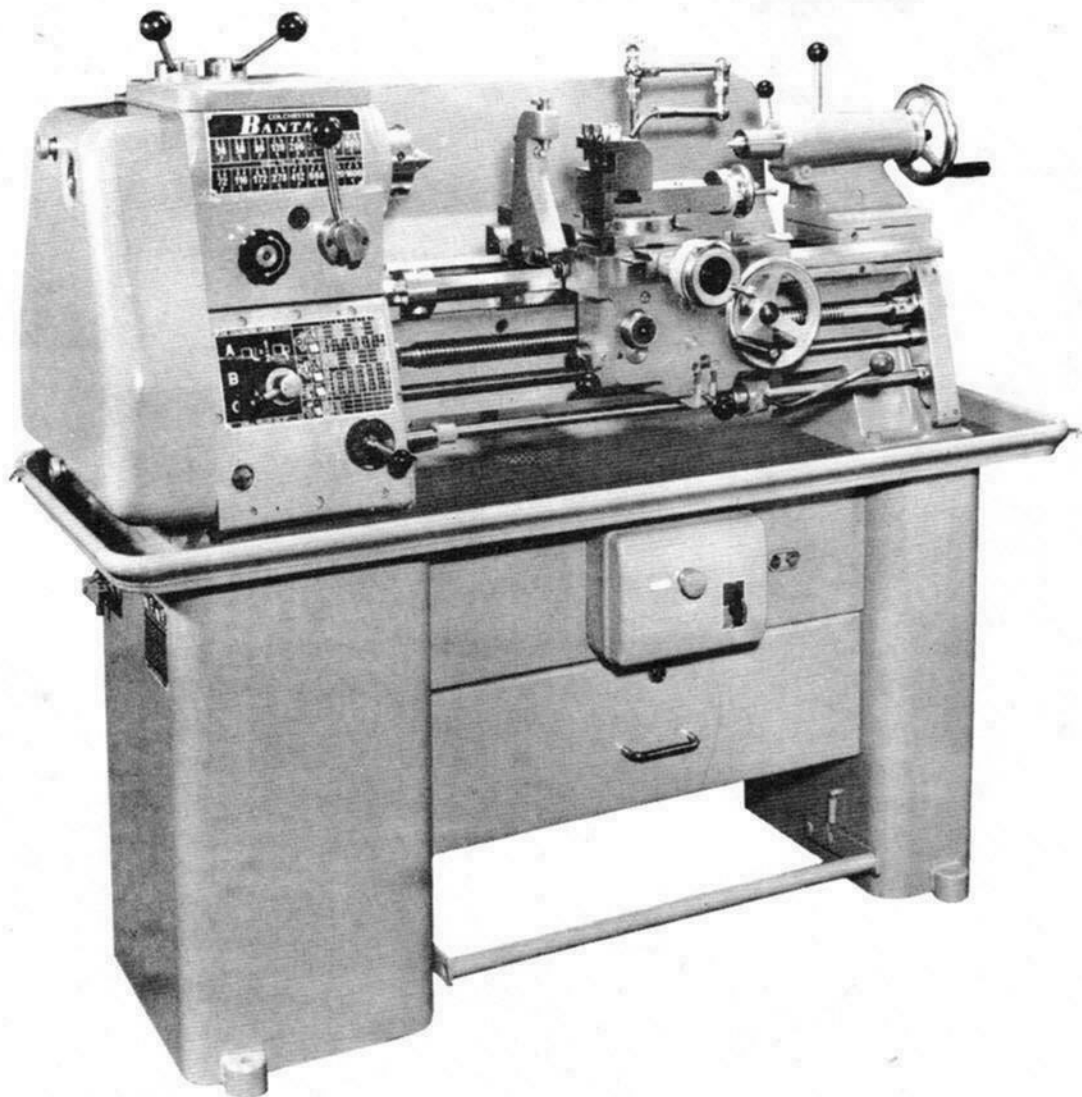
THIS MANUAL

applies to the Colchester 5½ in. (140 mm) Bantam Lathe. A thorough understanding of its contents will help you to obtain the best results from your machine.

Our Technical Service Department is at your disposal and will always be pleased to discuss problems concerning the application of Colchester Lathes and their attachments. Our aim is to ensure that you obtain the maximum satisfaction from your machine.

The serial number is stamped into the lathe bed at the tailstock end and MUST be quoted in all communications regarding your lathe. Due to the Company's policy of continuous improvement, designs may be modified or changed at any time and this manual applies only to the machine with which it is issued.

THE SERIAL NUMBER OF YOUR MACHINE IS



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

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BRIEF SPECIFICATION

- EAGLE 20** - 5½ in x 20 in straight bed floor mounted lathe, with English quick change gearbox.
EAGLE 30 - 5½ in x 30 in straight bed floor mounted lathe, with English quick change gearbox.
CONDOR 20 - 140 mm x 510 mm straight bed floor mounted lathe, with Continental quick change gearbox
CONDOR 30 - 140 mm x 762 mm straight bed floor mounted lathe, with Continental quick change gearbox

CAPACITIES		English	Metric
Height of centres	...	5½ in	143 mm
Turning diameters			
Over bed	...	11½ in	286 mm
Over cross slide	...	7 in	178 mm
Distance between centres	...	20 in or 30 in.	508 mm or 762 mm
Diameter of faceplate	...	10 in	254 mm
Diameter of driving plate	...	6½ in	175 mm
Capacity of travelling steady	...	1½ in	35 mm
Overall length of machine	...	53 in or 64 in.	1345 mm or 1630 mm
Overall width of machine	...	25 in	635 mm
Weight	...	980 lbs or 1020 lb	445 kg. or 463 kg
HEADSTOCK			
Spindle bore (Max. bar dia.)	...	1 in	25.4 mm
Spindle nose, camlock	...		3 in D.I.
Taper in spindle nose	...		No. 4 M.T.
Number of spindle speeds (single speed)	...		8
Range of spindle speeds (single speed)	...		36-800 r.p.m.
Number of spindle speeds (two speed)	...		16
Range of spindle speeds (two speed)	...		36-1600 r.p.m.
CARRIAGE			
Total travel of cross slide	...	6½ in	175 mm
Total travel of top slide	...	3½ in	92 mm
Height from top of top slide to centre line of spindle	...	1½ in	38 mm
Max. tool shank size	...	½ in x 1 in	12.5 mm x 25.4 mm
THREADS AND FEEDS			
TYPE OF GEARBOX		EAGLE	CONDOR
		English	Continental
PITCH OF LEADSCREW		4 t.p.i.	6 mm
Number of metric pitches	...	15	27
Range of metric pitches	...	0.5 mm to 6 mm	0.2 mm to 6 mm
Number of Whitworth threads	...	29	26
Range of Whitworth threads	...	3.5 to 80 t.p.i.	3.5 to 80 t.p.i.
Number of Module pitches	...	—	22
Range of Module pitches	...	—	0.3 to 6.0
Number of diametral pitches	...	18	—
Range of diametral pitches	...	7 to 48	—
Number of sliding and surfacing feeds shown	...	26	16
Range of sliding feeds001 to .028 in/rev	.001 to .032 in/rev
Range of surfacing feeds0005 to .014 in/rev	.0005 to .016 in/rev
TAILSTOCK			
Spindle travel (No. 3 M.T. Centre fitted)	...	4½ in	108 mm
Spindle travel (Standard tang drill fitted)	...	3½ in	89 mm
Taper in spindle	...		No. 3 M.T.
DRIVE			
Single speed motor	...	1 h.p. 3 phase 50 cycle	
Two speed motor	...	2/1 h.p. 3 phase 50 cycle	

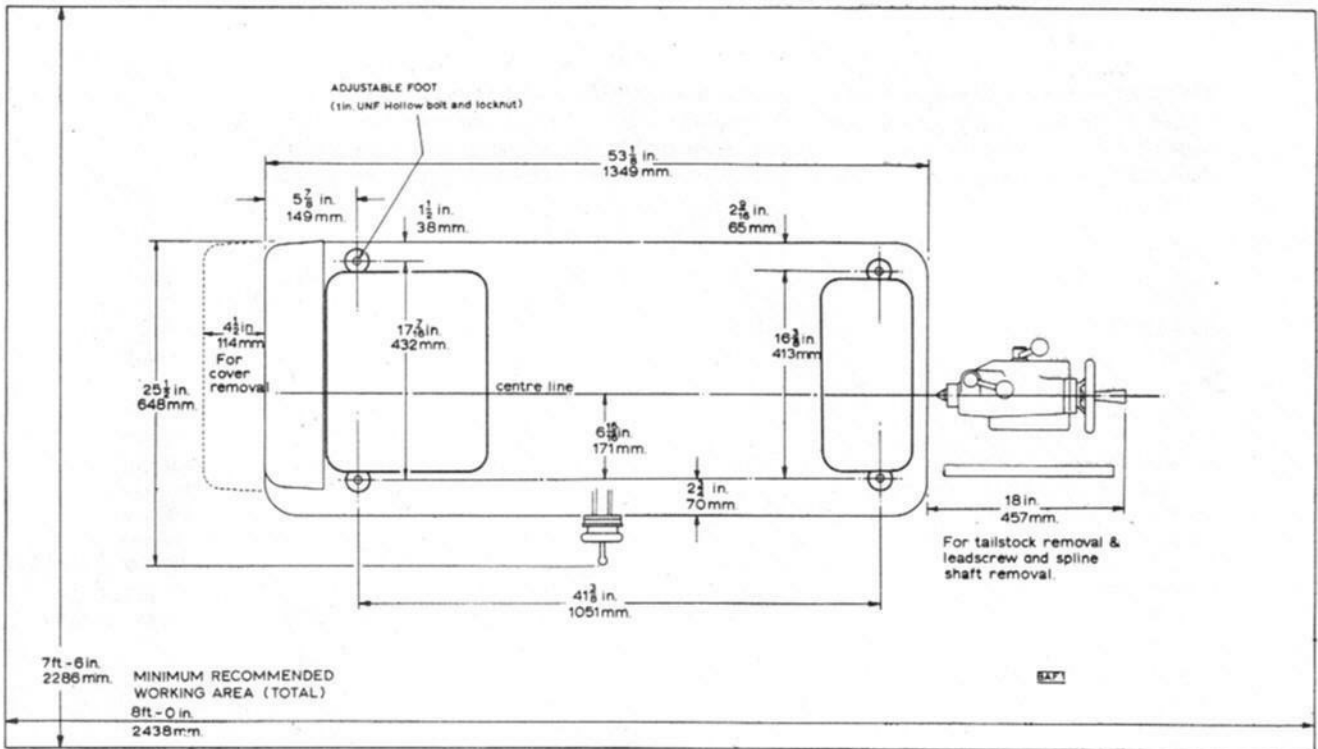
STANDARD EQUIPMENT SUPPLIED WITH THE MACHINE

(for details of accessories see page 20)

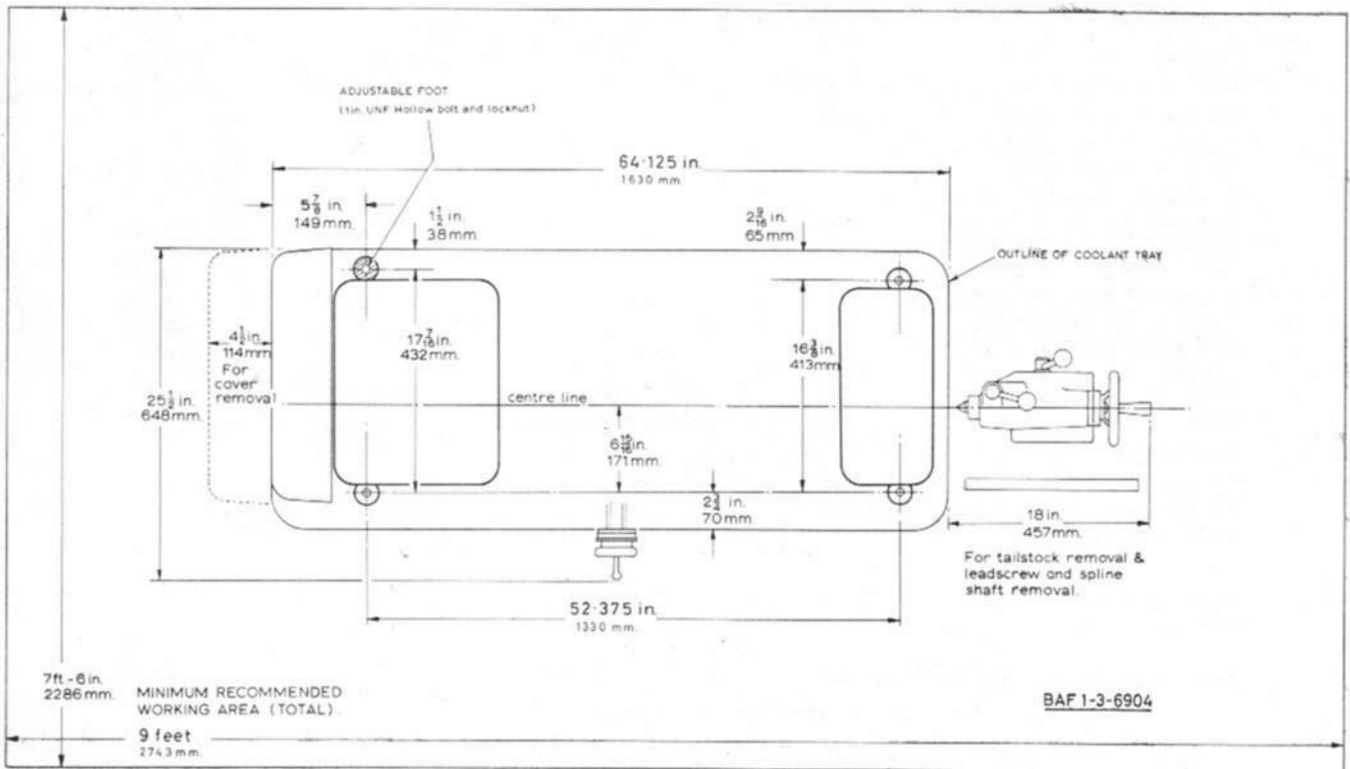
Apron Control Unit for Spindle (Forward/Stop/Reverse) . Swivel Toolblock . Rear mounted splash guard
 10" diameter faceplate . Foot actuated spindle brake . Travelling steady . Pedestal base tool cabinet . Driving
 Plate . Two Morse taper centres . Bedway wipers . Chip and coolant tray . Electrical equipment for standard
 50 cycle 3 phase A/C supply . Set of spanners and keys . Instruction and spare parts manual .

FOUNDATION PLANS

20 in (508 mm) BED



30 in. (762 mm) BED



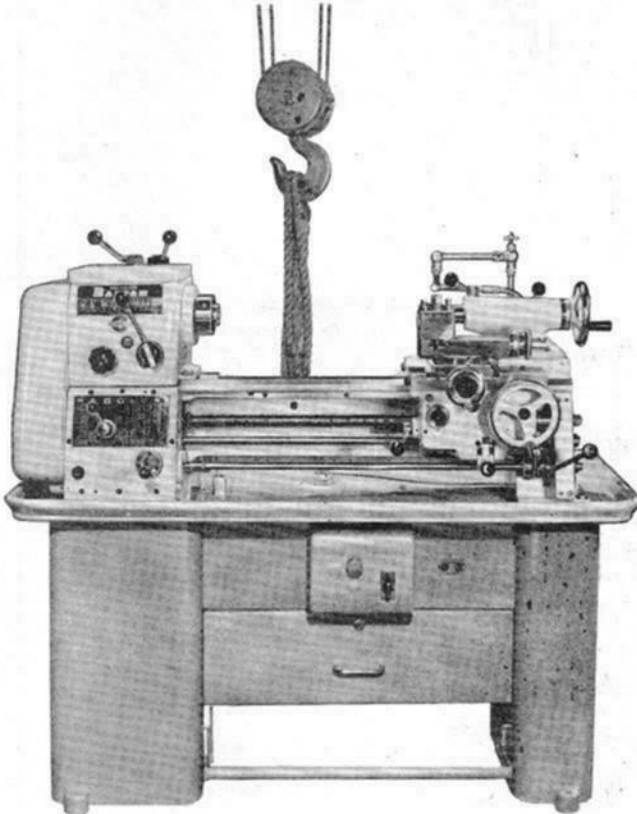
INSTALLATION

LOCATION

Provided the floor is firm, reasonably level and able to bear the weight the machine can be located in any convenient position.

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

In the foundation plan opposite the main dimensions are given together with the recommended minimum space required for the efficient operation and servicing of the machine.



LIFTING

Immediately in front of the headstock will be found a cross bar which passes through the bed. Full use should be made of this when manoeuvring the machine and under no circumstances should the lathe be lifted by means of a bar through the spindle bore or ropes around the headstock and tailstock assemblies. Proper equipment should be available for lifting the machine which weighs approximately 1,000 pounds (343 kgs).

CLEANING

When the lathe is delivered, all bright machined surfaces are covered by a heavy protective coating. This must be removed with white spirit or kerosene before attempting to use the machine. **DO NOT USE CELLULOSE SOLVENTS AS THESE WILL DAMAGE THE PAINT-WORK.**

Particular attention should be paid to the slides and spindle nose, and it is essential that the end guard is opened and the assemblies covered by this carefully cleaned. All traces of the cleaning agent should then be removed and the bright surfaces given a light coating of Shell Tellus 27 Oil.

POSITIONING

Machines Free Standing

For all work under normal conditions, the machine will perform perfectly when free standing.

Place the machine in position on the three fixed feet. Screw down the adjustable support and lock at a level where it shares the machine weight without causing any of the fixed feet to lose contact with the floor.

Any vibration that is apparent when the machine is run can be eliminated by resetting the adjustable support foot while the lathe is running.

Machines Bolted Down

When the machine is used regularly for high speed out-of-balance work, it is recommended that the cabinet be bolted down to a firm foundation by means of four $\frac{1}{2}$ in. diameter bolts.

As before, place the machine in position over the four holding down bolts so that it stands on the three fixed feet.

Screw down the adjustable support foot and lock at a level where it shares the machine weight without causing any of the fixed feet to lose contact with the floor.

Securely tighten the four holding down bolts and check that the cross wind alignment of the machine has not been disturbed.

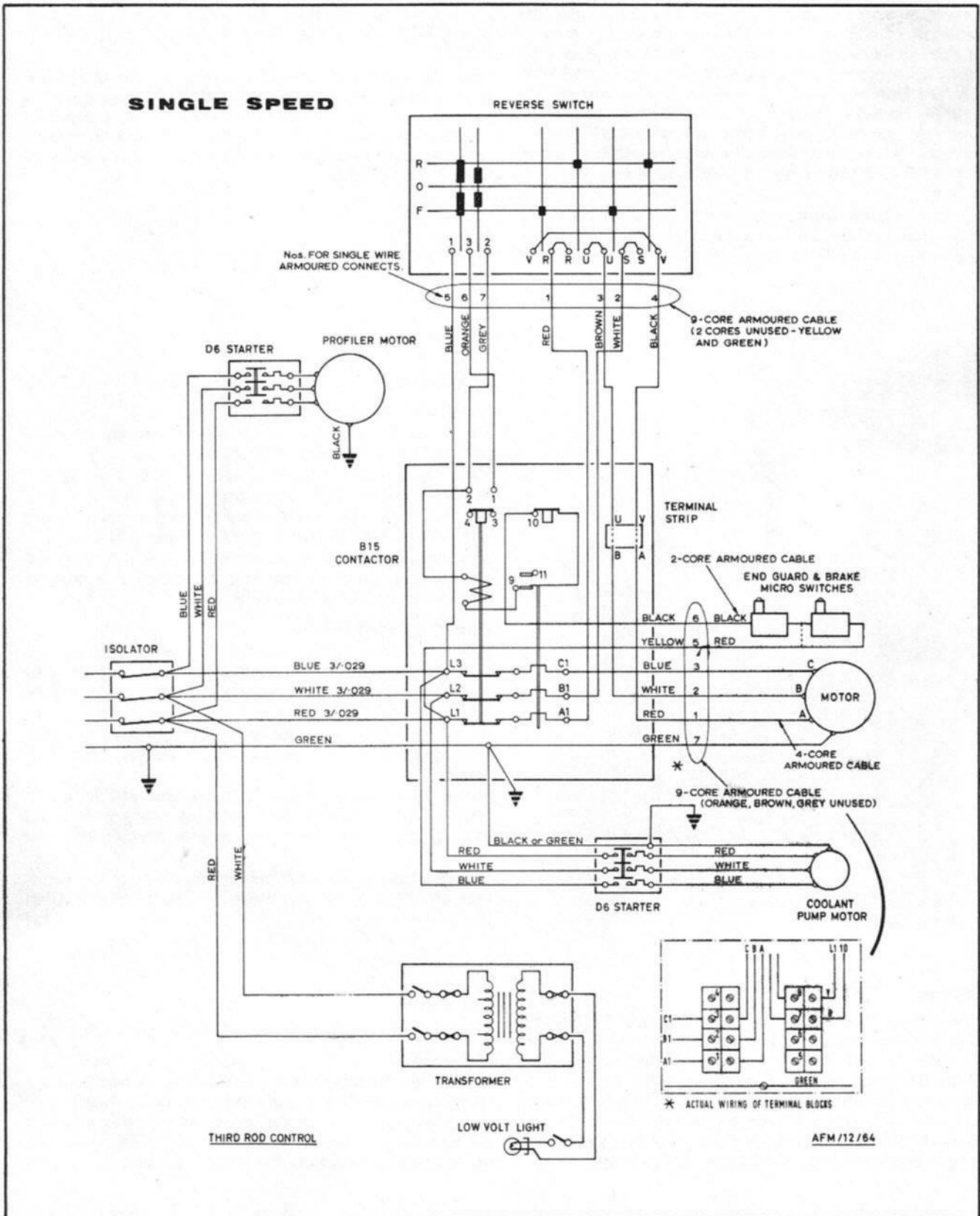
LEVELLING

A precision engineer's level should be used and readings taken across the bed at the headstock and tailstock ends and in two positions on the front and rear bed shears in a longitudinal direction. If necessary, mis-alignment can be rectified by re-setting the adjustable foot.

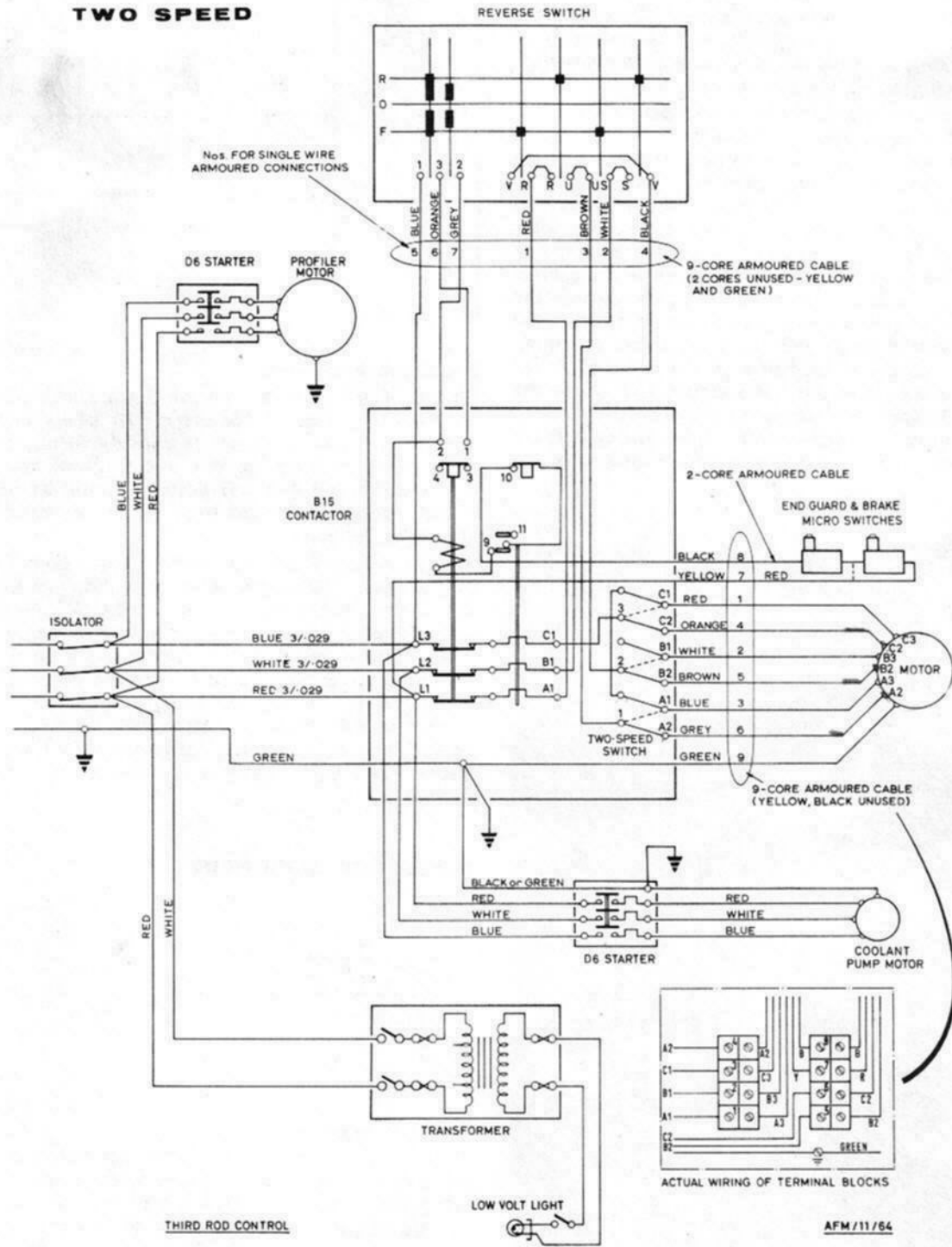
ELECTRICAL WIRING

The external wiring of the machine to the mains supply should be carried out by a competent electrician, and all wiring should be of a permanent character. All internal wiring is carried within the cabinet base, properly shielded to provide a high degree of safety. It is essential that a really efficient earth is provided in the installation as shown in the wiring diagrams, which cover the single-speed and two-speed machines. In both cases the

wiring to connect the lever operated FORWARD/OFF/REVERSE switch is shown. All machines include as standard an overload and no-volt release in the circuit with an emergency mushroom head stop button. A safety micro-switch is also fitted to the end guard which isolates the motor when the guard is removed. All wiring is protected in armoured hose or steel conduit.



TWO SPEED



CHUCK MOUNTING

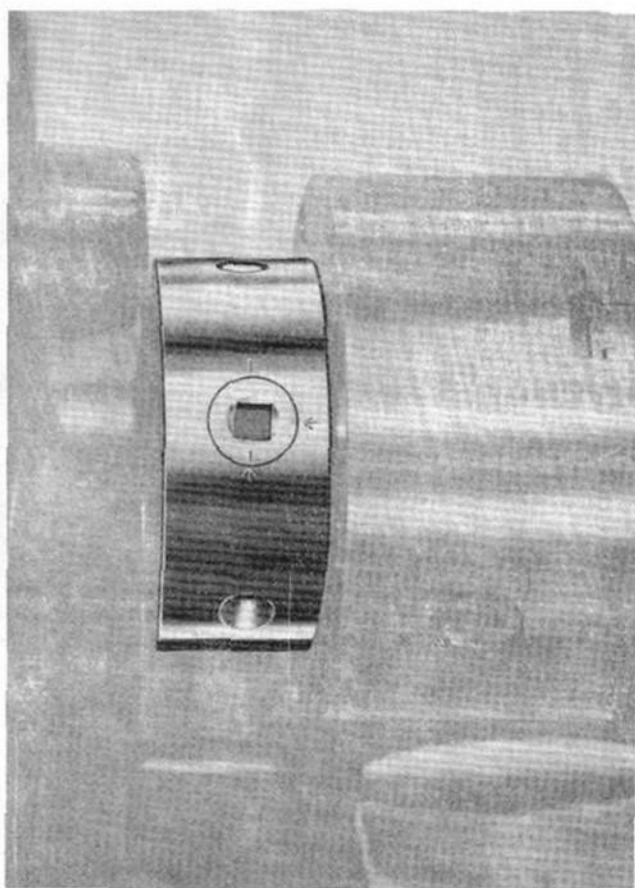
The American type D1-3 in. Camlock spindle nose has been selected to overcome the danger of chucks or faceplates becoming detached whilst rotating.

The open or unclamped position is indicated when the datum line on the cam is in line with the vertical datum on the spindle nose.

The closed or clamped position is indicated when the datum line on the cam comes between the two arrows on the spindle nose.

To ensure that each spindle nose cam is fully secured in order to obtain maximum grip, it may be necessary to re-set the camlock studs in any new accessories which are to be mounted on the spindle nose.

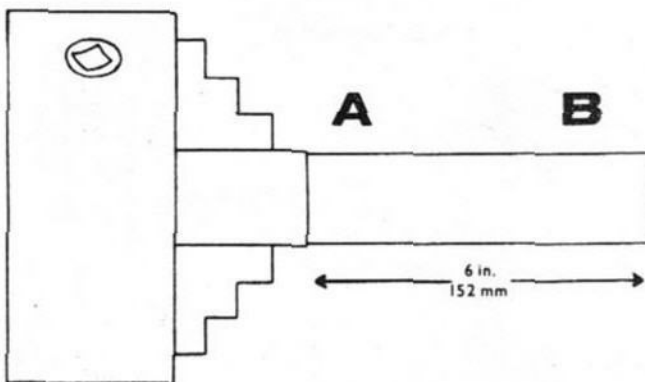
To do this remove the cap head screws locking the studs and set each stud so that the scribed datum lines are as close to the rear face of the accessory as possible, without being below the surface, with the grooves lining up with the locking screw holes. Mount the accessory on the spindle nose and tighten the three camlocks in turn. These should be fully tightened when the datum line on the camlock is between the two arrows on the spindle nose. If any of the camlocks do not tighten within the limits of the arrows remove the accessory and turn the stud concerned through 360° in a clockwise direction. (This will bring the scribed line on the stud below the rear face of the accessory.) Re-mount and check the locking action again and repeat the above procedure until all three camlocks tighten within the limiting arrows. Finally, replace the locking screws beside each stud.



ALIGNMENT CHECKS

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

HEADSTOCK ALIGNMENT TEST

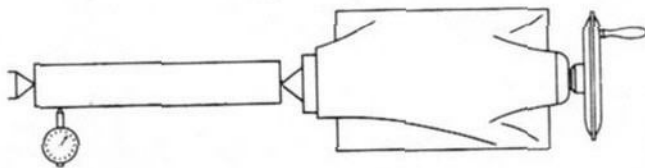


Headstock Alignment:

Place a length of mild steel bar in the chuck and take a light cut over the o.d. for about 6 in. of its length (Do not use the tailstock centre as a steady during this test). Micrometer readings at the two ends of the turned diameter (A and B in the sketch) should be the same. If the readings differ the head stock may easily be re-aligned as follows:

Slacken off the headstock holding down bolts (1) until they are only finger tight, which will allow the headstock to pivot round the locating dowel (2). A light tap with the palm of the hand in the required direction is all that is necessary to affect an adjustment. As a guide, with a dial indicator set against point B of the test piece it will be necessary to swing the headstock approximately $2\frac{1}{2}$ times the difference in micrometer readings between point A and point B. It is important that if any adjustments have been made, all holding-down bolts are securely tightened.

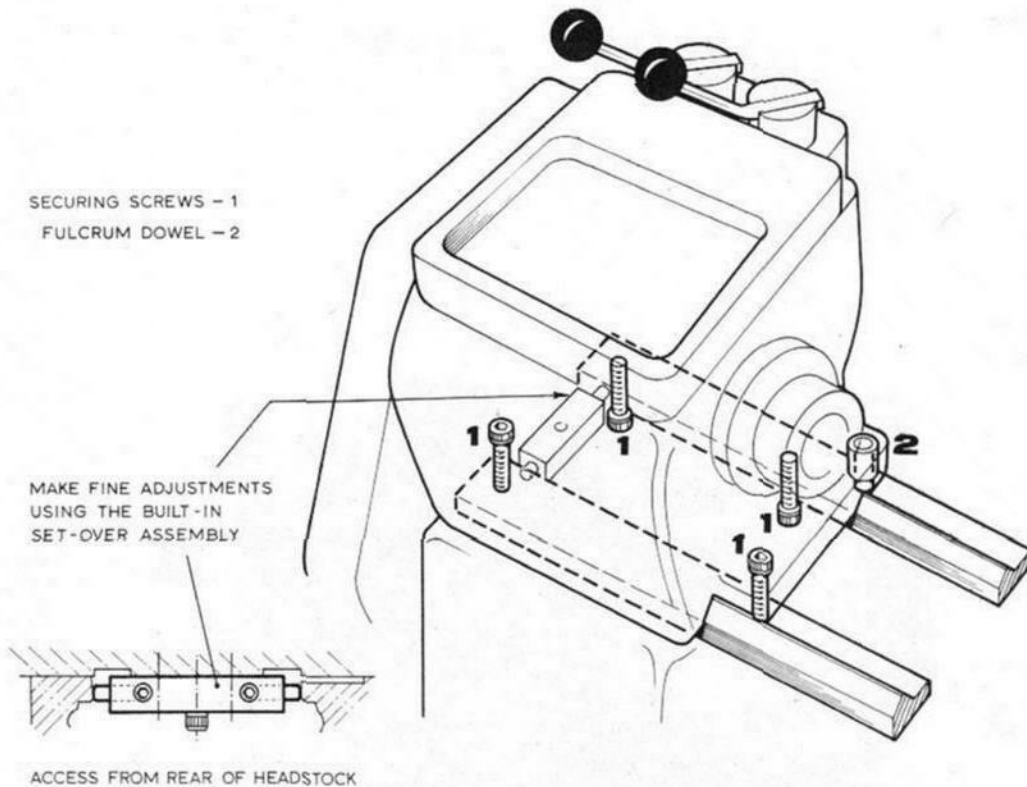
TAILSTOCK ALIGNMENT TEST



Tailstock Alignment:

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

ADJUSTING HEADSTOCK ALIGNMENT



LUBRICATION

The accuracy and life of the machine depend on correct lubrication. All oiling points should be properly lubricated and the oil levels of the headstock and gearbox checked before the machine is used.

The lubrication chart gives information on the points which need periodic attention and it cannot be stressed too strongly that all points marked with a black diamond should receive daily attention to ensure efficient operation.

When carrying out the weekly check on the headstock and gearbox always stop the machine to allow the oil to settle so that a true reading is obtained. If this precaution is not taken there is a risk of over-filling which will result in the generation of excessive heat and the loss of oil by leakage.

After the machine has been in operation for 160 hours or four weeks—whichever is the sooner—the headstock and gearbox should be drained, flushed with clean flushing oil and re-filled to the correct level with the appropriate grade of oil. This procedure should be repeated every 500 hours or 3 months—whichever is sooner.

When the machine is despatched from the works the headstock and gearbox are filled with Shell Tellus Oil 27. Tellus oils may be obtained from Shell Oil Companies throughout the world but in case difficulty is experienced in obtaining this particular grade the physical properties are given below:

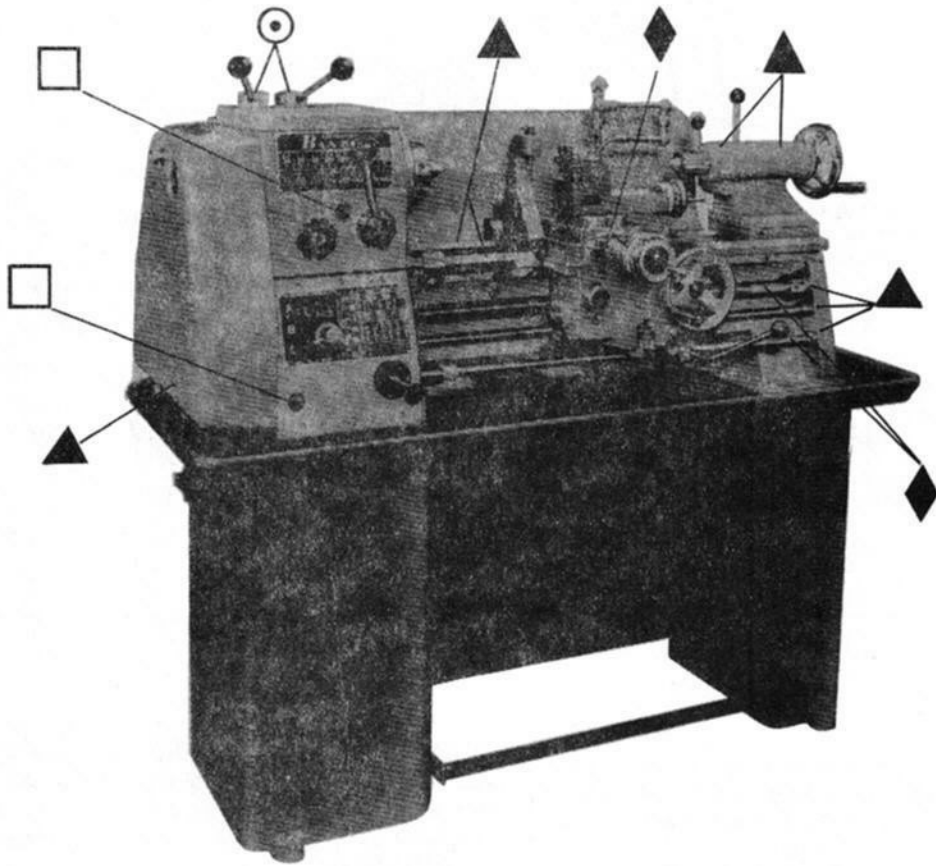
Specific Gravity at 60°F	0.870
Flash point closed	390°F
Pour point	— 20°F
Viscosity	
Redwood No. 1:	
70°F	310 secs
140°F	68 secs
200°F	41 secs

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

The bearings of the pump motor (where this is supplied) should also be greased periodically and for this application we recommend Shell Alvania 3 Grease.

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

LUBRICATION CHART



◆ CLEAN AND OIL WITH LIGHT OIL EACH DAY

▲ OIL ONCE PER WEEK WITH LIGHT OIL

□ TOP UP WITH RECOMMENDED OIL EACH WEEK

⊙ LIGHTLY OIL WHEN NEEDED

OPERATION

STARTING

On machines not fitted with the apron control unit the rotation of the main spindle is controlled by means of a push button direct-on-line starting switch situated at the front of the cabinet.

When the apron control unit is fitted the rotation of the spindle is controlled in forward and reverse directions by a lever situated on the right hand side of the apron which operates a switch under the cabinet tray. With the lever in the uppermost position, forward rotation of the spindle is achieved, reversals being made by depressing the lever to its lowest position. A neutral position is provided to stop spindle rotation and an emergency mushroom head stop button is also fitted to the front of the cabinet.

Where a two speed motor is fitted the control switch is incorporated in the switchgear on the front of the cabinet on all models.

The spindle brake, if fitted, is mechanically operated by means of the foot pedal situated between the cabinet legs.

Knob (4) on the front of the headstock operates the reversing mechanism for the leadscrew and feed shaft. THE SPINDLE AND HEADSTOCK GEARING MUST ALWAYS BE STOPPED BEFORE MOVING ANY OF THE ABOVE CONTROLS.

The charts reproduced below give the lever positions for the speeds available on single and two speed machines.



HEADSTOCK—SPEED SELECTION

Speed selection is by two levers (1-2) on top and one lever (3) in the front of the headstock. These levers are spring loaded and have a safety gate type of location. Until the gears are fully in mesh the levers will not seat correctly and no attempt should be made to turn the spindle under power.

SINGLE
SPEED

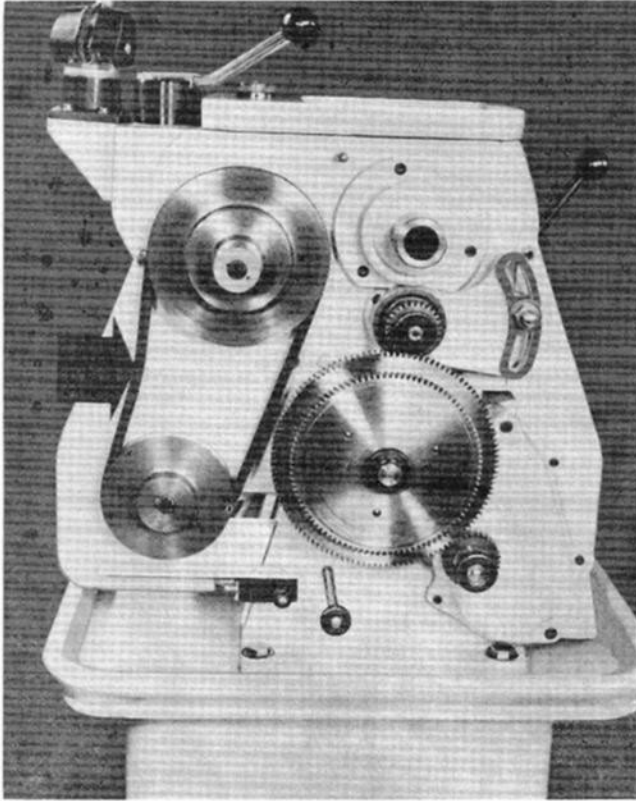
36	58	86	139	206	334	510	800
SHELL TELLUS OIL 27							
0470							

TWO
SPEED

36	58	86	139	206	334	510	800
SHELL TELLUS OIL 27							
0471							
72	116	172	278	412	668	1020	1600

DRIVE

Drive to the headstock from the motor is by vee belt. The motor platform is adjustable to allow for the correct tensioning of the belt which should have approximately $\frac{3}{4}$ in. (19 mm) free side movement in either direction under light pressure.



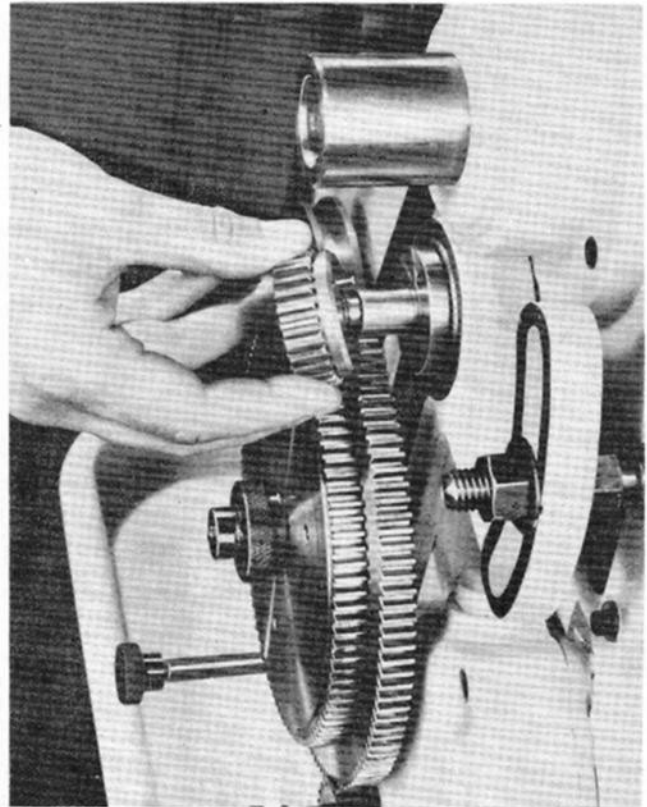
SWING FRAME ASSEMBLY

The drive from the headstock to the gearbox is transmitted through the end train of gears.

These are fitted to a swing frame which is readily adjusted to accommodate up to a 60T/16DP gear in the driving position up to a 100T/16DP gear in the driven position (127T/16DP on the non-gearbox model).

A shear pin device is fitted as a precautionary measure to protect the leadscrew against overload in the low speed range. A broken pin can easily be replaced by removing the top gear in the end train and then the splined sleeve which carries the gear. The broken pin can then be tapped out of the sleeve. To remove the remainder of the pin rotate the shaft until the pin hole is opposite the slot in the housing. This can now be knocked through and will drop out through the slot. A new pin may now be fitted and the change gear sleeve re-assembled.

When the end guard is opened the electrics are isolated by a micro-switch.



GEARBOX

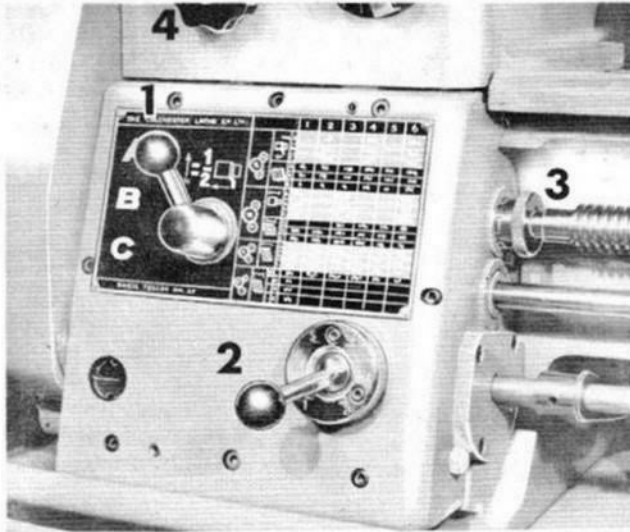
Two alternative types of quick change gearbox may be fitted in place of the two-feed box.

Control of both gearboxes is by two levers as illustrated, lever No. 1 having three positions and lever No. 2 having six positions. By manipulating these levers and fitting the correct change wheels as shown on the nameplate, the full range of threads and feeds are obtained.

The knob situated on the front of the headstock controls the direction of feed, reversing it as

necessary, and a dog clutch (No. 3) is provided so that the leadscrew may be disengaged as this should not be allowed to revolve except when screwcutting.

THE SPINDLE AND HEADSTOCK GEARING MUST BE STOPPED BEFORE ANY OF THE LEVERS CONTROLLING THE GEARBOX ARE MOVED.



		MM. 127		MM. 127			
		X	Y	X	Y		
0.5	A1	35	60	2.0	B1	35	30
0.6	A3	35	60	2.5	B5	35	36
0.75	A5	35	60	3.0	B5	35	30
1.0	A1	35	30	3.5	B5	49	36
1.2	A3	35	30	4.0	C1	35	30
1.25	A5	35	36	5.0	C5	35	36
1.5	A5	35	30	6.0	C5	35	30
1.75	A5	49	36				

SHELL TELLUS OIL 27

THE COLCHESTER LATHE CO LTD								
		1	2	3	4	5	6	
<p>A </p> <p>B </p> <p>C </p>		A		0.005		0.006		0.008
		B		0.010		0.012		0.016
		C		0.020		0.025		0.032
		A	24	22	20	18	16	14
		B	12	11	10	9	8	7
		C	6		5	4.5	4	3.5
		A			80	72	64	56
		B	48	44	40	36	32	28
		C	24	22	20	18	16	14
		A	48	44	40	36	32	28
		B	24	22	20	18	16	14
		C	12	11	10	9	8	7
	X		1	2	3	4	5	6
	39 A	26						
	57 B	19						
	C							

SHELL TELLUS OIL 27 0472

THREAD CUTTING WITH ENGLISH GEARBOX FITTED TO BANTAM EAGLE

1. Threads available from the gearbox

The screwcutting dial on the front face of the apron has four numbered divisions and four sub-divisions. To cut an even number of threads—i.e., 12 t.p.i.—the leadscrew may be engaged at any division. For odd numbered threads—i.e., 13 t.p.i.—the leadscrew may be engaged at any numbered division, and for fractional threads—i.e., $11\frac{1}{2}$ t.p.i.—the leadscrew must be engaged at the same mark at each pass.

2. Threads not available from the gearbox

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

English threads

$$\frac{7 \times Z}{3 \times Y \times \text{T.P.I.}} = \frac{\text{Driver}}{\text{Driven}}$$

Where Y = 1 for lever position A
 2 for lever position B
 4 for lever position C
 and Z = 12 with lever in position 1
 11 " " " " 2
 10 " " " " 3
 9 " " " " 4
 8 " " " " 5
 7 " " " " 6

Example:

It is required to cut 26 t.p.i. With lever Z in position 1 and lever Y in position A.

$$\text{Then: } \frac{7 \times 12}{3 \times 1 \times 26} = \frac{14}{13} = \frac{42}{39} \frac{\text{Driver}}{\text{Driven}}$$

D.P. Threads

$$\frac{22 \times Z}{3 \times Y \times \text{D.P.}} = \frac{\text{Driver}}{\text{Driven}}$$

Where Z and Y have the same values as for English threads.

Example:

It is required to cut 16 D.P. With lever Z in position 5 and lever Y in position B.

$$\text{Then: } \frac{22 \times 8}{3 \times 2 \times 16} = \frac{11}{6} = \frac{55}{30} \frac{\text{Driver}}{\text{Driven}}$$

Metric thread pitches

$$\frac{7 \times P \times Z}{72 \times Y} = \frac{\text{Driver}}{\text{Driven}} \times \frac{120}{127} \text{ (Compounded idler)}$$

Where P = pitch in millimetres to be cut and Z and Y have the same values as for English threads. The result will be compounded with 120 change gears thus:

$$\frac{120}{127}$$

Example:

It is required to cut a 3 mm pitch. With lever Z in position 5 and lever Y in position B.

$$\text{Then: } \frac{7 \times 3 \times 8}{72 \times 2} = \frac{7}{6} = \frac{35}{30} \times \frac{120}{127}$$

This is fitted to the swing frame thus:

$$\frac{35}{127} \times \frac{120}{30}$$

NOTE

When cutting metric thread pitches, the leadscrew halfnut should be engaged when thread cutting is commenced, and should not be disengaged until the thread is completed.

3. Multi Start Threads.

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

1. By repositioning the compound slide one pitch forward for each start. It will be realised however that the accuracy of this method depends upon the operator.
2. By using an accurately divided driver plate and turning the workpiece one division forward for each start.
3. By advancing the driver gear a calculated number of teeth to advance the spindle by one pitch of the thread to be cut. The accuracy of this method is that of the machine. In order to use this method a driver wheel should be used in which the number of teeth is a factor of the number of starts to be cut.

Example:

To cut a 6 start thread with 36T gear in the driver position:—

- (i) Cut one start.
Dividing 6 into 36 gives 6 which is the number of teeth to move the driver gear to obtain each subsequent start.
- (ii) Mark the meshing tooth on all gears, then remove the idler gear.
- (iii) Turn the driver gear through the calculated number of teeth and replace the idler gear, making sure that the meshing marks on the idler and driven gears correspond exactly.
- (iv) Cut the next start and repeat for each remaining start.

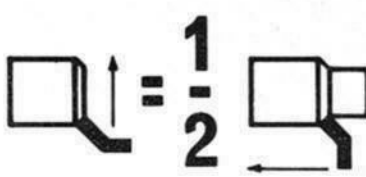
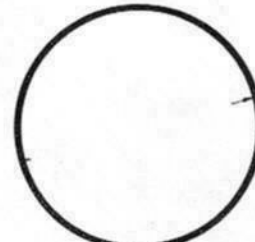

THREAD CUTTING WITH CONTINENTAL GEARBOX FITTED TO BANTAM CONDOR

1. Threads available from the gearbox

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

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

		1"		1"		0.468		MM.			
		X	Y	X	Y	X	Y				
35	A1	60	45	20	C1	28	30	0.3	C1	1.25	C3
4	A1	35	30	22	B5	35	55	0.4	B5	1.5	C1
5	A1	28	30	24	C5	35	30	0.5	B3	1.75	B6
6	A5	35	30	28	B5	30	60	0.6	B1	2.0	B5
7	B1	60	45	32	B6	30	60	0.7	A6	2.25	B4
8	B1	35	30	36	C5	35	45	0.8	A5	2.5	B3
9	A5	35	45	40	B6	30	75	0.9	A4	2.75	B2
10	B1	28	30	44	C5	35	55	1.0	A3	3.0	B1
11	A5	35	55	48	C5	35	60			3.5	A6
12	B5	35	30	56	C5	30	60			4.0	A5
14	C1	60	45	60	C5	35	75			4.5	A4
16	C1	35	30	64	C6	30	60			5.0	A3
18	B5	35	45	80	C6	30	75			5.5	A2
										6.0	A1
		127 X 120 Y		127 X 120 Y		33 120 45		120 55 100 18			
SHELL TELLUS OIL 27											

THE COLCHESTER LATHE CO. LTD.		1	2	3	4	5	6	
<p>A </p> <p>B </p> <p>C </p>	35	A	0.35		0.30			0.20
	120	B	0.20		0.15			0.10
	60	C	0.10		0.07			0.05
	35	A	3.0		2.5		2.0	1.75
	120	B	1.5		1.25		1.0	
	60	C	0.75				0.5	
	35	A	0.70		0.60			0.40
	120	B	0.40		0.30			0.20
	30	C	0.20		0.15			0.10
	120	A	6.0	5.5	5.0	4.5	4.0	3.5
	21	B	3.0		2.5		2.0	1.75
	100	C	1.5		1.25		1.0	
75	A	0.15		0.12			0.08	
120	B	0.07		0.06			0.04	
21	C	0.04		0.03			0.02	
100	A	1.2	1.1	1.0	0.9	0.8	0.7	
75	B	0.6		0.5	0.45	0.4	0.35	
120	C	0.3		0.25		0.2		
SHELL TELLUS OIL 27		1	2	3	4	5	6	

2. Threads not available from the gearbox

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

Metric thread pitches

$$\frac{28 \times P}{3 \times Z \times Y} = \frac{\text{Driver}}{\text{Driven}}$$

Where P = pitch to be cut.

Y = 4 for lever position A.

2 " " " B.

1 " " " C.

and Z = 12 with lever in position 1

11 " " " " 2

10 " " " " 3

9 " " " " 4

8 " " " " 5

7 " " " " 6

Example:

It is required to cut a .75 mm pitch. With lever Z in position 1 and lever Y in position C.

$$\text{Then: } \frac{28 \times .75}{3 \times 12 \times 1} = \frac{7}{12} = \frac{35}{60} \frac{\text{Driver}}{\text{Driven}}$$

Module pitches

$$\frac{88 \times M}{3 \times Z \times Y} = \frac{\text{Driver}}{\text{Driven}}$$

Where Z and Y have the same values as for metric pitches.

Example:

It is required to cut a pitch of 2 mod. With lever Z in position 5 and lever Y in position B.

$$\text{Then: } \frac{88 \times 2}{3 \times 8 \times 2} = \frac{11}{3} = \frac{66}{18} \frac{\text{Driver}}{\text{Driven}}$$

As this cannot be accommodated on the swing frame it is necessary to compound the train thus:

$$\frac{55}{18} \times \frac{120}{100}$$

English threads

$$\frac{224}{Z \times Y \times \text{t.p.i.}} = \frac{\text{Driver}}{\text{Driven}} \times \frac{127}{120} \text{ (Compounded idler gear)}$$

Where Z and Y have the same values as for metric pitches.

Example:

It is required to cut 10 T.P.I. With lever Z in position 1 and lever Y in position B.

$$\text{Then: } \frac{224}{12 \times 2 \times 10} = \frac{28}{30}$$

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

$$\frac{28}{30} \times \frac{127}{120}$$

and is fitted to the swing frame thus:

$$\frac{28}{120} \times \frac{127}{30}$$

When using any of the above formulae for both English and Continental gearboxes there is no set rule as to the lever positions to be used. It is normal, however, to use lever positions which give a standard thread or pitch through the gearbox which is close to the special thread or pitch required where possible.

Multi Start Threads

These may be cut in exactly the same way as previously described for the English gearbox.

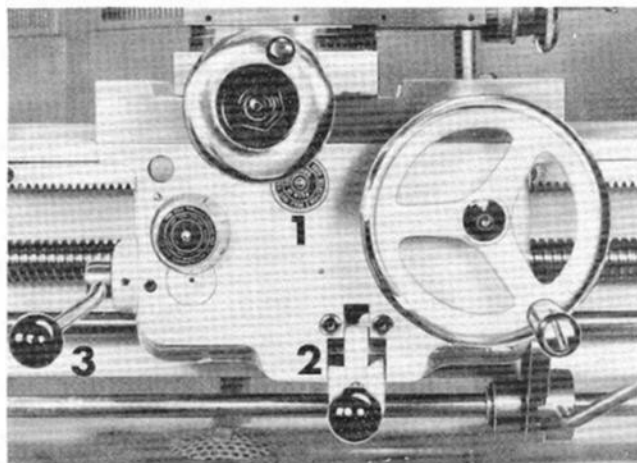
NOTE. Whichever method is used, the leadnut should be engaged to cut the first thread and not released until all starts have been completed.

APRON

Surfacing and sliding feeds are selected by a plunger (1). Surfacing feeds are obtained with the plunger fully extended and sliding feeds with the plunger fully depressed. The feeds are engaged by lever (2) which incorporates a safety device to prevent overloading. This device also allows the use of feed stops which automatically disengage the feed mechanism on contact with a pre-set limit stop.

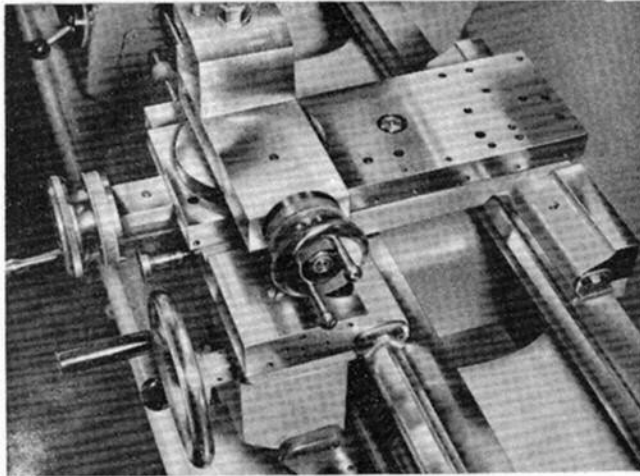
When screw cutting the lead nut is controlled by lever (3).

The screw cutting and feed engagement levers are fully interlocked to prevent simultaneous engagement.



SADDLE AND SLIDES

The saddle is secured to the bed by adjustable gibs at the front and rear and can be locked on the bed in any position. The slides carry large diameter micrometer dials graduated in 0.001in or 0.02mm divisions. The compound slide is radially graduated 90° - 0° - 90° each side for accurate setting. A front toolholder is fitted as standard equipment. As an alternative the Colchester quick change toolpost is available as additional equipment.



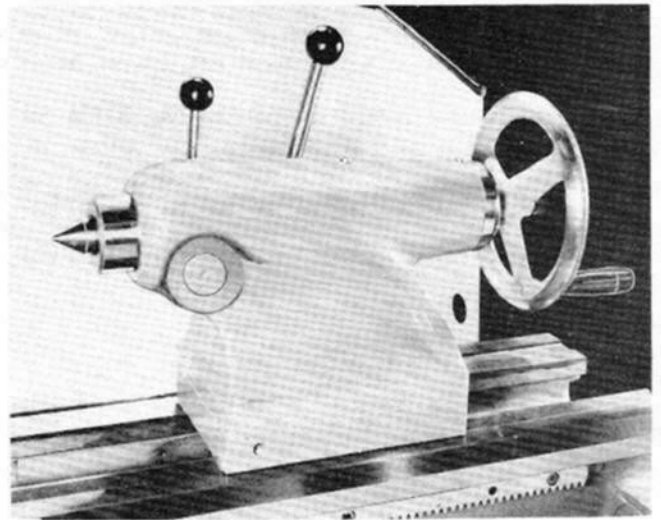
THE BED

The lathe bed should be cleaned down as often as possible by brushing to keep it free from cuttings. Do not use an air line, which will drive chips under the sliding surfaces and blow away the protecting oil film. After each cleaning the bed should be coated with Shell Tellus 27 oil to prevent rust formation.

THE TAILSTOCK

The barrel is graduated in inch and metric divisions and induction hardened both in the No. 3 morse taper bore and on the outside diameter. All standard tang drills are driven by the tang and eject at zero graduation. A tool height indicator line is stamped on to the front face of the nose chamfer to assist in setting tools to the correct centre height when a workpiece is being held between centres.

There are two parts to the tailstock casting, the base proper which slides along the bedways and the tailstock body which may be moved laterally on the base. This movement or "setting over" allows shallow tapers to be turned without the need of a special taper-turning attachment. The tailstock is set over by first releasing the bedway clamp lever and adjusting the two set-over screws fitted for this purpose. THE TWO SPRING-LOADED SHOULDER BOLTS HOLDING THE BASE TO THE MAIN CASTING DO NOT REQUIRE SLACKING OFF AT ANY TIME. Quick lever clamping is employed to lock the assembly in position on the bedways. The tailstock barrel is locked by a lever-operated clamp.



ACCESSORIES

A comprehensive range of accessories is available for the Colchester Bantam lathe, specifically designed for the machine and engineered for simplicity, robustness and reliability.

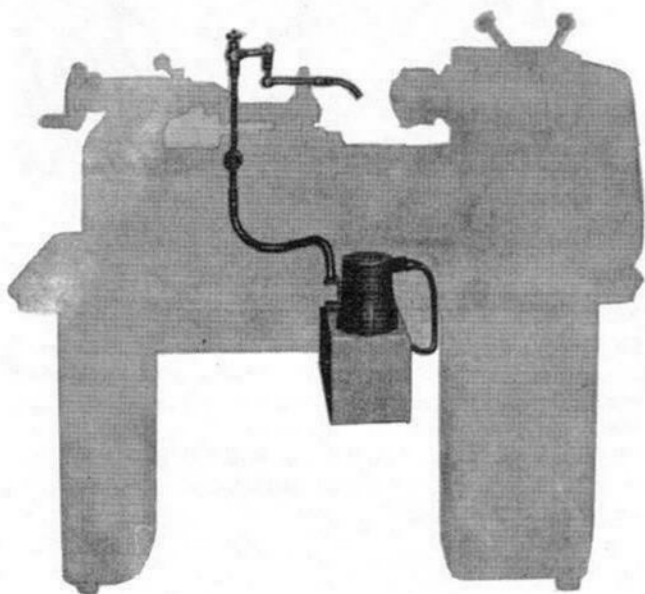
A brief list of these is given below and more detailed information on certain items is given in subsequent pages. All these accessories can be fitted to the machine after it has left the works.

5-station hand-operated inclined head capstan slide with adjustable rotating stops and maximum working stroke of 4½ in. bored to receive ¾ in. dia. shank toolholder	661	Flexible round bore E Type collets for 'Multi-size' collet chuck: each having ½ in. capacity in steps from 1/16 in. to 1½ in. Price each also suitable for hexagonal bore up to 1¼ in. AF	653
5-station capstan slide as above with maximum working stroke of 114 mm bored to receive 20 mm dia. shank toolholders	686	Jacobs type drill chuck with 3 M.T. arbor 0-½ in. capacity	622
Colchester type No. 259 quick change toolpost complete with 4 standard toolholders, 1 vee holder, 1 morse taper holder and 2 wrenches	671	Perspex chuck/chip guard for fitting to lathe bed or saddle	664
Additional standard toolholders No. 83116 for above	672	Single-type bed stop	697
Additional vee holders No. 83117 for above	673	Micrometer bed stop	695
Additional morse taper holders No. 83118 for above	674	5-position turret type bed stops for automatic cut-out on cross feeds	624
Rear toolposts	646	5-position turret type bed stops for automatic cut-out on longitudinal feeds	625
125 mm dia. Burnerd 3-jaw geared scroll D.I. Camlock chuck (no backplate required).	601	Electric coolant pump, tank and fittings	608
205 mm dia. Burnerd 4-jaw independent D.I. Camlock chuck (no backplate required).	602	3-point stationary steady 3½ in. dia. capacity	609
Burnerd lever operated 'Multisize' collet chuck for direct mounting on spindle nose, complete with anchor bracket (for details of collets see Code Nos. 653, 665 and 666)	663	50 volt 48 watt low volt lighting for standard A.C. supply only	610
Burnerd 1½ in. capacity key operated 'Multisize' collet chucks	652	Telescopic taper turning attachment	632
		G.M.T. type 3 RC/I No. 3 M.T. rotating centre	617

THE COOLANT SYSTEM

The coolant tank and pump unit is attached to the underside of the tray at the rear of the machine. A return pipe from the centre of the tray takes the coolant back to the tank and a gauze strainer is fitted to the pipe at tray level to ensure that no swarf is returned to the tank. The flexible piping supplied with this unit is fully universal and will feed coolant to any required position. The supply of coolant is easily controlled by the leakproof ball type shut-off valve. The whole unit has been designed to eliminate the leaks which are usually inherent in coolant systems.

A start/stop switch is fitted into the top of the pump unit casing.



Soluble oil emulsions

For most work a soluble oil emulsion should be chosen since this will almost always be adequate for the work in hand and will be preferred by the machine operator. When screwing with a die head, tapping, or reaming, some extra coolant applied locally may be required. If much work of this type is contemplated, it may be better to use an emulsion of an extreme pressure soluble oil in the machine sump. A good quality oil of this type will give results equal to neat cutting oil whilst retaining the cleanliness of soluble oil.

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

Shell Dromus Oil B—conventional milky soluble oil mixed with water in the ratio 25/30:1.

Shell Dromus Oil D—translucent soluble oil mixed with water in the ratio 40:1.

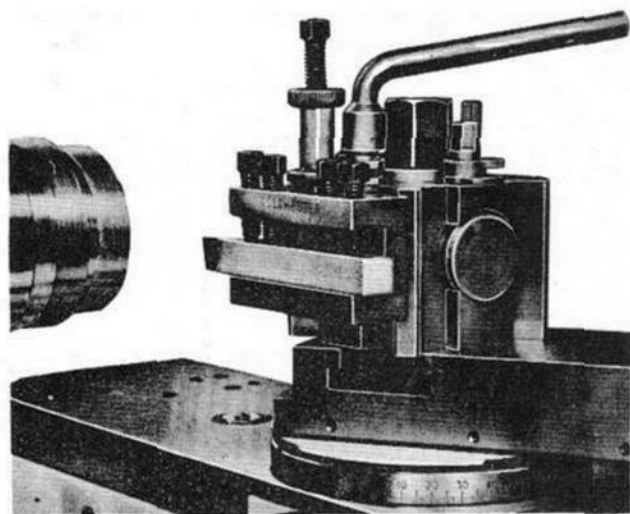
Shell Dromus Oil 908—extreme pressure oil mixed with water in the ratio 10/15:1.

Soluble oils and machine maintenance

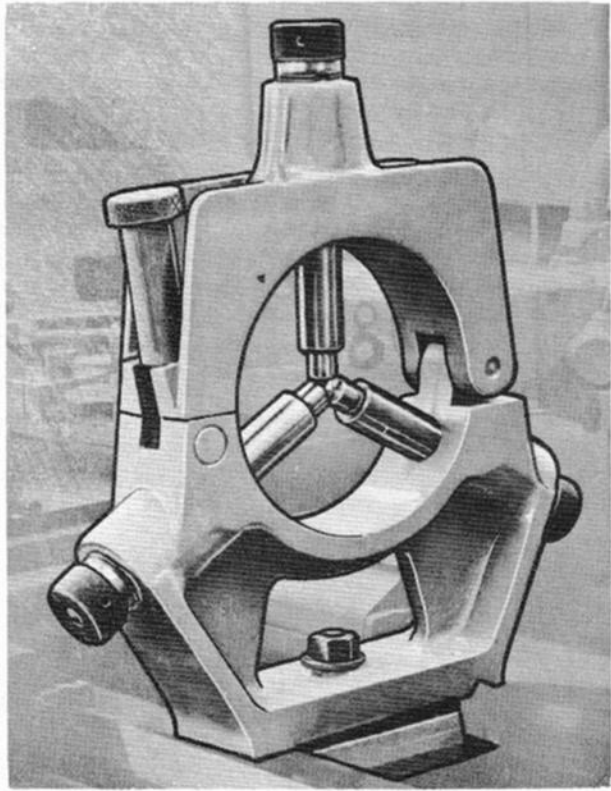
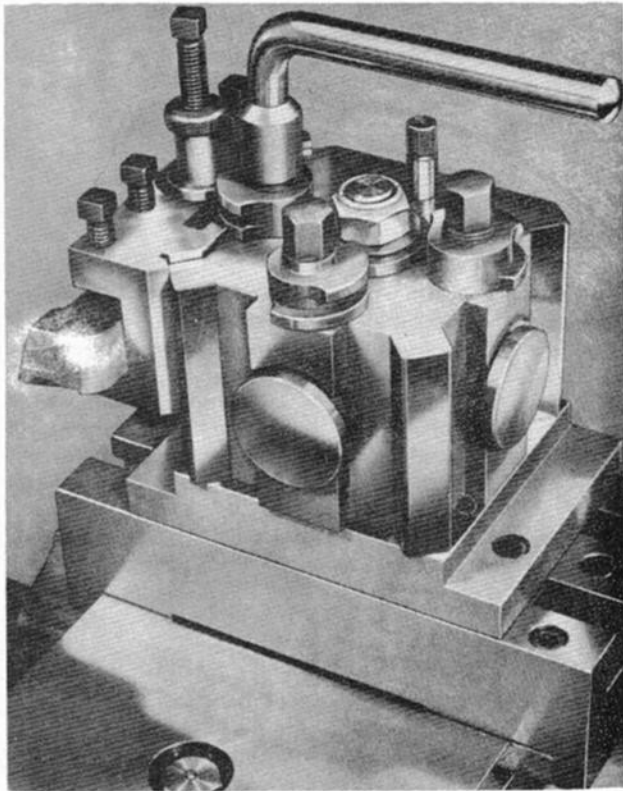
No soluble oil, however good, can completely prevent rust without help from the operator. The machine should therefore be cleaned down regularly and the bright parts wiped over with machine oil. It should never be left, especially over weekends or holidays, with wet swarf on the bed or slides. When the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

COLCHESTER QUICK CHANGE TOOLPOST

This type of toolpost may be fitted to existing standard slotted topslides without alteration. It enables any number of toolholders to be used and any lathe operation to be carried out. Designed to cut down time on repetition work, the Colchester Quick Change Toolpost is outstanding in its versatility and ease of use. It consists of a basic clamping head to which a variety of toolholders may be fitted.



Each toolholder has a vertical adjusting screw and when a tool in its holder has been set to centre height it may be removed and replaced any number of times in the sure knowledge that the tool will be at exact centre height each time it is returned to the clamping head.



Three types of toolholder are available.

The standard toolholder will accommodate all normal types of tool up to a maximum size of $\frac{3}{4}$ in. x $\frac{1}{2}$ in. (19 mm x 12.5 mm). The vee toolholder will accommodate boring tools with parallel shanks up to $\frac{5}{8}$ in. (16 mm) diameter. A morse taper holder is also available suitable for all tools having a No. 1 M.T. shank.

STATIONARY STEADY

Of extremely rigid design and having a maximum capacity of $3\frac{1}{2}$ " (89mm) bar diameter, this attachment is rapidly clamped on to the bed by a plate and bolt and easily removed when not required.

The top section is locked by a knurled screw and the adjustable fingers are fitted with replaceable sintered bronze press-fit inserts.

REAR TOOLPOST

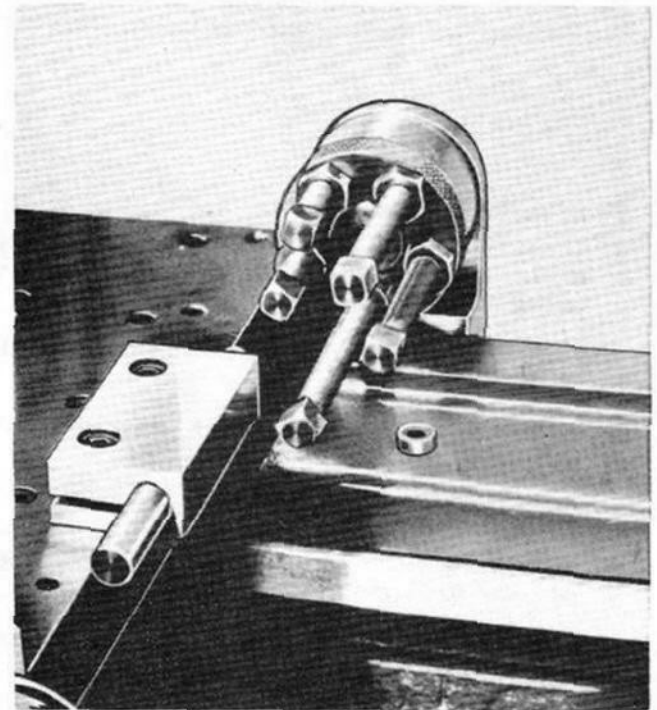
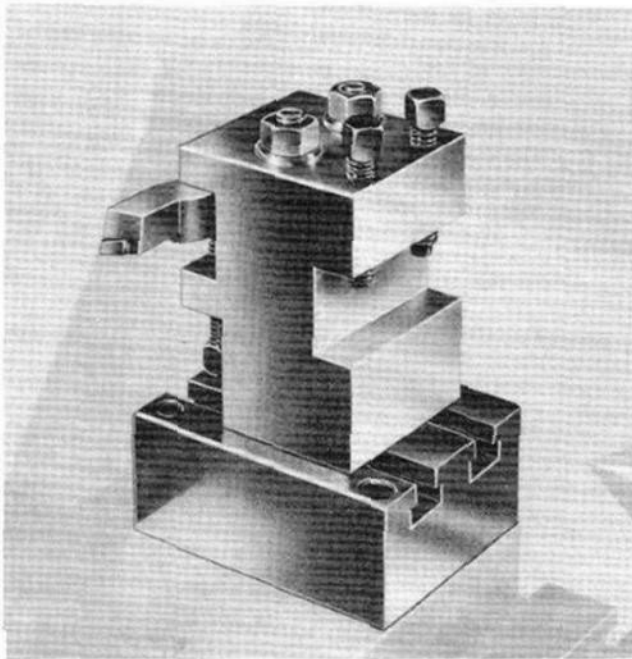
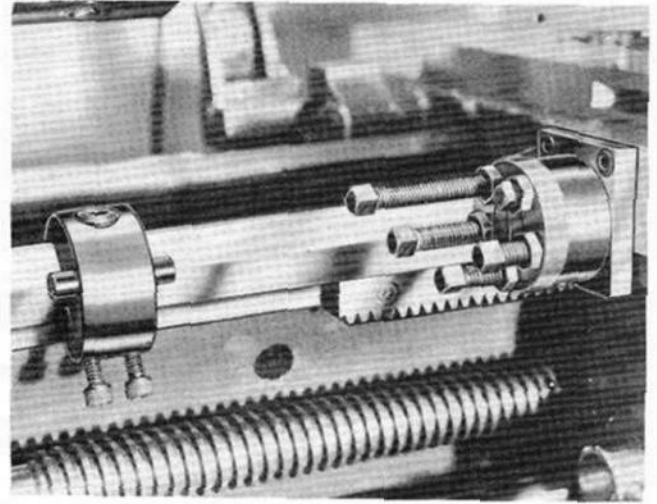
As an aid to production, a rear toolpost is available for fitting direct to the cross slide which is drilled and tapped ready to receive it.

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

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

Supplied complete with all the necessary fixing screws, the only fitting required is the physical bolting of the base pad to the cross slide. Tee slots are provided in the base pad so that the toolpost may be adjusted in position on the base. Maximum tool depth that can be accommodated in either position is $\frac{5}{8}$ in. (16 mm).

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



FEED STOPS

To provide an accurate and reliable means of repeating shoulder lengths, single type or five-position type feed stops are available. A five-position stop can also be supplied for repeating diameters.

With these units, the saddle or cross slide can be stopped in any desired position, the feed mechanism in the apron disengaging immediately contact is made.

TELESCOPIC TAPER ATTACHMENT

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

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

The swivel slide is graduated in both radial degrees and ratios of taper on diameter (1 in 3 to 1 in 50). Great sensitivity of control is obtained when setting a taper by the use of the micro adjustment screw.

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

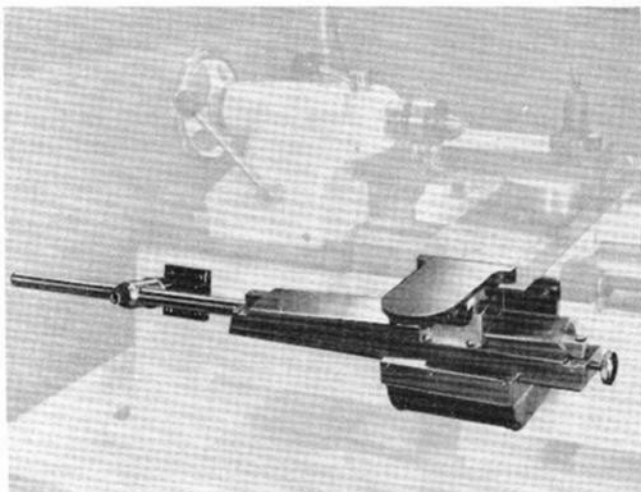
The attachment will deal with a length of 10 in. (254 mm) of taper at any one setting.

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

The fitting of this attachment in no way detracts from the use of the machine as a normal centre lathe. Change-over can be simply accomplished by loosening the connecting rod clamping screw and traversing the saddle towards the headstock to disengage the connecting rod from the clamp. Then remove the anchor bracket from the bed so that there is no obstruction to foul the connecting rod. By replacing the bracket and engaging the connecting rod, the taper turner is rapidly reset for use. Great care should be taken when re-adjusting or altering the fit of the base slide in the taper turner bracket, as any slackness will result in incorrect tapers.

To fit the taper attachment

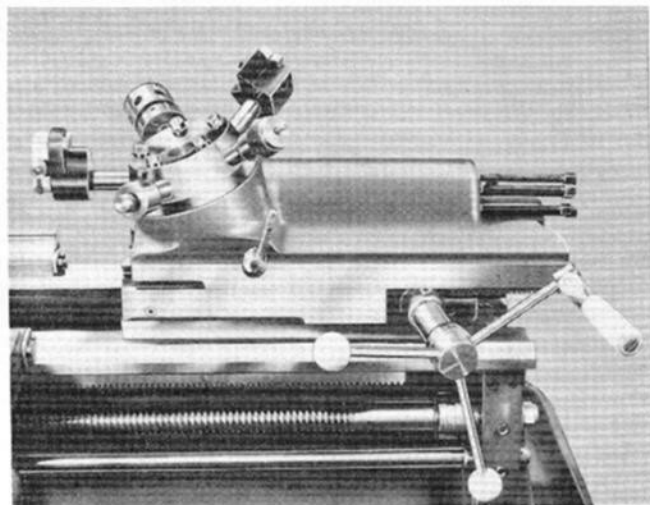
1. The saddle and cross slide are ready drilled to receive the attachment, the necessary holes being drilled and tapped during manufacture.
2. Clean down the rear end of the saddle to receive the taper turner bracket.
3. Release the locknut in the centre of the cross slide handwheel.
4. Slide the cross slide to the rear of the saddle.
5. Remove the saddle screw nut fixing bolt and withdraw the screw and nut from the rear end.
6. Insert the taper turner saddle screw and nut and secure the nut with the fixing bolt.
7. Pull the cross slide forward and engage the saddle screw in the handwheel pinion. (NOTE: The locknut from the original saddle screw is not replaced, but should be retained in case it is needed when refitting the original screw.)
8. The slide block assembly can now be fitted to the thrust block on the rear of the saddle screw assembly. Engage the slides in the bracket and the slide block assembly on the slides. This will enable the bracket to be bolted to the rear of the saddle using the pre-tapped holes provided.
9. Finally, bolt the cross slide extension piece to the rear of the cross slide. Fit the connecting rod to the taper turner slide and the connecting rod clamp to the machined face on the back of the bed.



THE COLCHESTER CAPSTAN UNIT

The five-station, manually operated, inclined head capstan attachment is built on a base plate which utilises the existing tailstock ways of the bed and requires no fitting prior to use.

Having a maximum working stroke of $4\frac{1}{2}$ in. (114 mm), the length of travel can be adjusted for each station by setting the stop screws and the turret slide may be locked in any position by a lever situated at the rear of the attachment. Standard single spindle auto toolholders with $\frac{3}{8}$ in. shanks (or 20 mm shanks if the attachment is supplied with metric bores) are accommodated in the turret which is positioned and locked



after each indexing to an accuracy of 0.0002 in. (0.005 mm) three inches (76 mm) from the turret face. Whilst indexing is normally achieved by returning the slide fully to the right by the handwheel, the turret can be rotated by hand if required.

NOTE: Tooling should be obtained through your usual supplier.

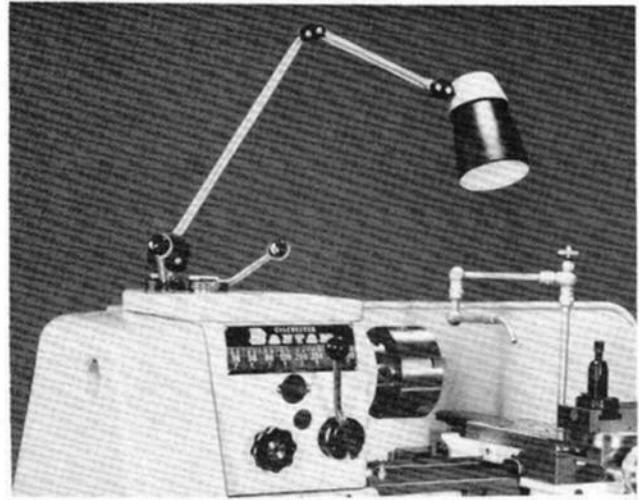
LOW VOLT LIGHTING UNIT

This extremely robust attachment consists of two units:

The light standard, which has a local switch built into the top of the shade, is attached to the back of the headstock by the bracket provided.

The transformer and main switch unit is fitted to the rear of the cabinet pedestal below the headstock.

All electrical connections are made as shown in the wiring diagram.



SERVICING AND MAINTENANCE NOTES

SPINDLE BEARING ADJUSTMENT

The adjustment of the spindle bearing assembly is carefully set before despatch of each lathe from the Works and should, thus, ensure a high standard of performance without the need for further attention.

The user is advised not to disturb this setting during normal use of the machine but to consult our Service Department. In those instances, however, where re-adjustment becomes necessary it is essential that the following procedure is strictly complied with:—

1. Set up a dial test indicator, having 'tenth' divisions (0.0001 in.) with the stylus registered on the nose-end of the headstock spindle. Preferably, locate the stylus centrally on a flat-nosed centre placed in the spindle bore. When the test indicator is set up on the saddle and slides it is advisable to lock the saddle by means of the locking screw before proceeding with the adjustment.
2. Take off the cover from the rear of the headstock and remove the cover plate over the spindle back bearing and screwed collar.
3. The spindle should then be rotated by hand from the back of the headstock whilst pulling and pushing at the nose end so that any end-float present can be read off the test indicator dial.

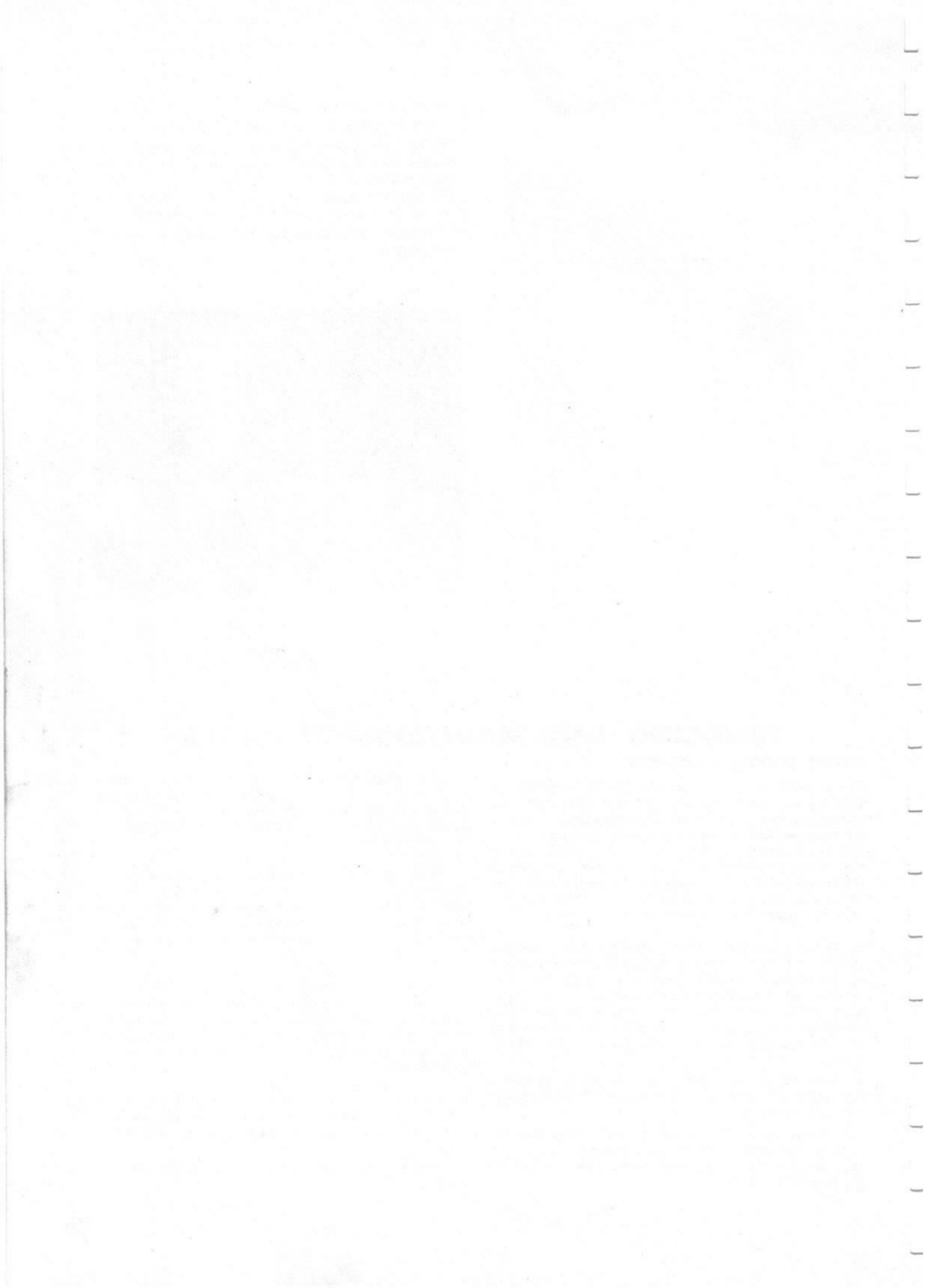
4. The correct setting of the bearings, with the headstock cold, is when the end-float condition does not exceed one ten-thousandth of an inch (0.0001 in. or 0.0025 mm) whilst **THE SPINDLE REMAINS FREE TO BE TURNED BY HAND.**

5. When adjustment is necessary to restore the limited end-float condition, release the locking screw of the screwed adjusting collar and push the spindle forward whilst rotating it in the hand to ensure that the bearing rollers are registering correctly in the bearing inner ring thrust faces.

6. Whilst keeping watch on the indicator dial, tighten the bearing adjusting collar until the excessive end-float is taken up. Now ascertain the end-float by pushing and pulling upon the spindle and make any necessary slight adjustment required to provide the correct setting (maximum 0.0001 in.).

7. Tighten the locking screw of the adjusting collar and, once more, re-check the end-float to be sure that no inadvertent alteration of the setting has taken place.

8. Refit the back bearing cover and replace the end guard.



SPARE PARTS SECTION



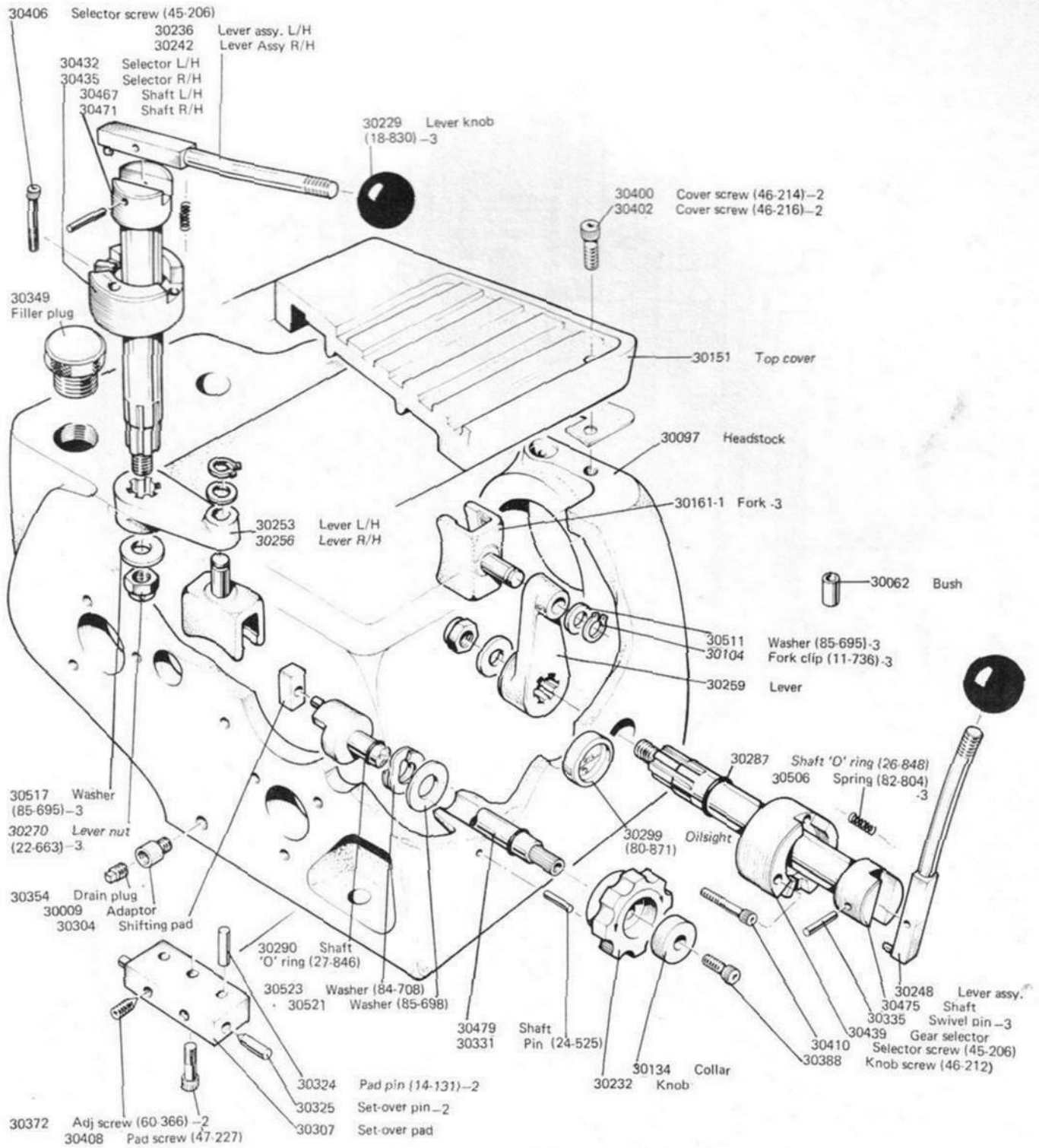
Always quote lathe Serial
Number in all parts orders or
technical enquiries.

This number is stamped into
lathe bed at tailstock end



HEADSTOCK CASTINGS & LEVERS

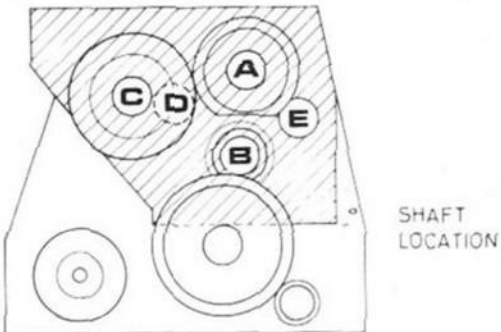
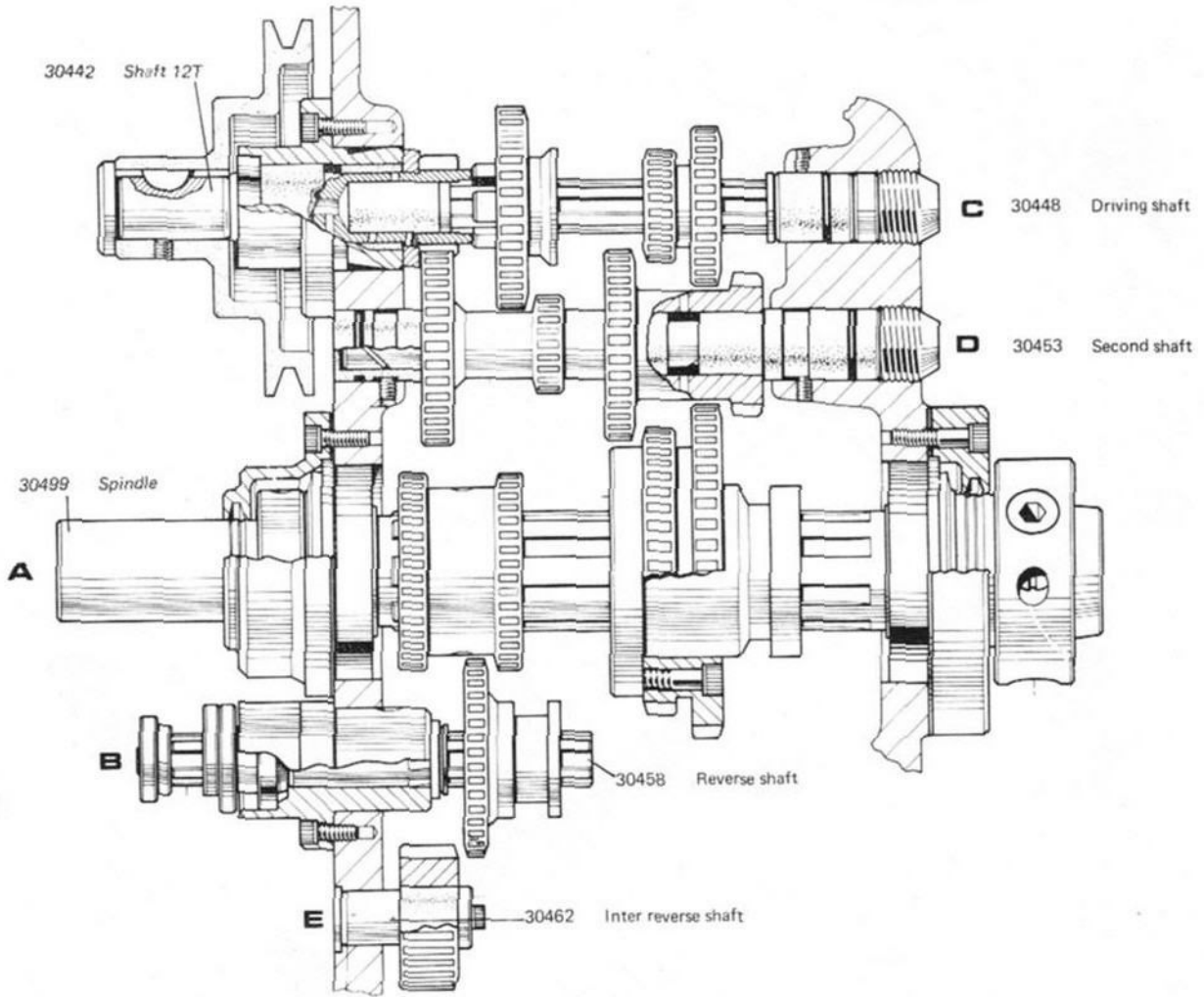
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BAN-02-7008

HEADSTOCK SHAFTS

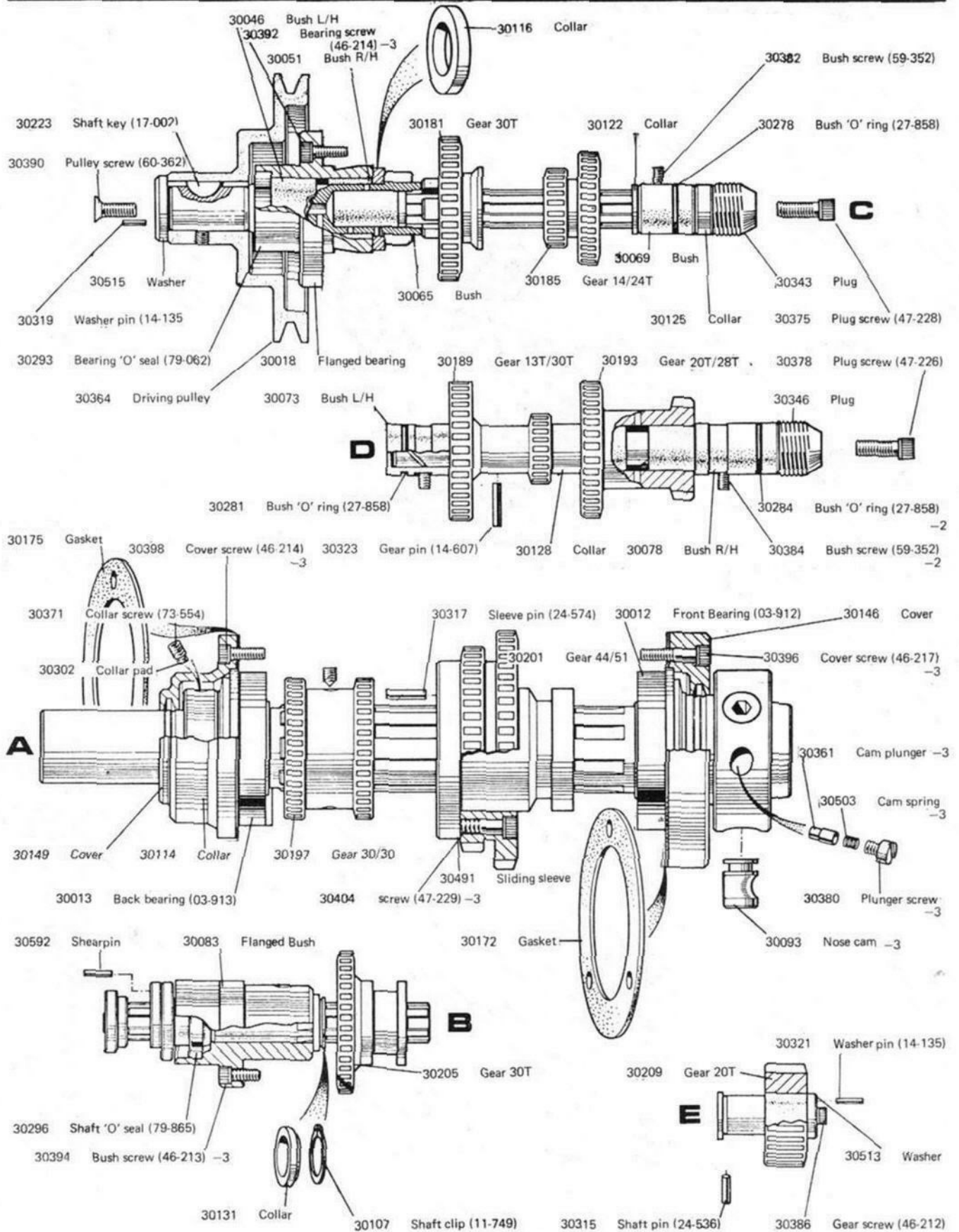
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BAN-01-7008

HEADSTOCK GEARING

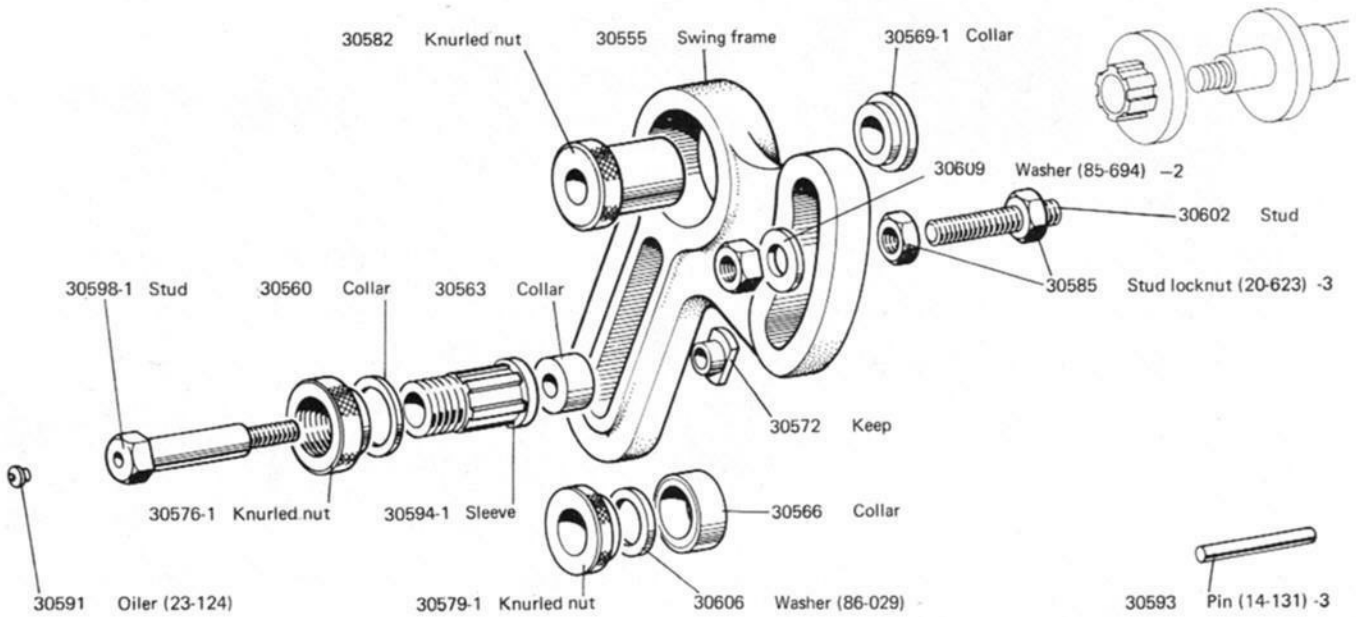
FROM SER. NO. AA 1300
TO SER. NO.



BAN-33-7101

SWING FRAME & CHANGE GEARS

FROM SER. NO. AA 4721
TO SER. NO.



CHANGE GEARS ENGLISH GEARBOX	
LATHE Code	EAGLE
21T	1 OFF
30T	1 OFF
35T	1 OFF
36T	1 OFF
39T	1 OFF
42T	1 OFF
49T	1 OFF
55T	1 OFF
57T	1 OFF
60T	1 OFF
100T	1 OFF
120T	1 OFF
127T	1 OFF
69T	1 OFF

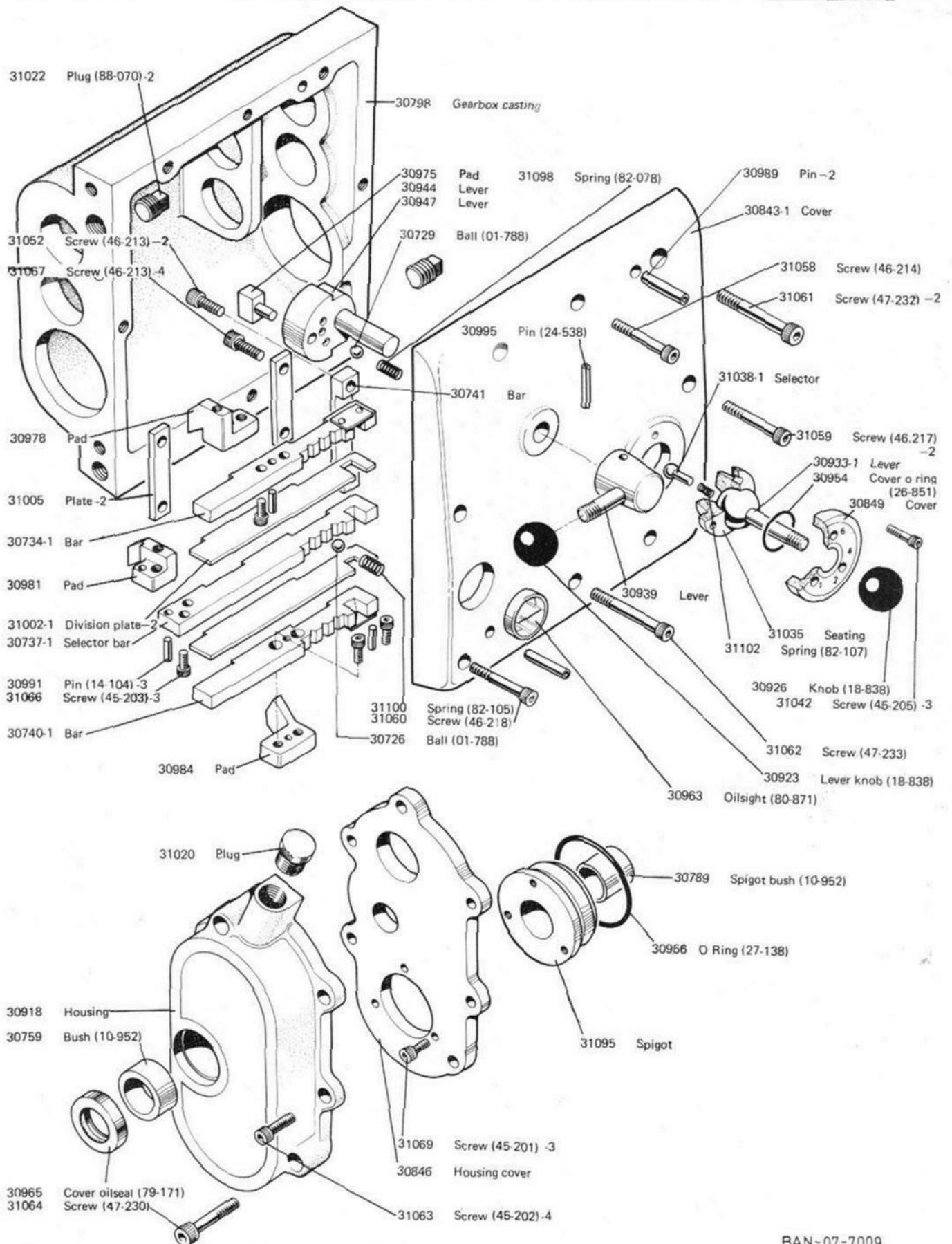
CHANGE GEARS CONTINENTAL GEARBOX	
LATHE Code	CONDOR
18T	1 OFF
21T	1 OFF
28T	1 OFF
30T	1 OFF
33T	1 OFF
35T	1 OFF
45T	1 OFF
55T	1 OFF
60T	1 OFF
75T	1 OFF
100T	1 OFF
120T	1 OFF
127T	1 OFF

30627	18T Change gears
30629	20T Change gears
30630	21T Change gears
30634	25T Change gears
30637	28T Change gears
30639	30T Change gears
30641	32T Change gears
30642	33T Change gears
30644	35T Change gears
30645	36T Change gears
30648	39T Change gears
30651	42T Change gears
30654	45T Change gears
30658	49T Change gears
30659	50T Change gears
30664	55T Change gears
30666	57T Change gears
30669	60T Change gears
30674	65T Change gears
30678	69T Change gears
30679	70T Change gears
30681	72T Change gears
30684	75T Change gears
30696	100T Change gears
30699	110T Change gears
30702	120T Change gears
30708	127T Change gears

BAN-03-7008

GEARBOX GEARS & LEVERS

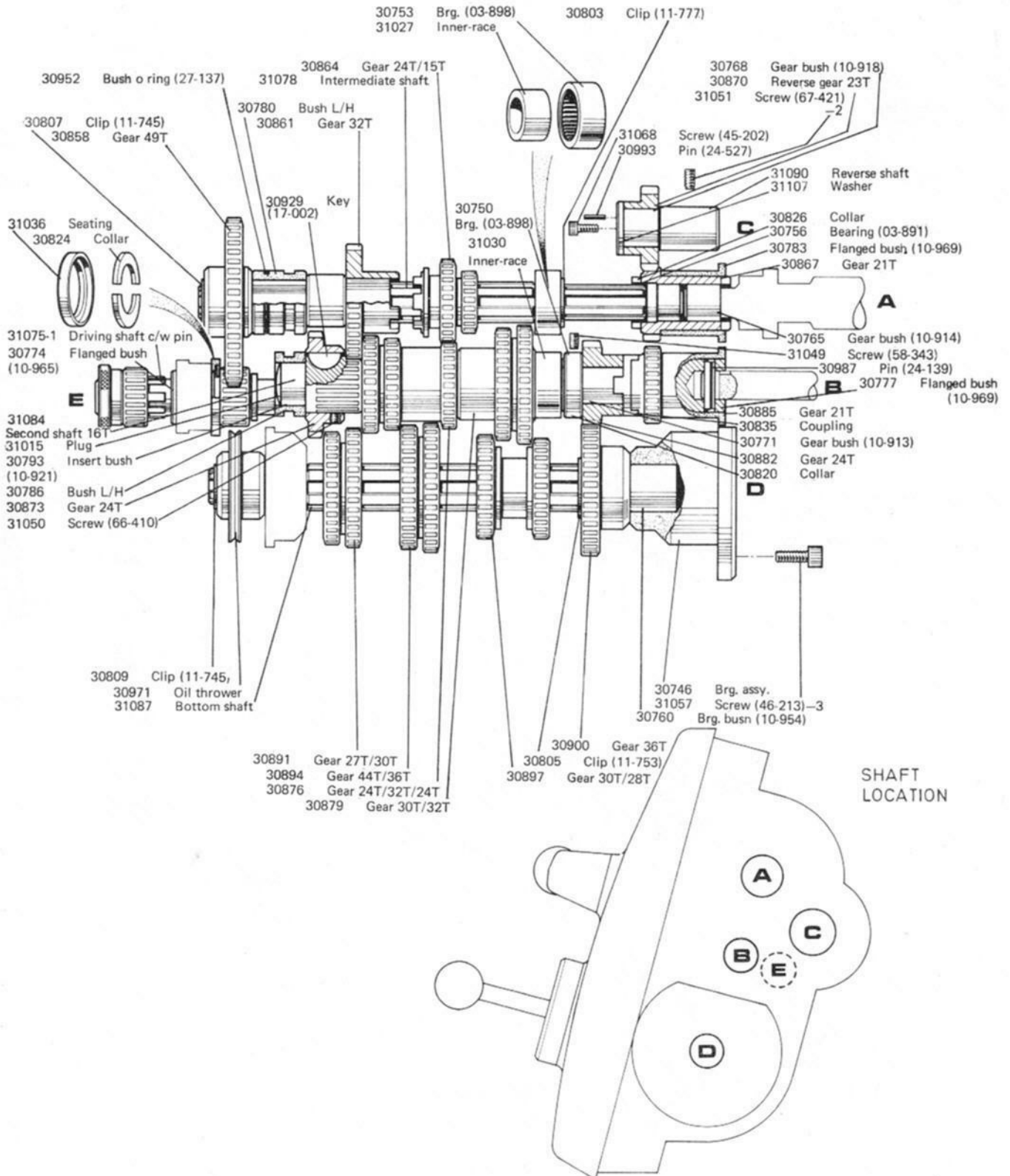
FROM SER. NO. 6449
TO SER. NO.



BAN-07-7009

GEARBOX GEARS & SHAFTS - ENGLISH

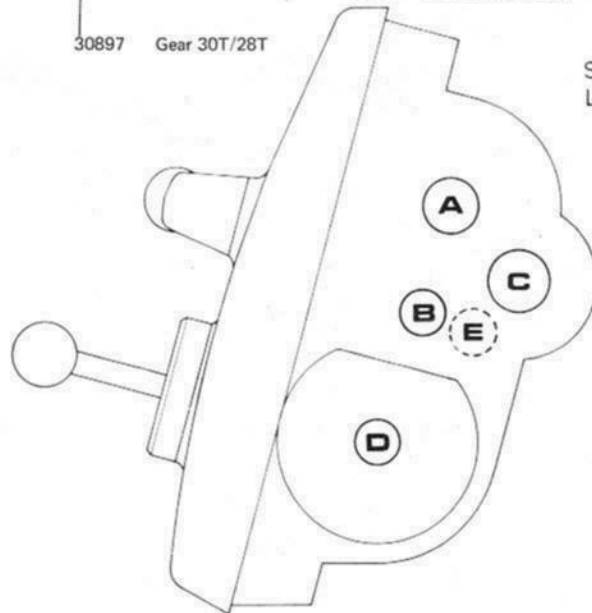
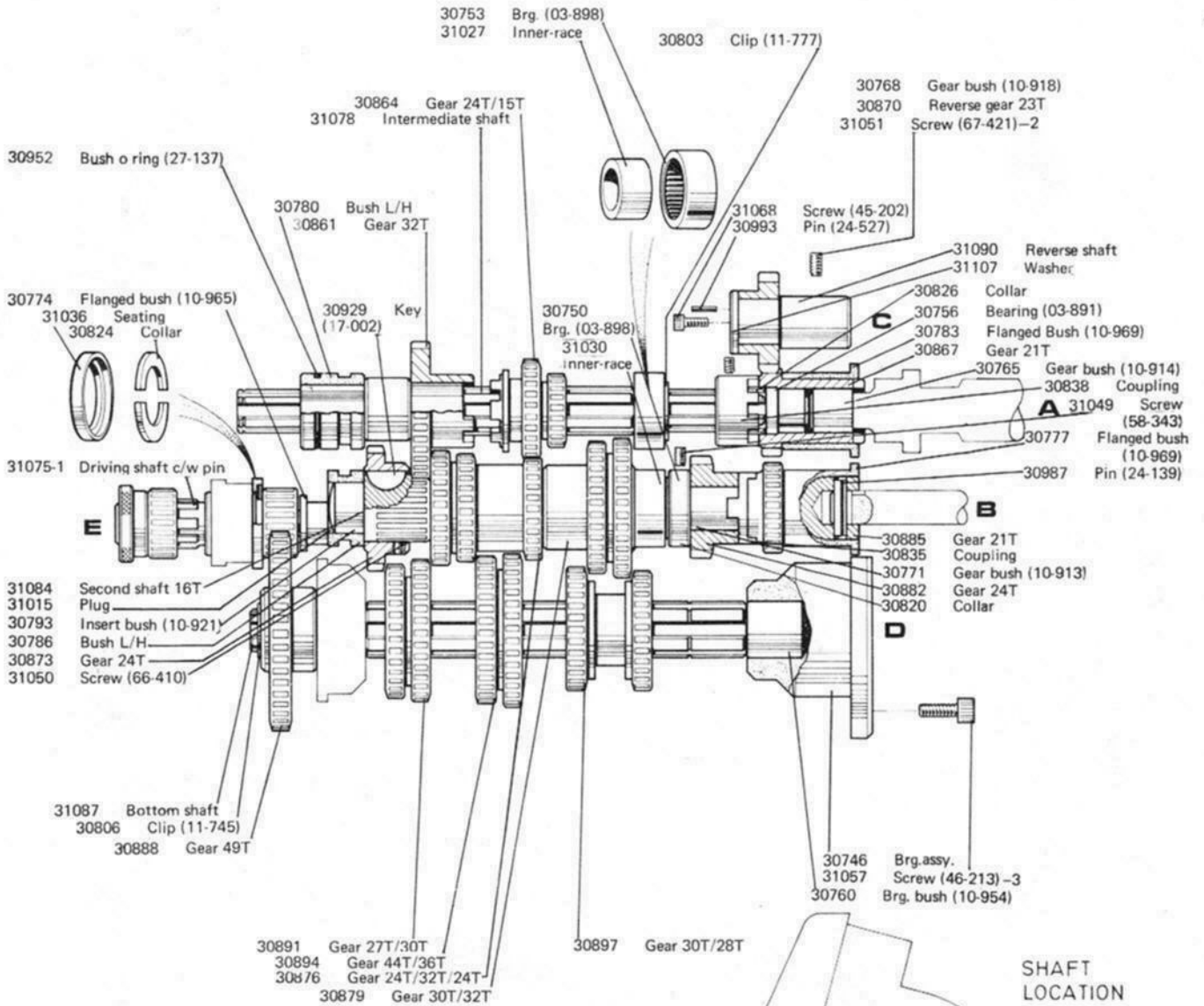
FROM SER. NO. AA 4721
TO SER. NO.



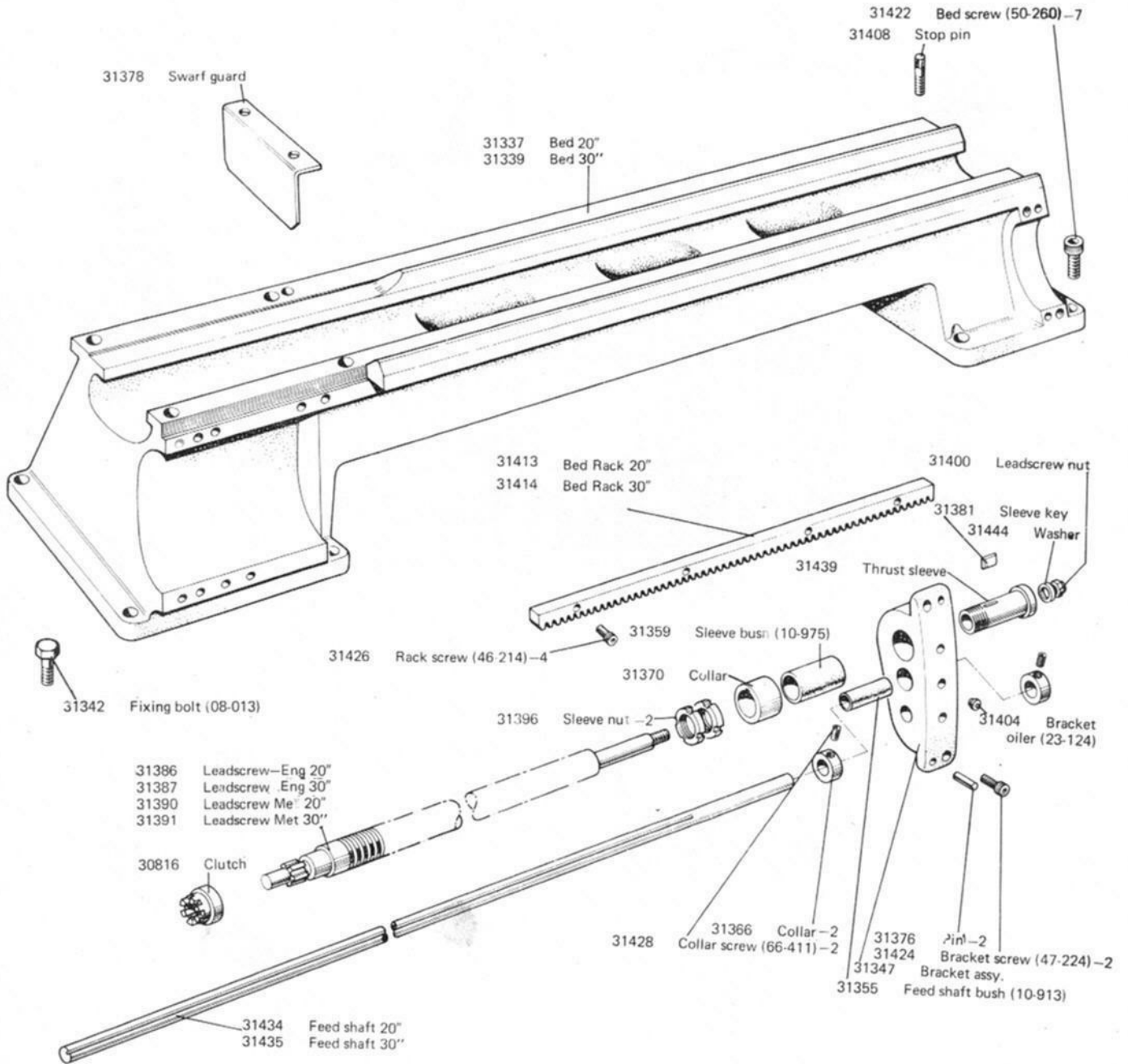
BAN-05-7009

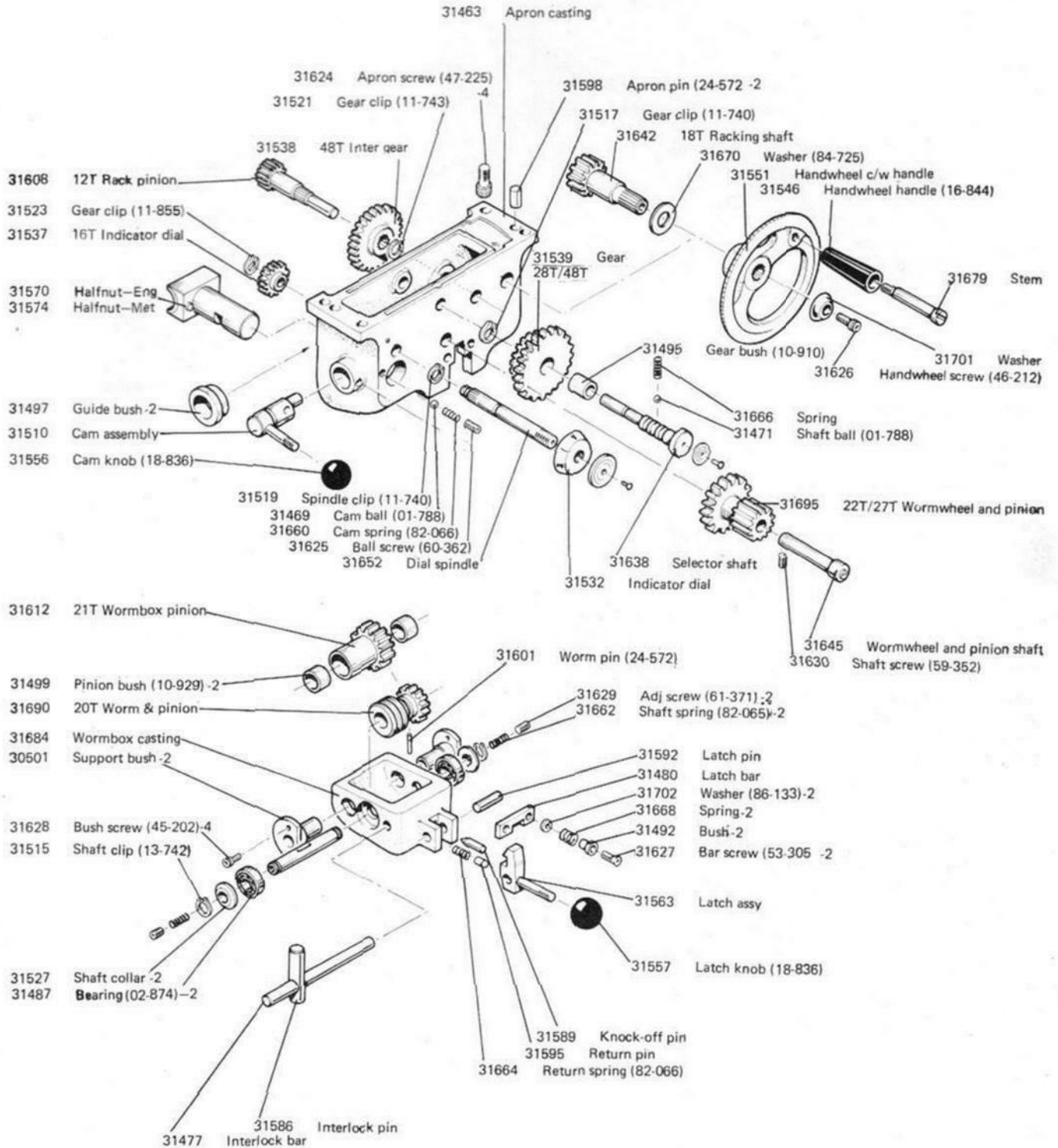
GEARBOX GEARS & SHAFTS - METRIC

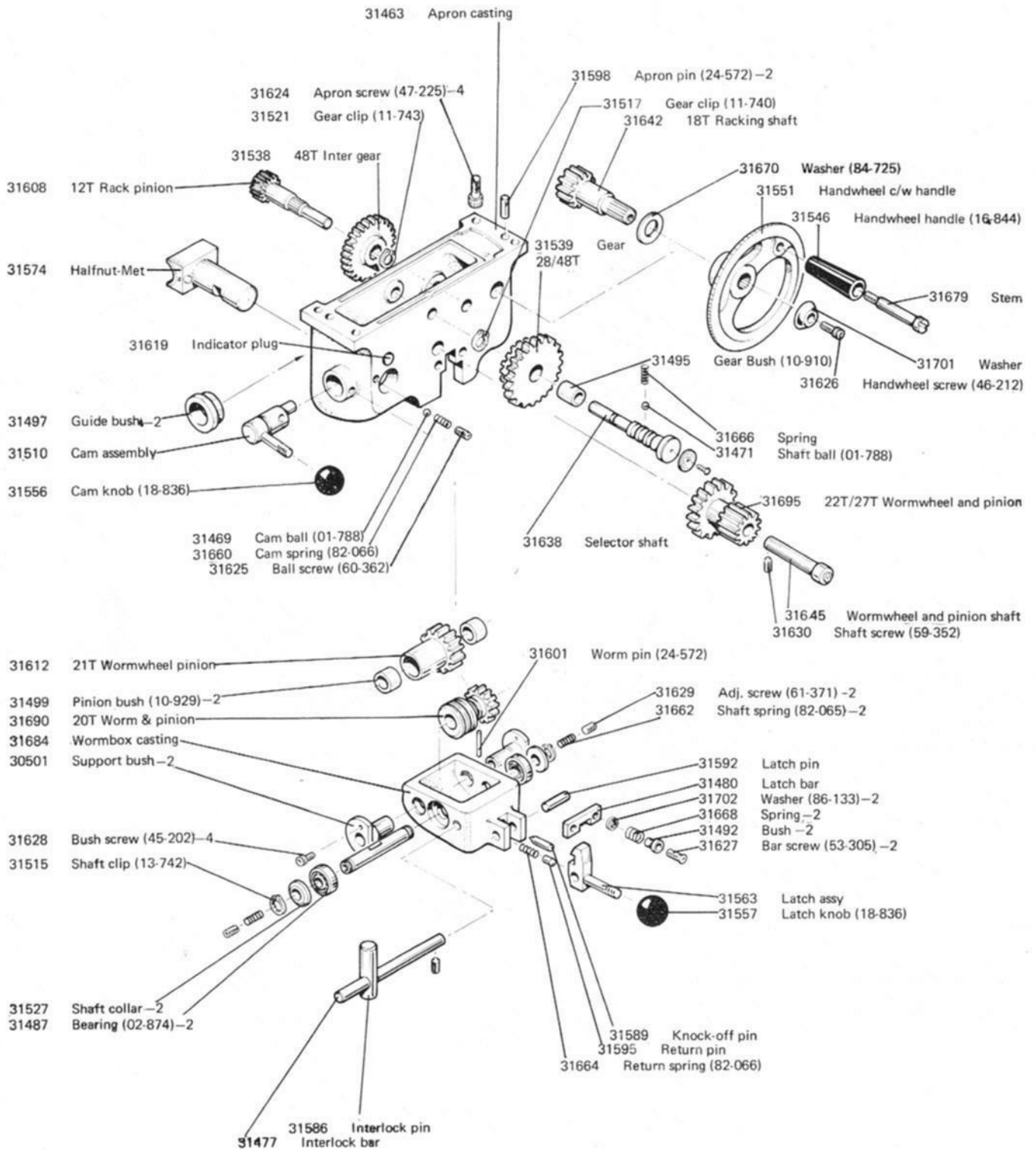
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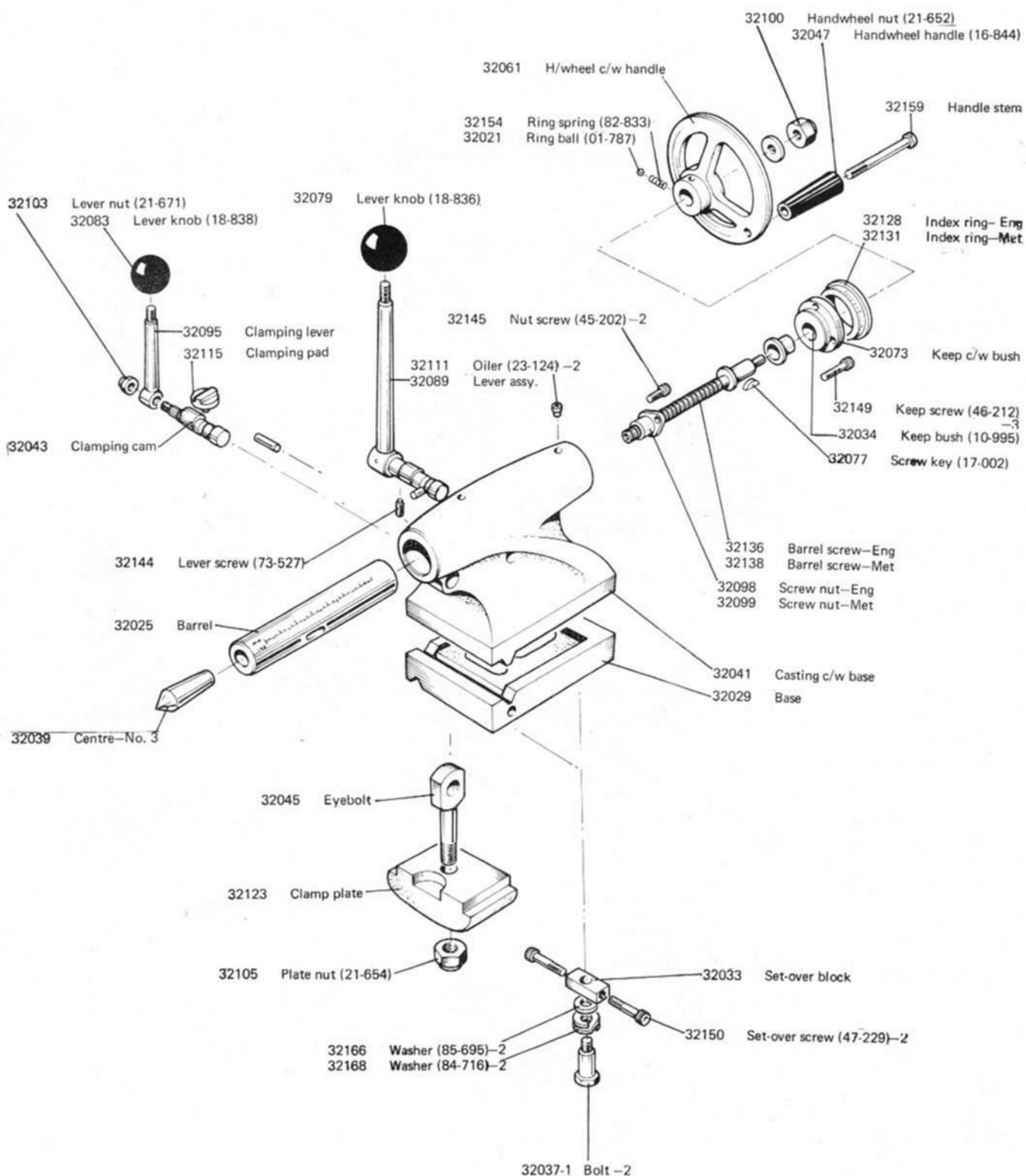


BAN-06-7009



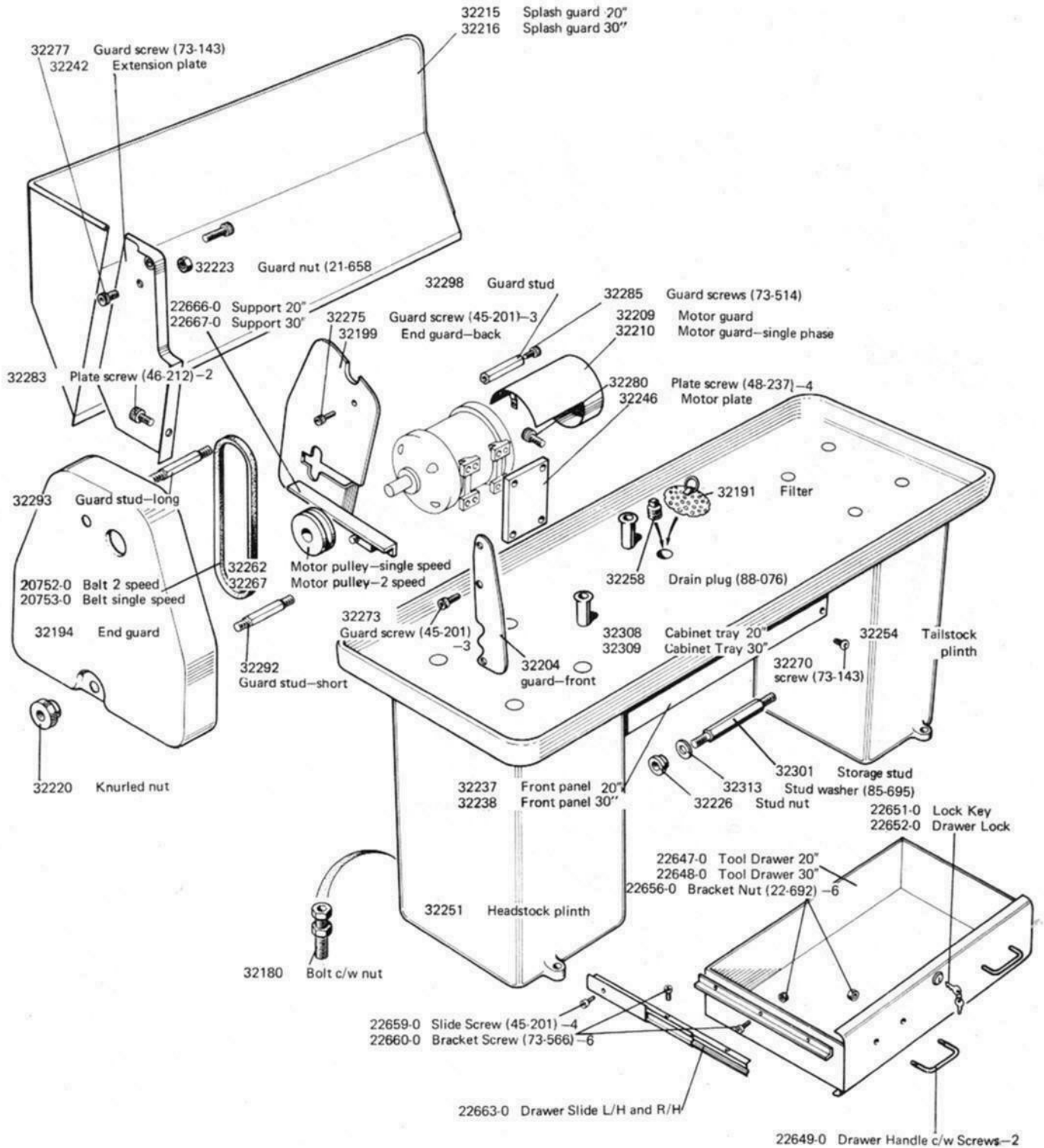






CABINET ASSEMBLY

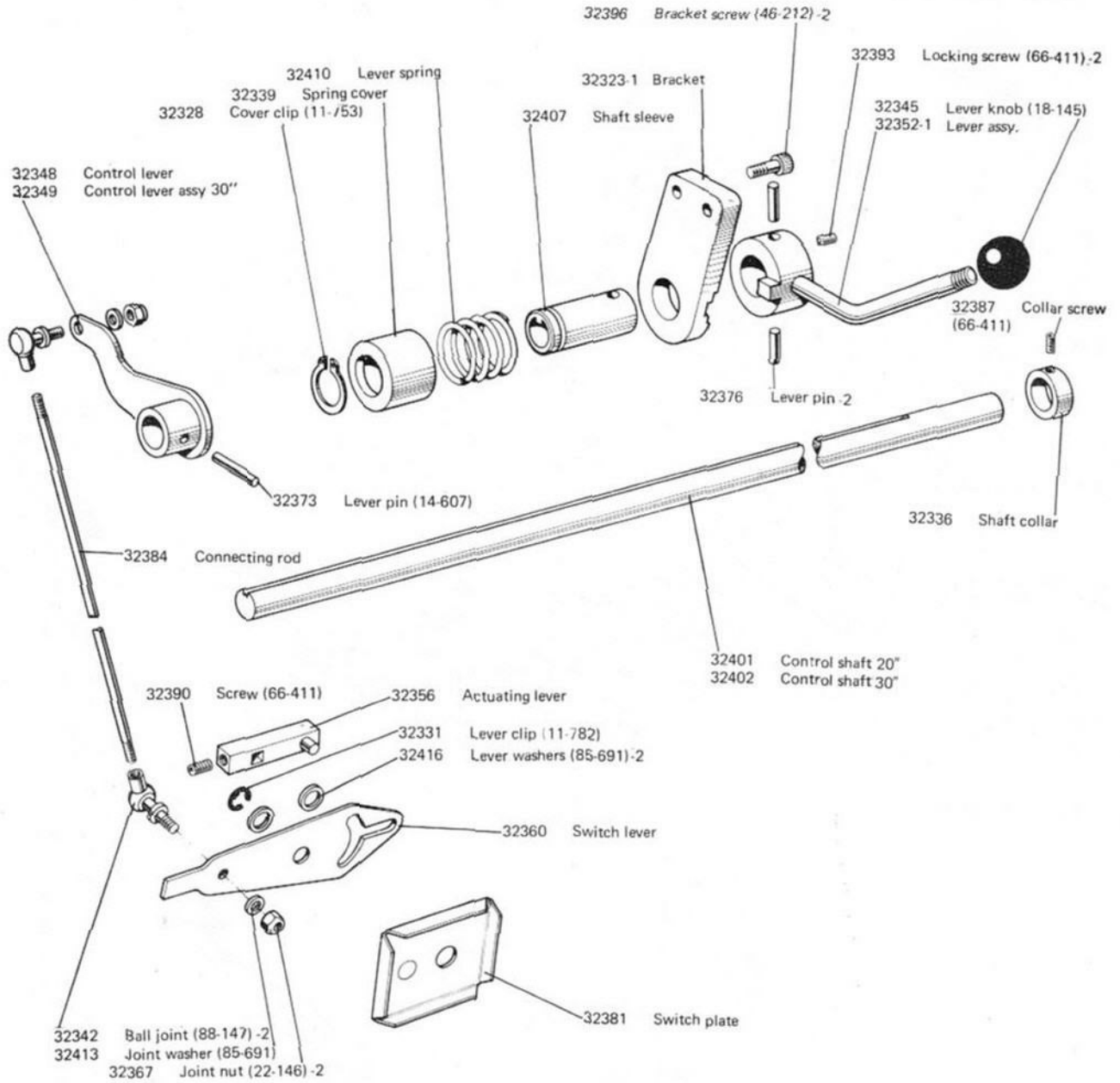
FROM SER. NO. 5058
TO SER. NO.



BAN-13-7008

APRON CONTROL ASSEMBLY

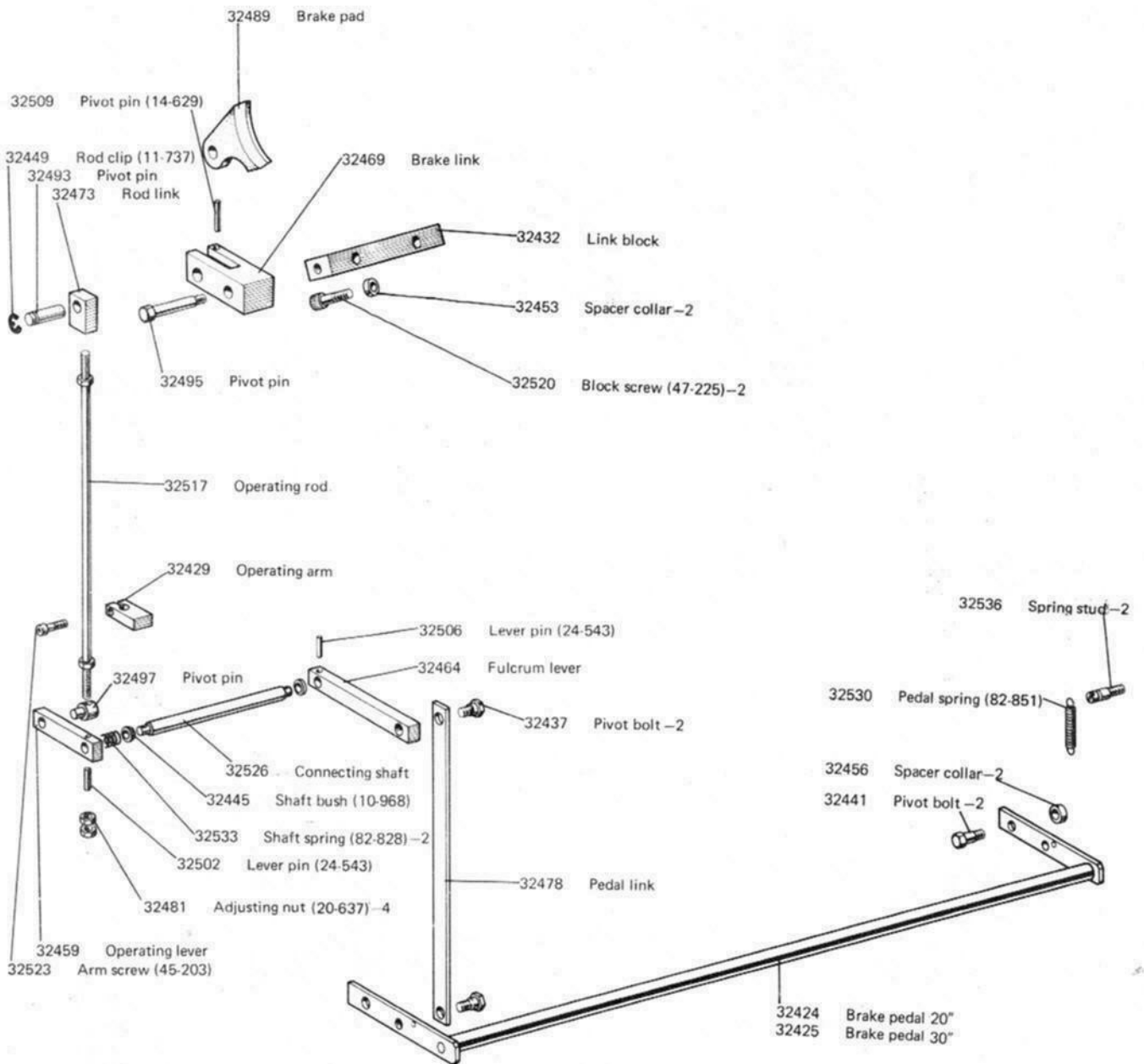
FROM SER. NO. AA 5861
TO SER. NO.



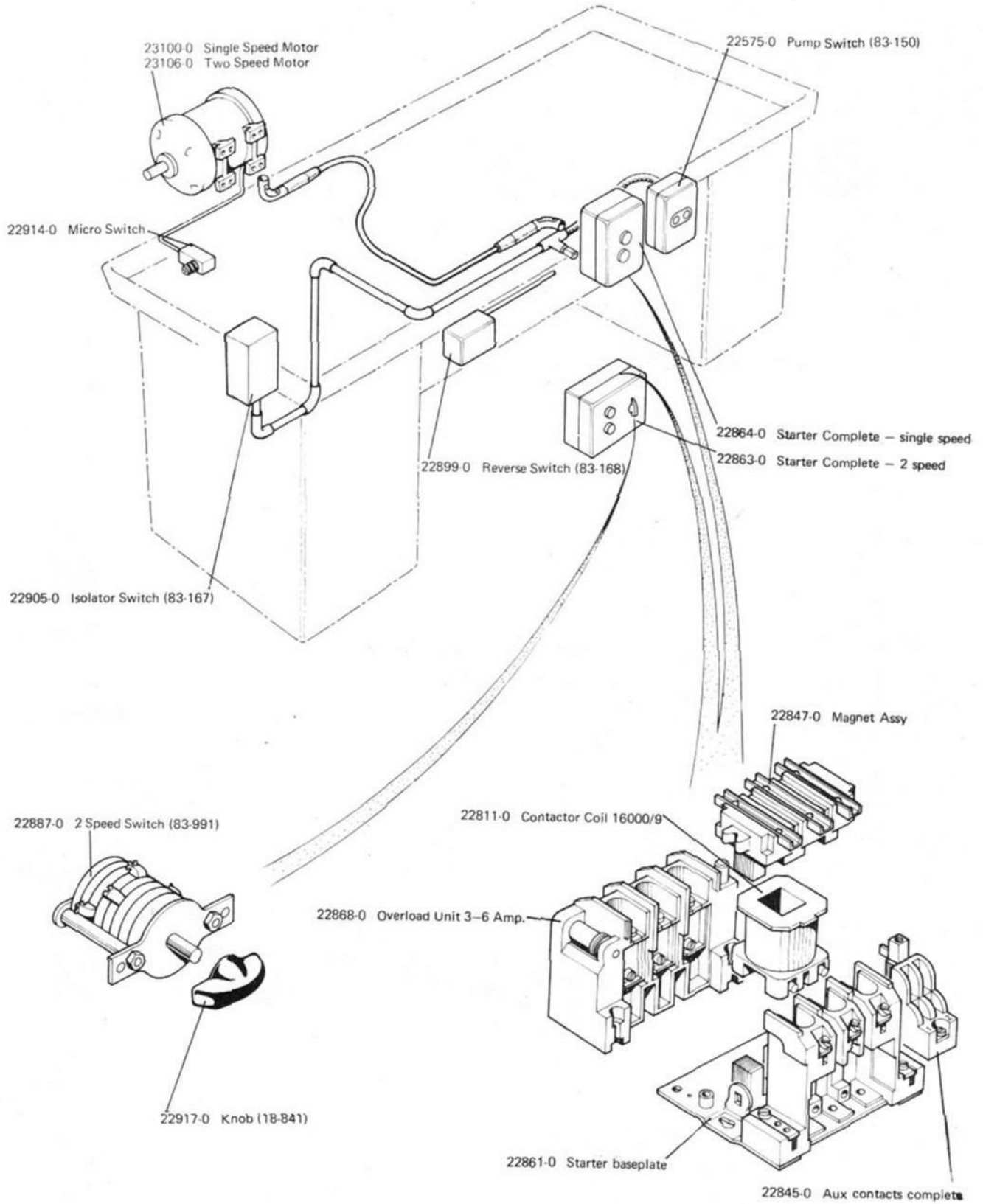
BAN-14-7008

BRAKE ASSEMBLY

FROM SER. NO. AA 5058
TO SER. NO.

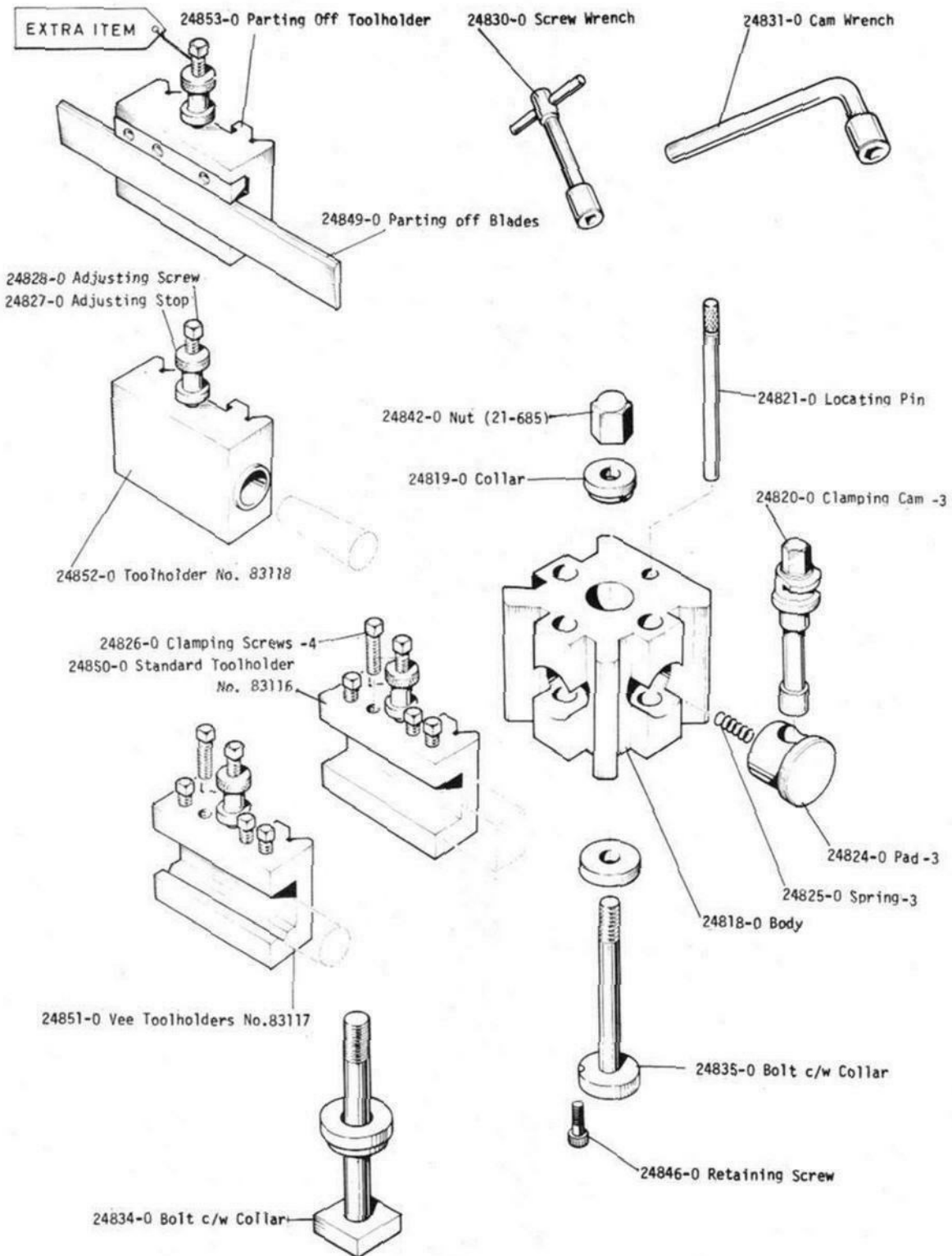


STATE MACHINE SUPPLY VOLTAGE WHEN ORDERING PARTS



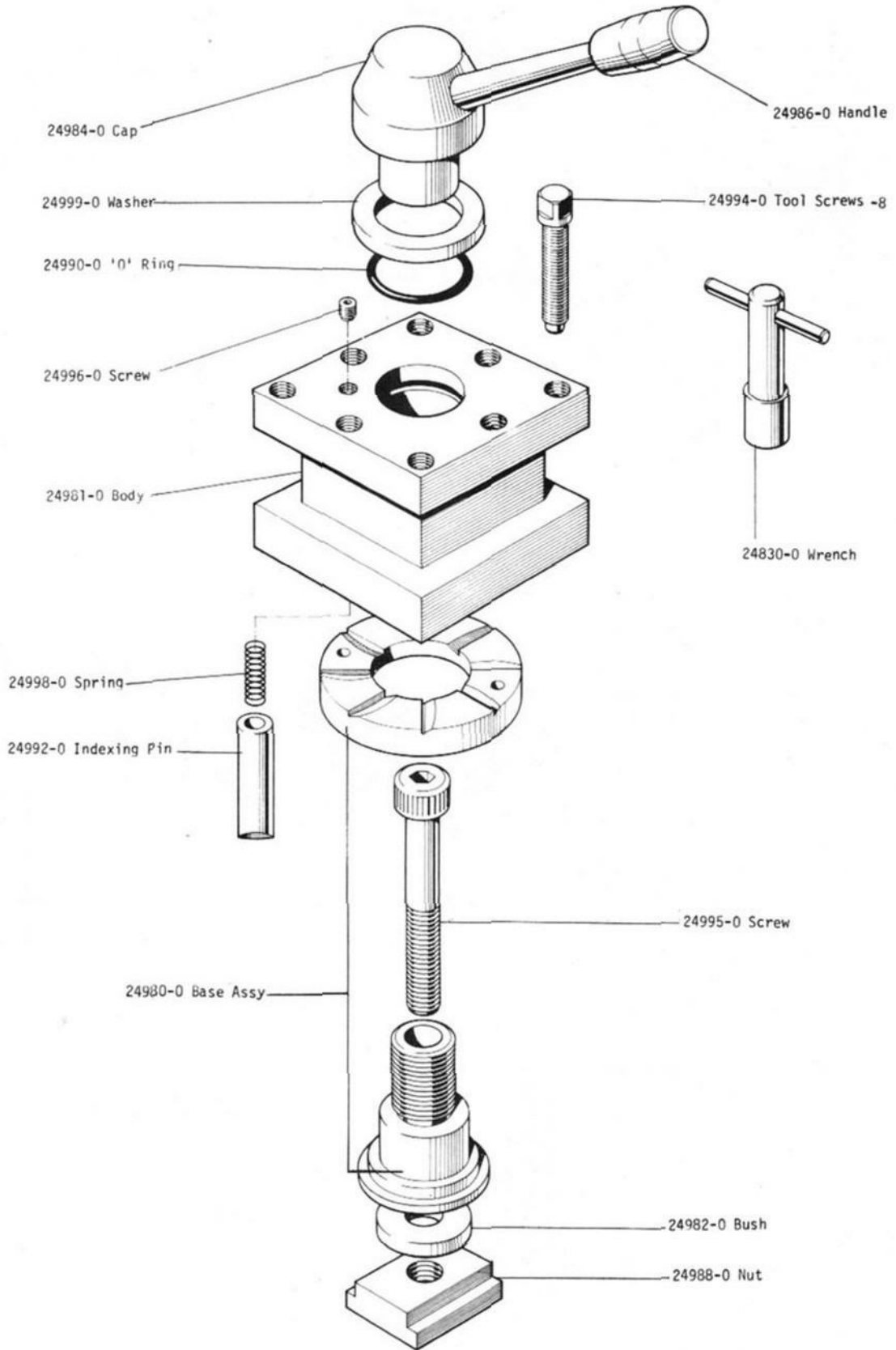
QUICK CHANGE TOOLPOST

FROM SER. NO. AAI
TO SER. NO.



8 POSITION TOOLPOST

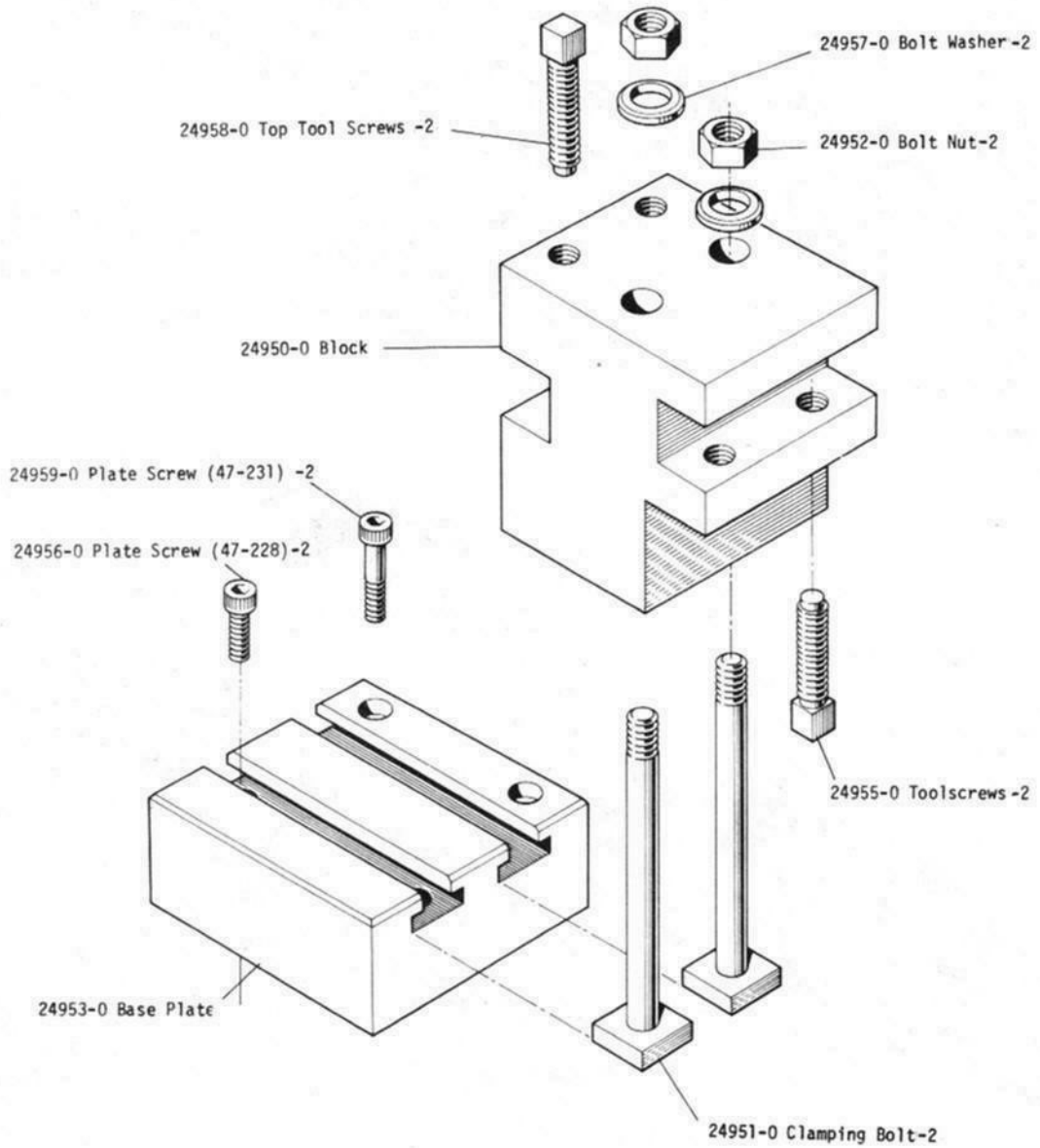
FROM SER. NO. AA1
TO SER. NO.

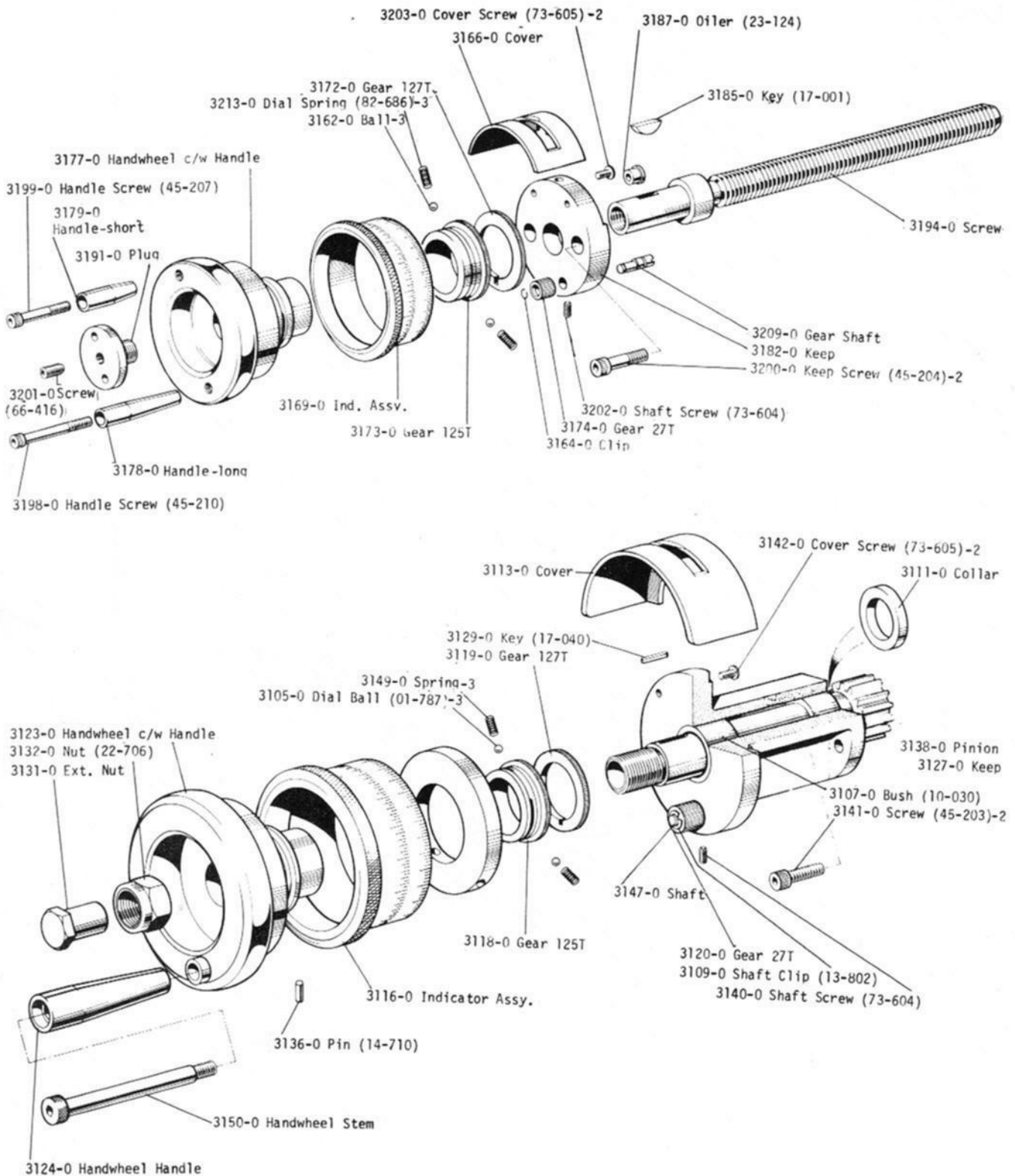


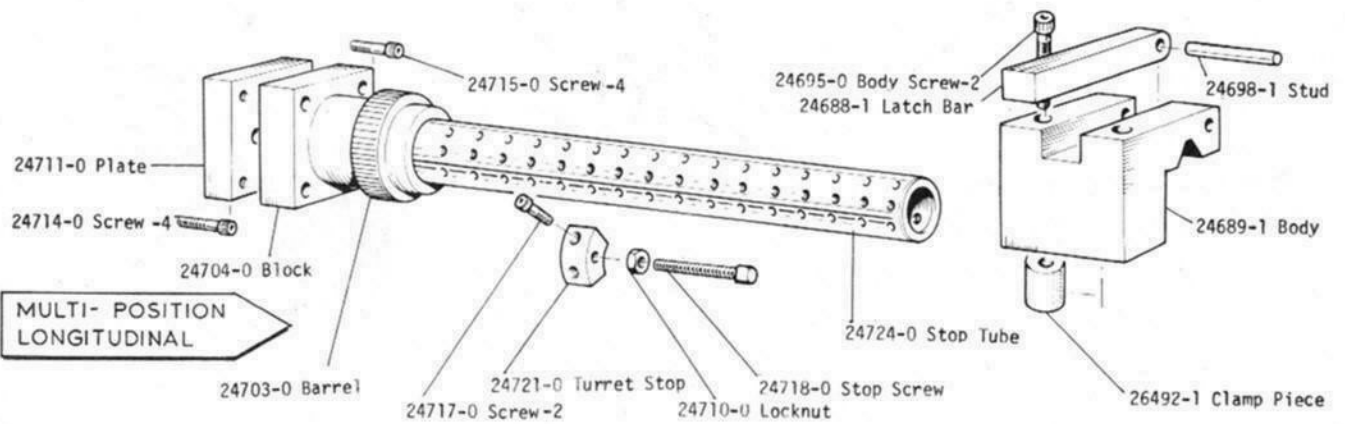
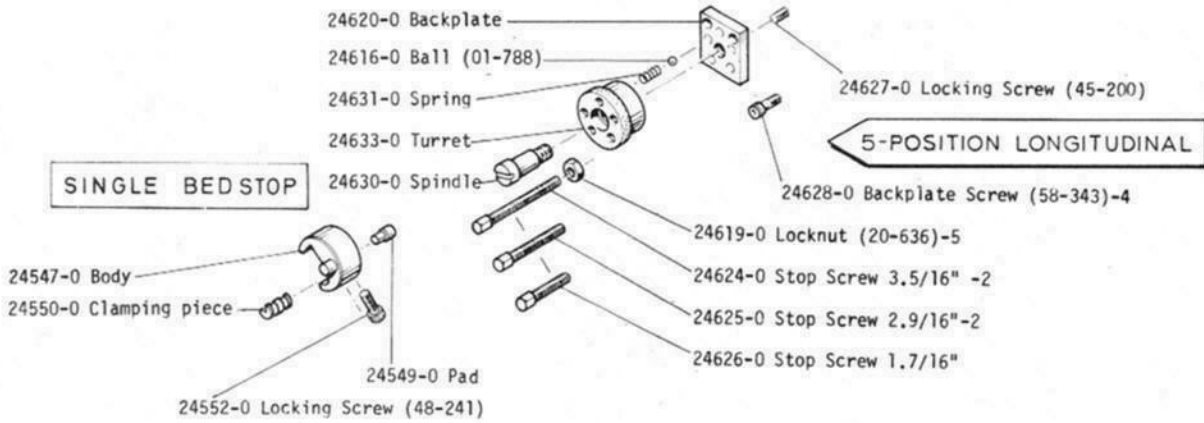
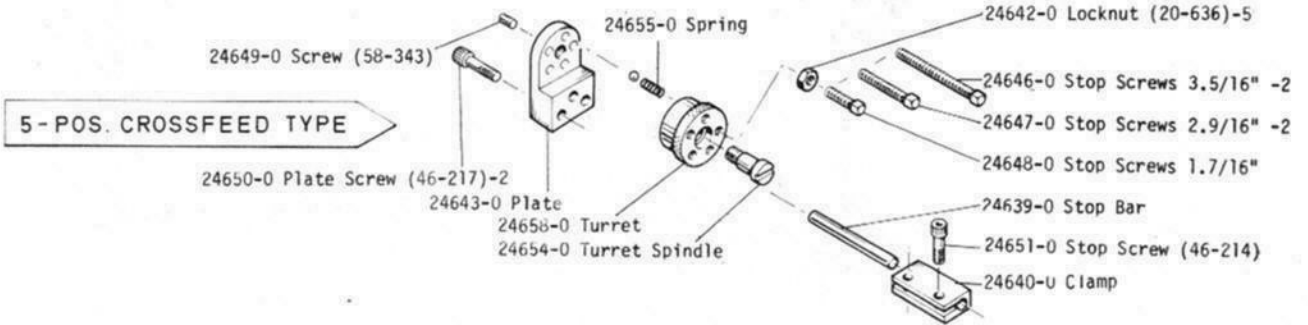
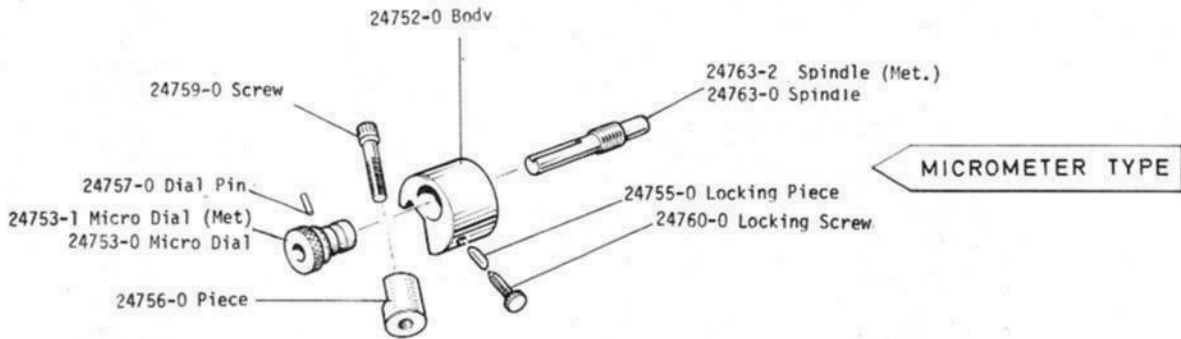
COM-04-7006

REAR TOOLPOST

FROM SER. NO. AA1
TO SER. NO.

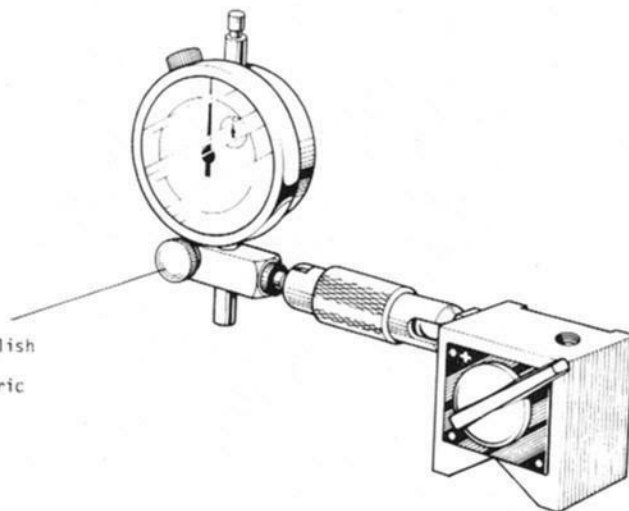
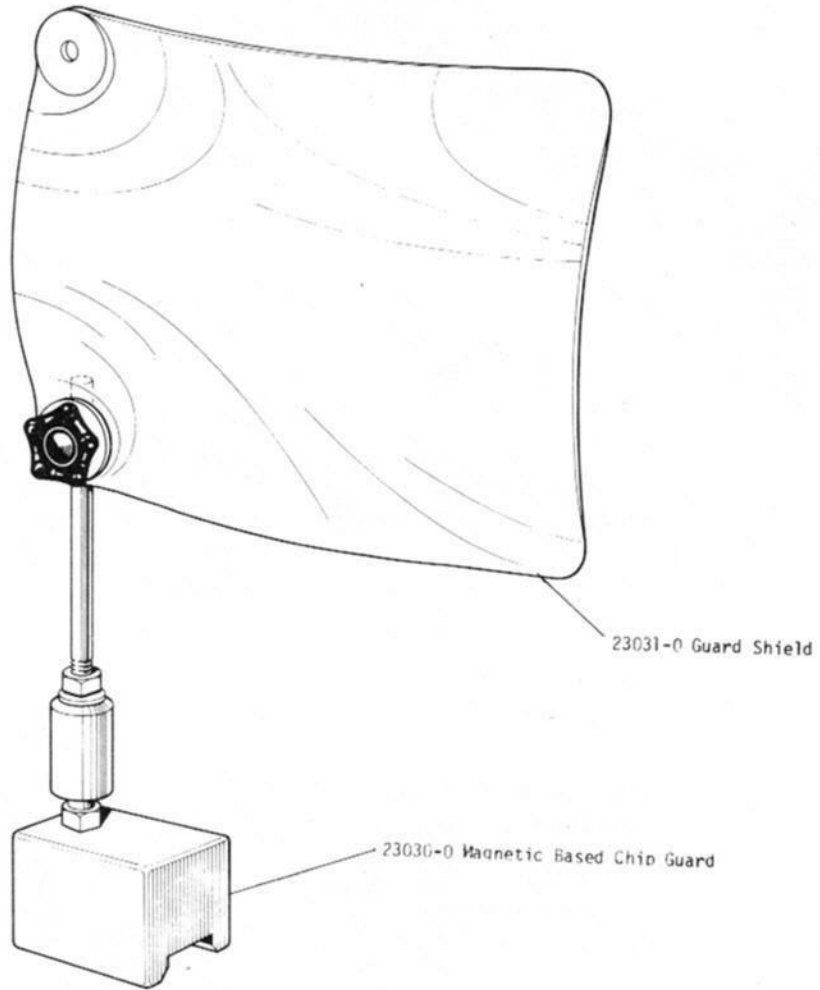






MAGNETIC CHIP GUARD/DIAL INDICATOR

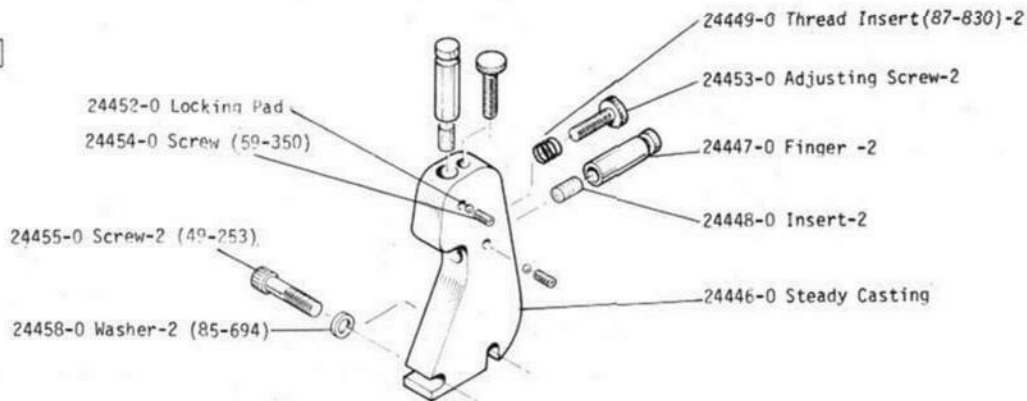
FROM SER. NO. AAI
TO SER. NO.



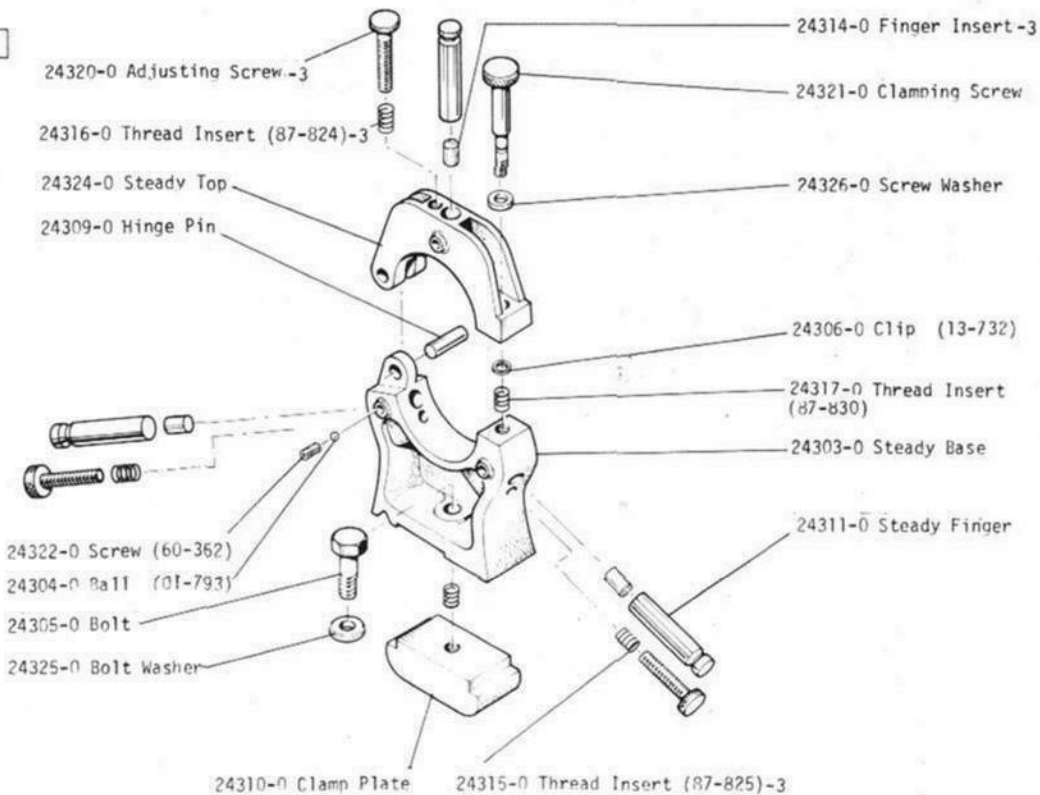
23032-0 Magnetic Based Dial Indicator Assy/English

23033-0 Magnetic Based Dial Indicator Assy/Metric

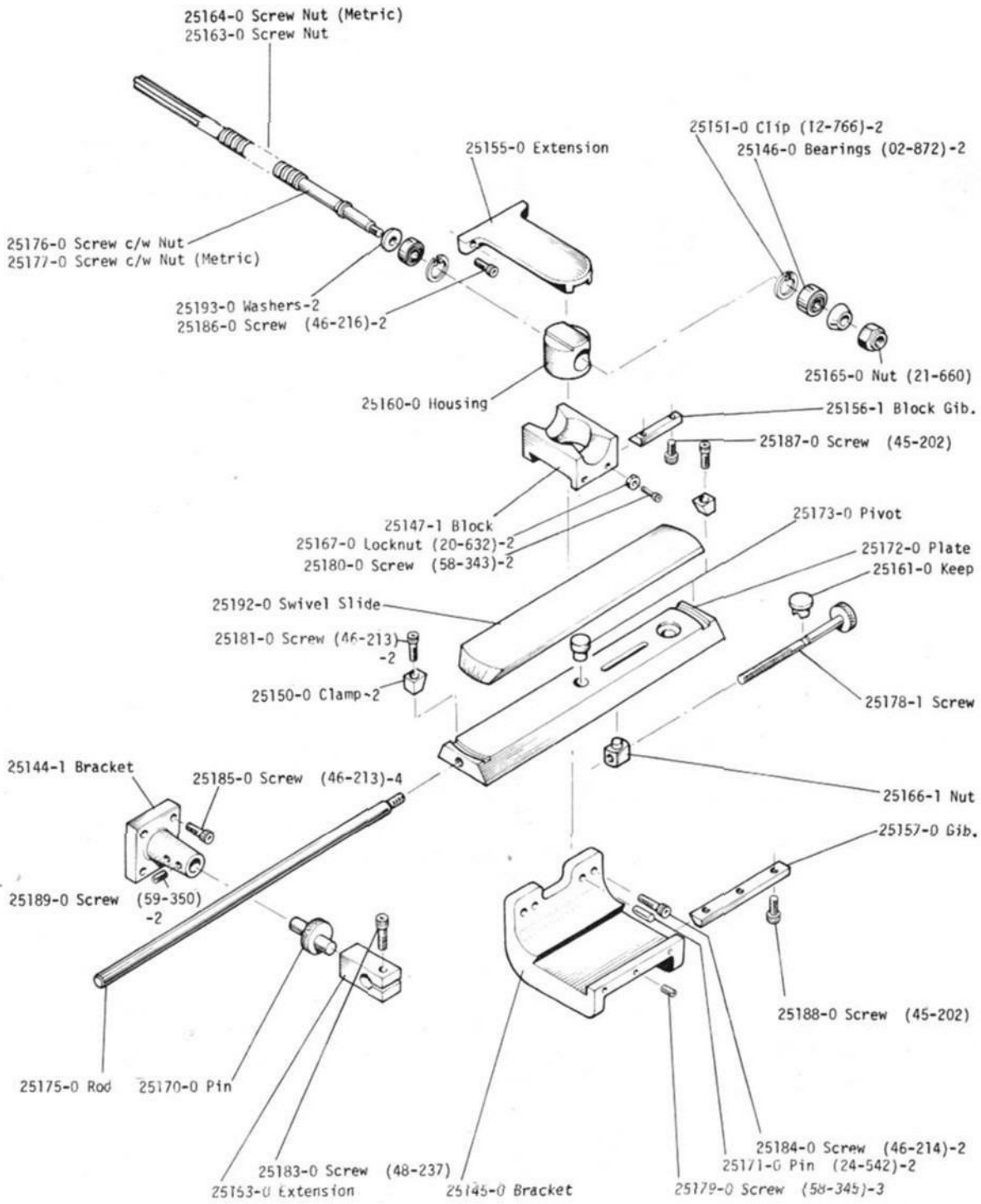
TRAVELLING



STATIONARY

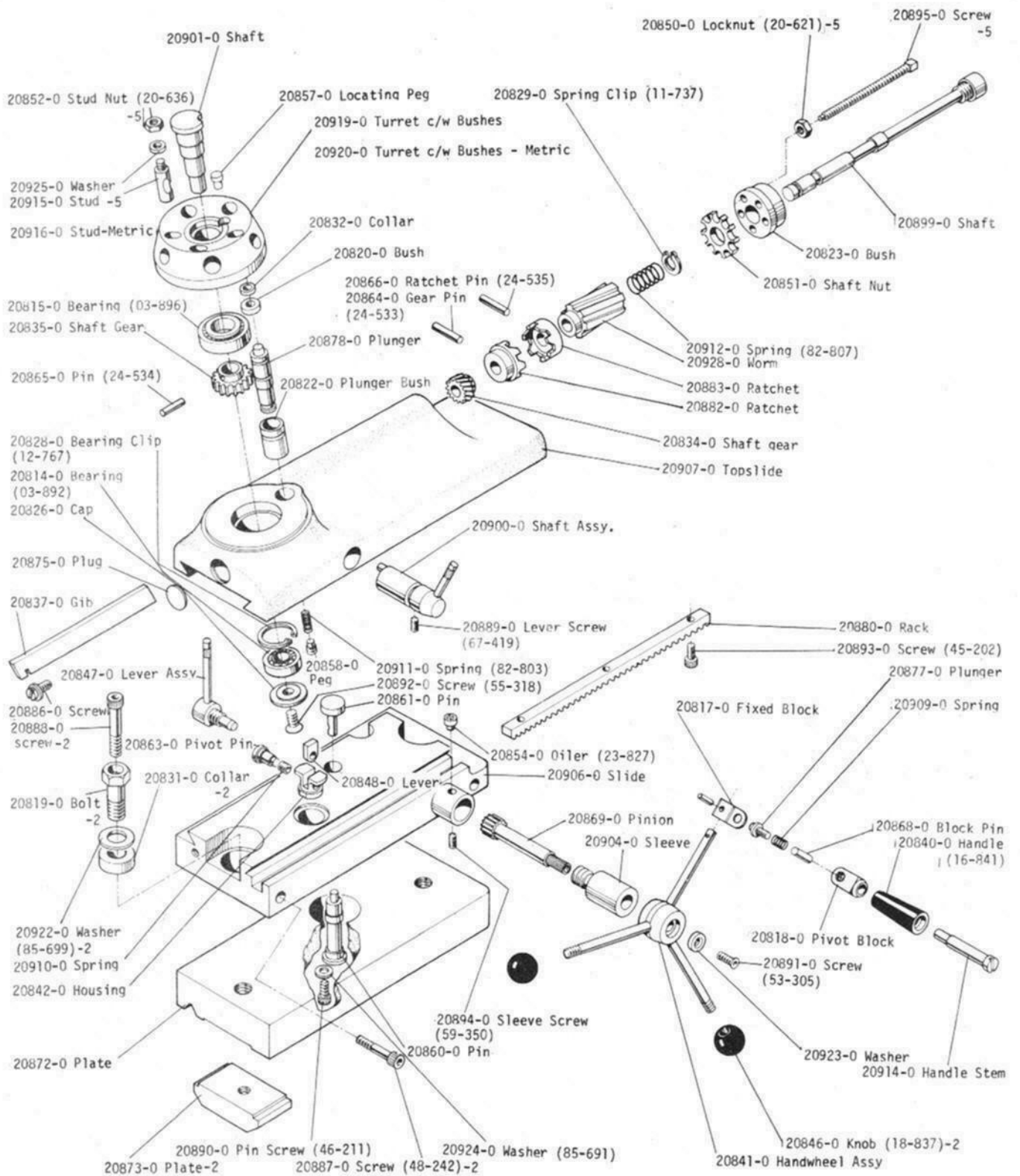


TAPER TURNER ATTACHMENT

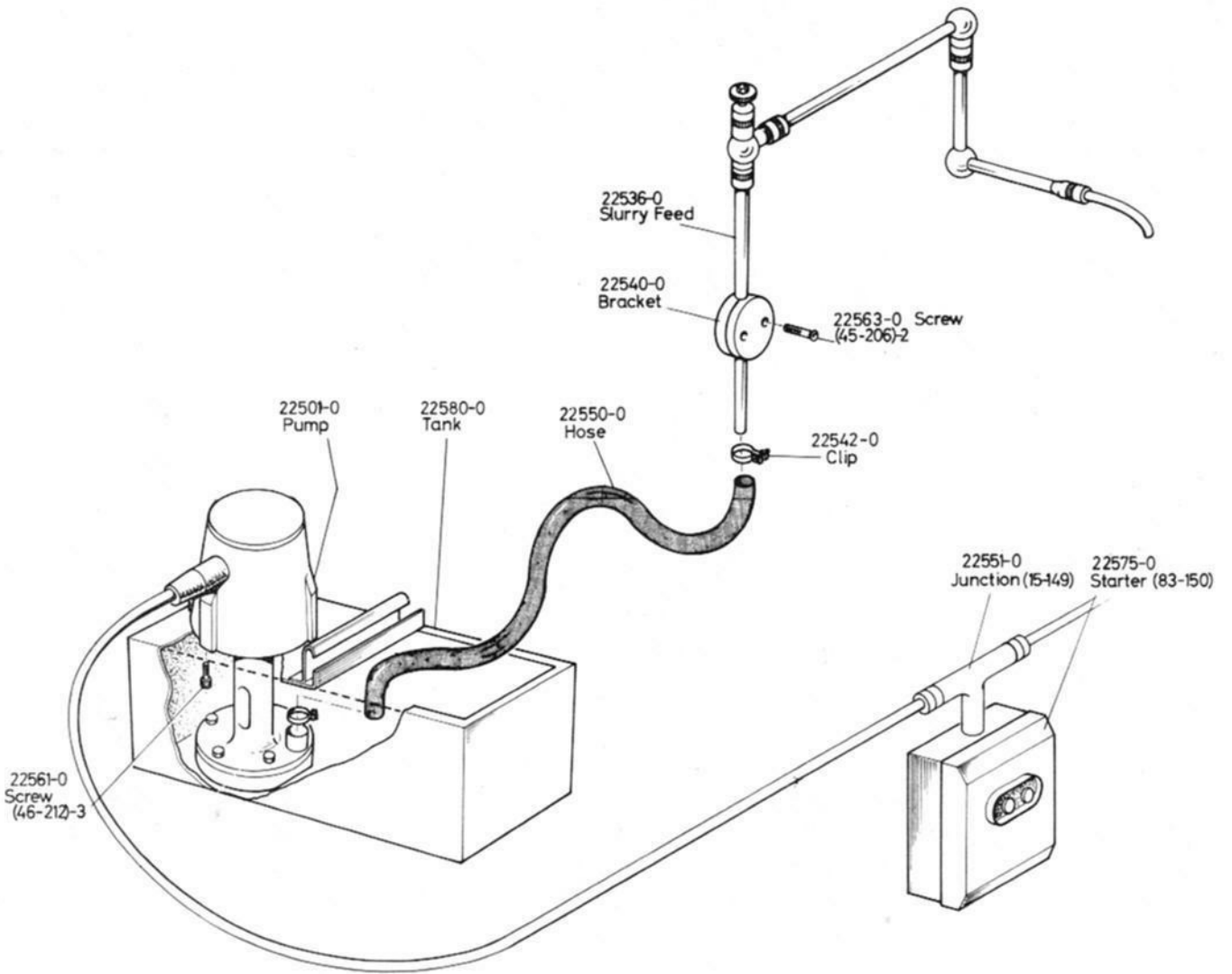


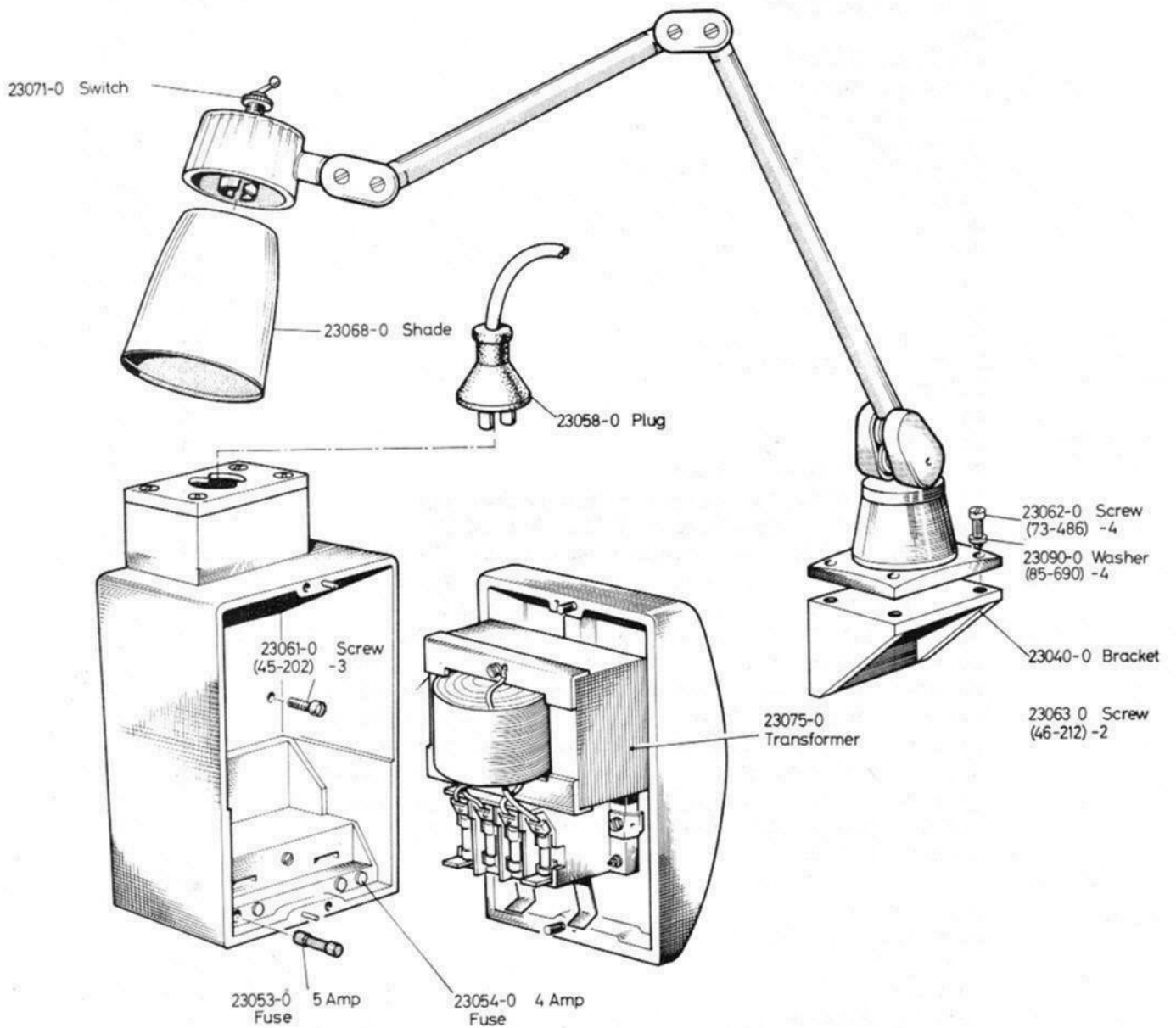
CAPSTAN ATTACHMENT

FROM SER. NO. AAI
TO SER. NO.



COM-11-7009





STANDARD PARTS REFERENCE LIST

<u>Description</u>	<u>Section</u>
Balls	01
Bearings-Ball Journal	02
Bearings - Roller	03
Belts - Vee	07
Bolts - Hex Head	08
Bushes	10
Circlips External	11
Circlips Internal	12
Circlips Special	13
Spring Dowels	14
Electrical - Miscellaneous	15
Handles	16
Keys	17
Knobs	18
Motors	19
Nuts	20
Lock Nuts	21
Nuts - Miscellaneous	22
Oilers	23
Mills Pin	24
Oil Rings	26
Oil Rings - Miscellaneous	27
10 x 24 t.p.i. Cap Screws - Hex Socket Head	45
1/4 in. U.N.C. Cap Screws - Hex Socket Head	46
5/16 in. U.N.C. Cap Screws - Hex Socket Head	47
3/8 in. U.N.C. Cap Screws - Hex Socket Head	48
7/16 U.N.C. Cap Screws - Hex Socket Head	49
1/2 in. I.N.C. Cap Screws - Hex Socket Head	50
10 x 24 t.p.i. C/Sunk Screws - Hex Socket Head	53
10 x24 t.p.i. Cup Point Screws - Hex Socket Head	58
1/4in. U.N.C. Cup Point Screws - Hex Socket Head	59
5/16 in. U.N.C. Cup Point Screws - Hex Socket Head	60
3/8 in. U.N.C. Cup Point Screws - Hex Socket Head	61
10 x 24 t.p.i. 1/2 Dog Screws - Hex Socket Head	66
1/4 in. U.N.C. 1/2 Dog Screws - Hex Socket Head	67
Special Screws	73
Oil Seals	79
Oil Sights	80
Spanners & Wrenches	81
Springs	82
Switches	83
Locking Washers	84
Standard Washers	85
Washers Miscellaneous	86
Thread Inserts	87
Miscellaneous	88

SPARE PARTS LIST APPENDIX 1

SPECIFICATIONS OF STANDARD ITEMS

FROM SER.NO. AA1-
TO SER.NO.

Ref. No.

01-787 3/16 Dia. Steel Ball
 01-788 1/4 Dia. Steel Ball
 01-793 1/4 Dia. Phosphor Bronze
 01-794 7/32 Dia. Steel Ball

02-872 10 m/m x 28 m/m x 8 m/m Hoffmann. A10
 02-874 15 m/m x 35 m/m x 8 m/m Hoffmann. A.15

03-891 9/16 bore x 3/4 o.d. x 1/2 in. long Ina SC98 Needle Roller
 03-892 17 m/m x 40 m/m x 13 m/m KGS Taper Roller KE30203
 03-896 25 m/m x 52 m/m x 16 m/m KGS Taper Roller KE30205
 03-898 1.1/8 x 1.3/8 x 1/2 Ina SC188 Needle Roller
 03-912 111, 050/111, 090 C Gamet
 03-913 112, 045/112, 085 C Gamet

07-142 A34 x 1/2 in. wide x 5/16 Thk.
 07-932 A33 x 1/2 in. wide x 5/16 Thk.
 07-934 A35 x 1/2 in. wide x 5/16 Thk.

08-013 1/2 U.N.C. x 1.1/4 in. long

10-030 Glacier 11 DU 14
 10-910 CT51 x 7/8 in. long
 10-913 CT174 x 5/8 in. long
 10-914 BS2 x 1.1/2 in. long
 10-918 CT175 x 3/4 in. long
 10-921 CT15 x 5/8 in. long
 10-929 BS15 x 1 in. long
 10-941 BS2 x 5/8 in. long
 10-951 BS105 x 1.9/16 in. long
 10-952 CT 15 x 3/4 in. long
 10-954 CT 18 x 1 in. long
 10-965 FCT 60 x 1/2 in long
 10-968 FCTSA x 5/8 in. long
 10-969 FGH40A x 1.3/8 in. long
 10-975 BS2 x 1.9/16 in. long
 10-995 FCT 201 x 13/16" long
 10-997 BS 69 x 7/8" long

11-736 1/2 dia. Anderton type 1400
 11-737 1/2 dia. Anderton type 1500. E396
 11-740 1/2 dia. Seeger
 11-743 5/8 dia. Anderton type 1400
 11-745 3/4 dia. Anderton type 1400
 11-749 7/8 dia. Anderton type 1400
 11-753 1 dia Anderton type 1400
 11-777 3/4 dia Anderton type 1500 E580
 11-782 1/4 dia. Anderton type 1500 E210
 11-855 7/16 Dia. Anderton type 1500 E343

12-766 28 m/m (1.102) Anderton type 1300

Ref. No.

13-732 3/8 dia. Anderton type 700/37A Ext.
13-742 9/16 dia. Salter Bowed Ext. type 5101/56
13-802 Anderton type 1000-15

14-104 1/8 dia. x 3/4 in. long
14-131 1/4 dia. x 1 in. long
14-135 1/8 dia. x 1/2 in. long
14-144 3/16 dia. x 1.1/4 in. long
14-606 3/16 dia. x 7/8 in. long
14-607 3/16 dia. x 15/16 in. long
14-629 1/8 dia. x 7/8 in. long
14-643 5/32 dia. x 1 in. long
14-710 1/16 dia. x 1/4 in. long

15-149 A.E.I. 'T' junction 3/4 in. conduit thrd.type

16-842 3/8 bore x 3 in. long cream
16-844 3/8 bore x 3 in. long black

17-001 No. 3. Woodruff
17-002 No. 9. Woodruff
17-040 1/8 x 1/8 x 3/4 lg. round ends BS 46

18-145 1.1/4 dia. x 3/8 U.N.C. Red
18-830 1.1/2 dia. x 7/16 U.N.C. Black
18-836 1.1/4 dia. x 3/8 U.N.C. Black
18-837 1.1/4 dia. x 3/8 U.N.C. Cream
18-838 1 dia x 3/8 U.N.C. Black
18-841 Reverse and two speed switch knob

19-165 A.E.I. 1 hp 200/240/380/440. BK2410c. Speed 1400-1730
19-166 A.E.I. 2/1 hp 380/420/3/50/60. Frame KNX.C164

20-620 1/4 U.N.C. Std. Nut
20-621 5/16 U.N.C. Std. Nut
20-623 7/16 U.N.C. Std. Nut
20-632 10 x 24 T.P.I. Std. Nut
20-636 5/16 U.N.C. Thin Nut
20-637 3/8 U.N.C. Thin Nut
20-638 7/16 U.N.C. Thin Nut

21-651 7/16 U.N.F. Std. Lock nut
21-654 5/8 U.N.F. Std. Lock Nut (Nyloc)
21-658 1/4 U.N.C. Std. Lock Nut
21-660 3/8 U.N.C. Std. Lock Nut (Simmonds Aero)
21-671 3/8 U.N.F. Thin Nut 'T'
21-685 5/8 U.N.C. Thin Nut 'T' (Simmonds NT3N206)

22-146 1/4 B.S.F. Nylock (Simmonds Type 'T')
22-663 1/2 U.N.C. Wedglok
22-692 4 BA Std. Nut
22-695 1/4 B.S.F. Std. Locknut
22-706 Thin type 5/8 x 18 T.P.I. U.N.F. Nyloc

Ref. No.

23-124 1/4 Dia. Springwell oil cup
23-827 1/4 Dia. Garland diaphragm oiler

24-525 1/8 Dia. x 9/16 in. long G.P.3.
24-527 1/8 Dia. x 3/8 in. long G.P.4.
24-531 5/32 Dia. x 3/8 in. long G.P.3.
24-533 5/32 Dia x 3/4 in. long G.P.3.
24-534 5/32 Dia. x 1 in. long G.P.3.
24-535 5/32 Dia. x 1.1/4 in. long G.P.3.
24-536 3/16 Dia. x 1/2 in. long G.P.1.
24-538 3/16 Dia. x 1.1/8 in. long G.P.1.
24-542 3/16 Dia. x 3/4 in. long G.P.3.
24-543 3/16 Dia. x 7/8 in. long G.P.3.
24-545 3/16 Dia. x 1/4 in. long G.P.3.
24-548 3/16 Dia. x 11/16 in. long G.P.2.
24-549 3/16 Dia. x 1.3/4 in. long G.P.3.
24-553 1/4 Dia x 1 in. long G.P.2.
24-572 5/16 Dia. x 1 in. long G.P.3.
24-574 5/16 Dia. x 1.1/2 in. long G.P.3.
24-575 5/16 Dia. x 1.3/4 in. long G.P.3.

26-848 11/16 Dia. x .103 Thk. Pioneer PO/08706810
26-851 1 Dia. x .139 Thk. Pioneer PO/12510013

27-137 Dowty MK7 list 4 pp 73c
27-138 Dowty Mk24 list 5 pp 49c
27-141 Superfect SH/96/16
27-846 .424 i.d. x .070 Thk. Pioneer PO/06204310
27-858 POS/2506/MP/658

45-201 10 x 24 t.p.i. x 3/8 in. long
45-202 10 x 24 t.p.i. x 1/2 in. long
45-203 10 x 24 t.p.i. x 5/8 in. long
45-204 10 x24 t.p.i. x 3/4 in. long
45-205 10 x 24 t.p.i. x 7/8 in. long
45-206 10 x24 t.p.i. x 1 in. long
45-207 10 x24 t.p.i. x 1.1/4 in. long
45-209 10 x24 t.p.i. x 1.3/4 in. long
45-210 10 x 24 t.p.i. x 2in. long

46-212 1/4 U.N.C. x 1/2 in. long
46-213 1/4 U.N.C. x 5/8 in. long
46-214 1/4 U.N.C. x 3/4 in. long
46-215 1/4 U.N.C. x 7/8 in. long
46-216 1/4 U.N.C. x 1 in. long
46-217 1/4 U.N.C. x 1.1/4 in. long
46-218 1/4 U.N.C. x 1.1/2 in. long
46-219 1/4 U.N.C. x 1.3/4 in. long

Ref. No.

47-244 5/16 U.N.C. x 5/8 in. long
47-225 5/16 U.N.C. x 3/4 in. long
47-226 5/16 U.N.C. x 7/8 in. long
47-227 5/16 U.N.C. x lin. long
47-228 5/16 U.N.C. x 1.1/4 in. long
47-229 5/16 U.N.C. x 1.1/2 in. long
47-230 5/16 U.N.C. x 1.3/4 in. long
47-231 5/16 U.N.C. x 2in. long
47-232 5/16 U.N.C. x 2.1/4 in. long
47-233 5/16 U.N.C. x 2.1/2 in. long

48-237 3/8 U.N.C. x 5/8 in. long
48-249 3/8 U.N.C. x 4in. long

49-253 7/16 U.N.C. x 2in. long

50-260 1/2 U.N.C. x 1.1/2 in. long

53-305 10 x24 t.p.i. x 3/4 in. long

58-243 10 x 24 t.p.i. x 1/4 in. long
58-344 10 x 24 t.p.i. x 5/16 in. long
58-345 10 x 24 t.p.i. x 3/8 in. long
58-349 10 x 24 t.p.i. x 3/4 in. long

59-350 1/4 U.N.C. x 1/4 in. long
59-352 1/4 U.N.C. x 3/8 in. long
59-356 1/4 U.N.C. x 3/4 in. long

60-362 5/16 U.N.C. x 3/8 in. long
60-366 5/16 U.N.C. x 3/4 in. long

61-371 3/8 U.N.C. x 1/2 in. long

66-410 10 x 24 t.p.i. x 3/16 in. long
66-411 10 x 24 t.p.i. x 1/4 in. long
66-416 10 x 24 t.p.i. x 3/4 in. long

67-418 1/4 U.N.C. x 5/16 in. long
67-419 1/4 U.N.C. x 3/8 in. long
67-421 1/4 U.N.C. x 1/2 in. long

73-143 1/4 U.N.C. x 3/8 in. long domed head
73-169 10 x 24 t.p.i. x 1/4 in. c/sunk screw (slotted)
73-486 2 BA x 1/2 in. long cheese head
73-514 1/8 U.N.C. x 3/8 in. long brass round head
73-523 5/16 U.N.C. x lin. wedglok set screw
73-543 1/4" U.N.C. x 5/8" long domed head screw
73-544 4 BA x 5/8" long C/SK head screw
73-554 5/16" U.N.C. x 3/8 long cup point wedglok socket set screw
73-564 1/4" U.N.C. x 3/4" long cap head screw type CX HD
73-604 6 BA x 1/8" long half dog
73-605 No. 4-40 U.N.C. x 1/4" long SKT. HD Dome Hd.
73-619 2-56-2A U.N.C. x 1/4 long C/Sunk Hd.
73-620 10-32-2A U.N.F. x 5/8 long C/Sunk Hd.

Ref. No.

79-062 Weston. W16211237.R
79-071 Angus. MS012
79-865 11/16 i.d. x 1.5/8 o.d. x 5/16 wide. W16210631.R4

80-871 1.1/4 o.d. Tecalemit. IC4610

81-151 15/16 a/f x 3/4 a/f open end spanner
81-152 9/16 a/f x 11/16 a/f open end spanner
81-153 7/16 sq. x 1/2 a/f combination spanner
81-154 15/16 a/f x 11/16 a/f box Spanner
81-155 Tommy Bar
81-156 3/8 a/f Allen hexagon key
81-157 5/16 a/f Allen hexagon key
81-158 7/32 a/f Allen hexagon key
81-159 3/16 a/f Allen hexagon key
81-161 1/8 a/f Allen hexagon key
81-162 3/32 a/f Allen hexagon key

82-064 707-0040 0.240 Dia x 9/16 in. free length
82-065 707-0035 0.312 Dia. x 1.7/16 in. free length
82-066 .237 o/d x 1.1/8 in. free length
82-078 707-0028 0.237 Dia. x 1.1/8 in. free length
82-105 Flexo 82504
82-107 Flexo 62604
82-795 707-0021 1/4 o/d x 1/2 in. free length
82-802 Flexo 93107
82-804 Flexo 123106
82-807 Flexo 223412
82-828 Flexo 237508
82-833 Flexo 62603
82-851 Flexo AP3516
82-868 Spring Flexo No. 72804
82-875 Flexo 72806

83-086 Burgess MK.3 BR 600 V 2A Micro switch
83-087 Moving contact for Crabtree B15 Starter 1600/13
83-088 Fixed contact for Crabtree B15 Starter 1600/11
83-089 Crabtree cable clamp assy 1600/19
83-092 Overload release unit Crabtree type 16007 3.6 amp.
83-093 Magnet coil Crabtree type 1600/9/5 380-420 V.
83-094 Crabtree B15 Starter interior type
83-095 Crabtree B15 starter moving contact 28011
83-096 Crabtree series 16021. Aux contact
83-100 Crabtree contactor magnet 16000/20
83-150 Crabtree starter type D6 0.75-1 2 A
83-163 Crabtree B15 D & C Starter 16104/5.
83-164 Crabtree B15 D & C Starter 16199
83-167 MEM.1315 AX 15 A isolator
83-168 Klockner Moeller T2-4/60-102/7.
83-991 Santon SR1311 PC

84-706 1/2 Dia. bore single coil
84-708 5/8 Dia. bore single coil
84-716 1/2 Dia. bore double coil
84-725 Schnorr disc spring washer type K.620L

Ref. No.

85-690 3/16 Dia. bore
85-691 1/4 Dia. bore
85-694 7/16 Dia. bore
85-695 1/2 Dia. bore x 1. o/d x .092in. W
85-696 1/2 Dia. bore x 1.1/8 o/d x .062 in. W
85-698 5/8 Dia. bore
85-699 3/4 Dia. bore

86-029 3/4 Internal fan disc washer
86-133 Dowty rubber washer GD1321-3
86-738 1/4 bore shakeproof
86-741 3/16 bore x 7/16 o/d x 1/16 Thk. rubber
86-787 Thrust washer Glacier DU 10
86-788 Thrust washer Glacier DU 06

87-824 3/8 U.N.C. x 9/16 in. long Helicoil
87-825 1/2 U.N.C. Helicoil

88-070 3/8 in. solid gas plug
88-076 1 in. solid gas plug
88-147 1/4 in. B.S.F. ball joint