

COLCHESTER BANTAM



INSTRUCTION AND SPARE PARTS MANUAL

THE COLCHESTER LATHE COMPANY LTD., COLCHESTER, ENGLAND

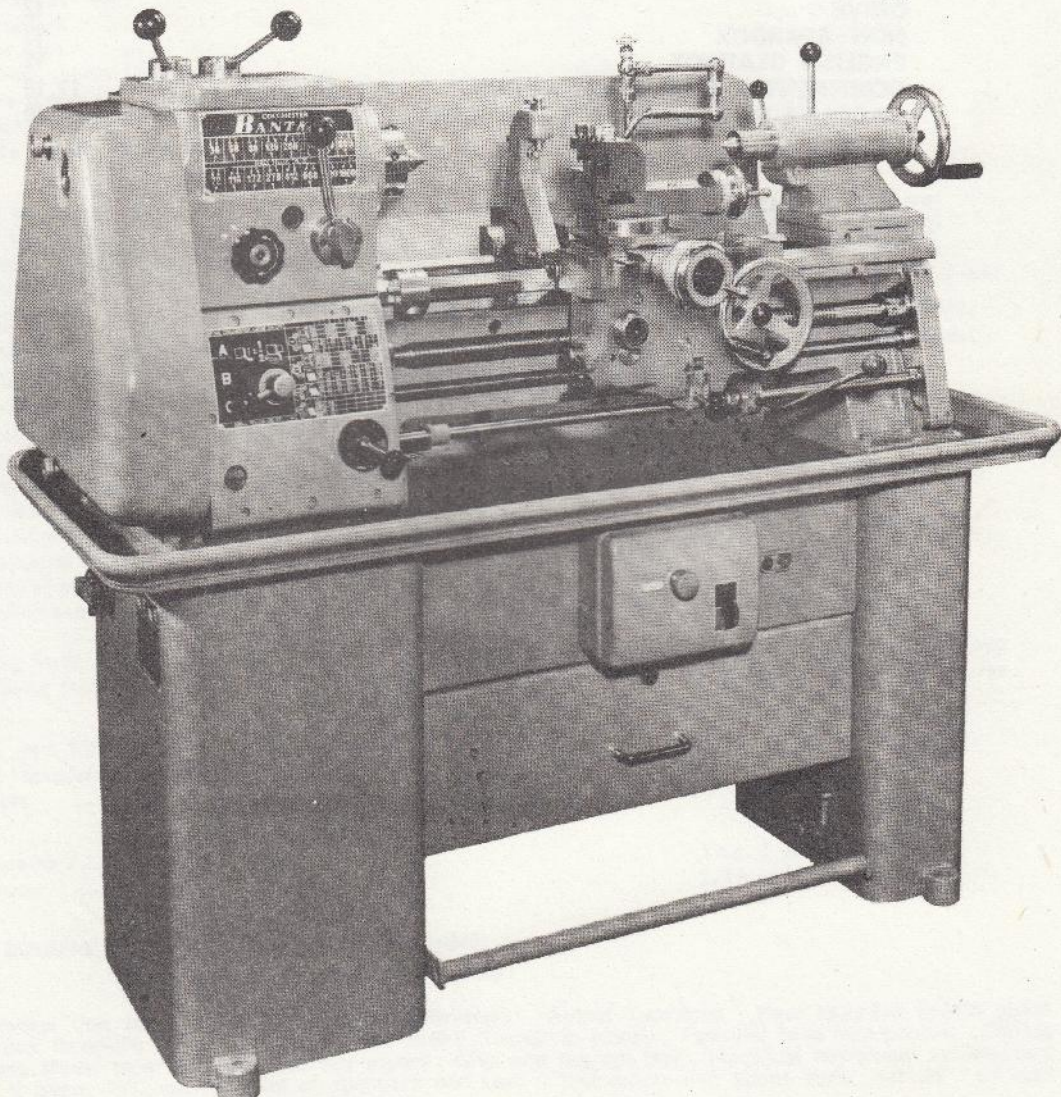
THIS MANUAL

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 will be found on a blue disc on each major assembly 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

- HAWK 20** - 5½ in x 20 in straight bed floor mounted lathe, without quick change gearbox.
HAWK 30 - 5½ in x 30 in straight bed floor mounted lathe, without quick change gearbox.
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

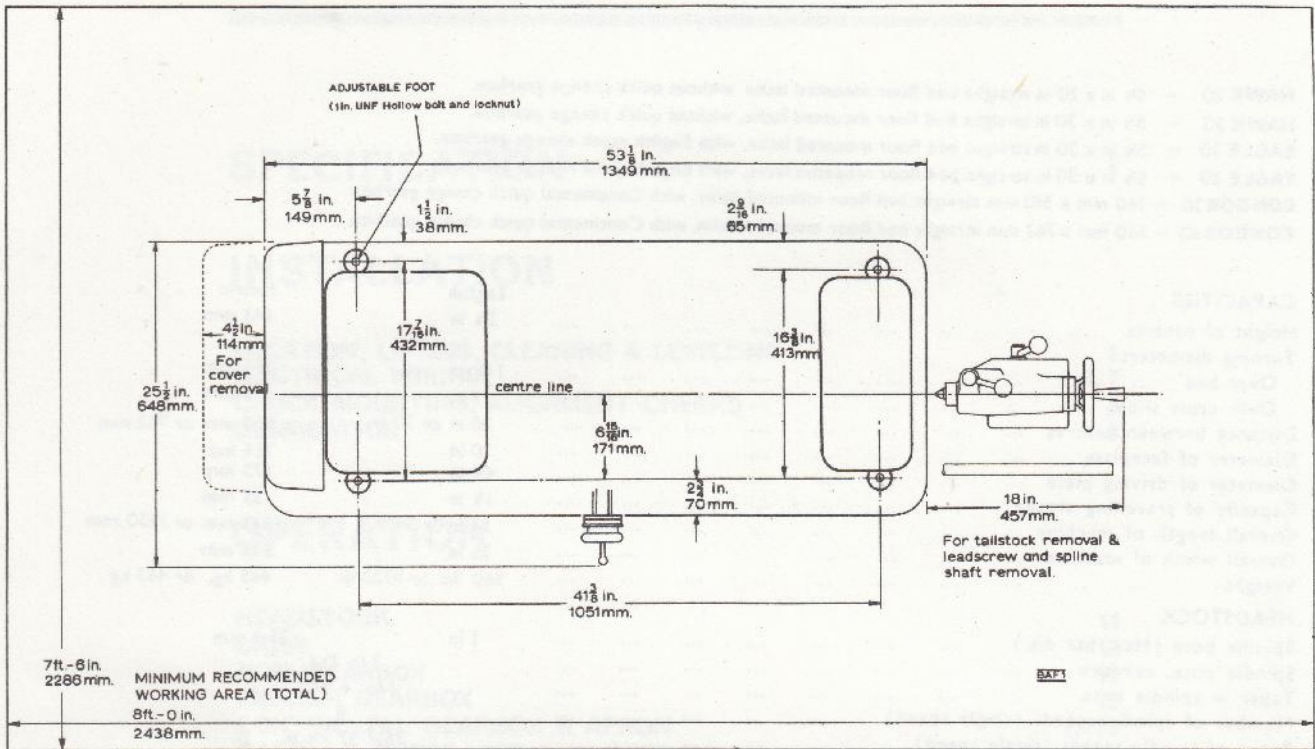
CAPACITIES		English	Metric
Height of centres	...	5½ in	143 mm
Turning diameters			
Over bed	...	11½ in	286 mm
Over cross slide	...	7 in	178 mm
Distance between centres	...	20 in or 30 in.	508 mm or 762 mm
Diameter of faceplate	...	10 in	254 mm
Diameter of driving plate	...	6½ in	175 mm
Capacity of travelling 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	...	6⅞ in	175 mm
Total travel of top slide	...	3⅝ 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			
	HAWK	EAGLE	CONDOR
TYPE OF GEARBOX	Not Fitted	English	Continental
PITCH OF LEADSCREW	4 t.p.i.	4 t.p.i.	6 mm
Number of metric pitches	19	15	27
Range of metric pitches	0.5 mm to 6 mm	0.5 mm to 6 mm	0.2 mm to 6 mm
Number of Whitworth threads	25	29	26
Range of Whitworth threads	4 to 56 t.p.i.	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	13	16
Range of sliding feeds	.001 to .028 in/rev	.001 to .032 in/rev	0.02 to 0.7 mm/rev
Range of surfacing feeds	.0005 to .014 in/rev	.0005 to .016 in/rev	0.01 to 0.35 mm/rev
TAILSTOCK			
Spindle travel (No. 3 M.T. Centre fitted)	...	4¼ 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)

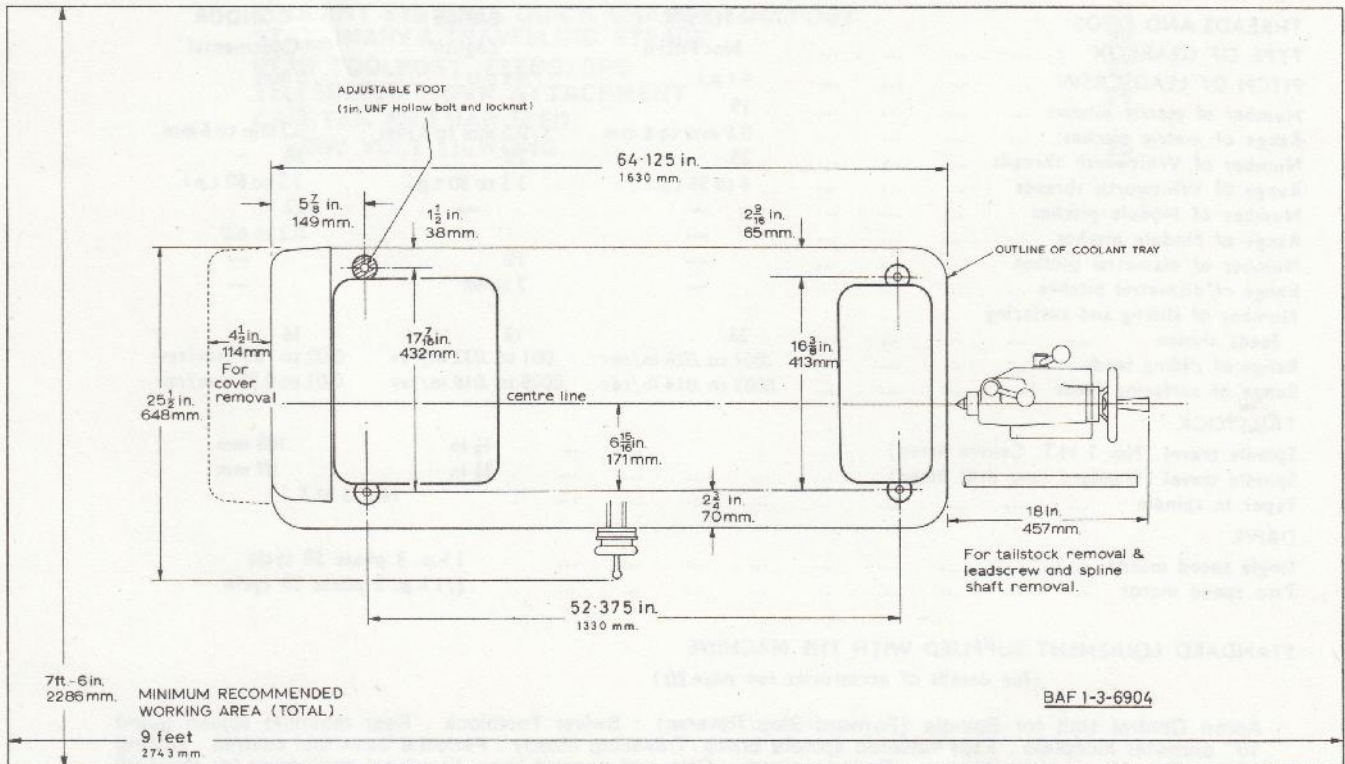
Apron Control Unit for Spindle (Forward/Stop/Reverse) . Swivel Toolblock . Rear mounted splash guard
 10" diameter faceplate . Foot actuated spindle brake . Travelling steady . Pedestal base tool cabinet . Driving
 Plate . Two Morse taper centres . Bedway wipers . Chip and coolant tray . Electrical equipment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

FOUNDATION PLANS

20 in (508 mm) BED



30 in. (762 mm) BED



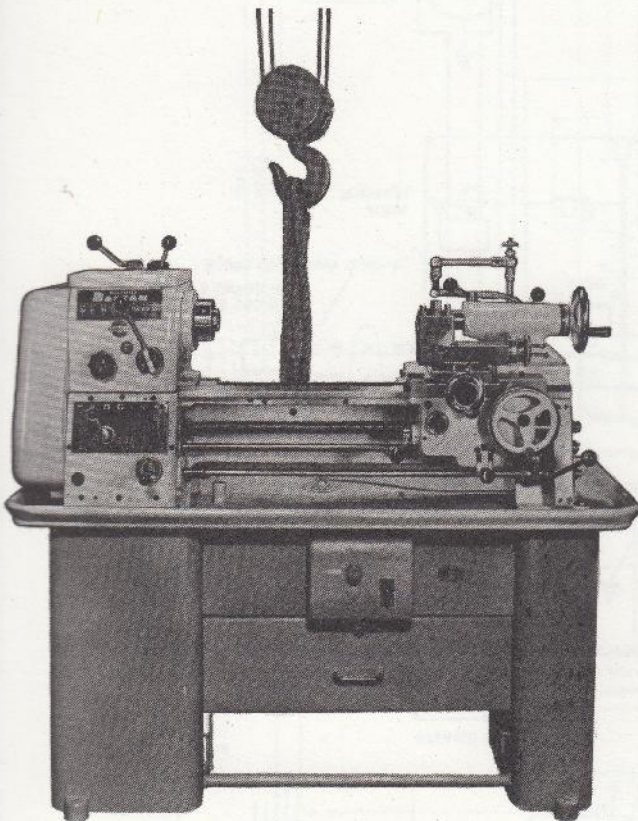
INSTALLATION

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.

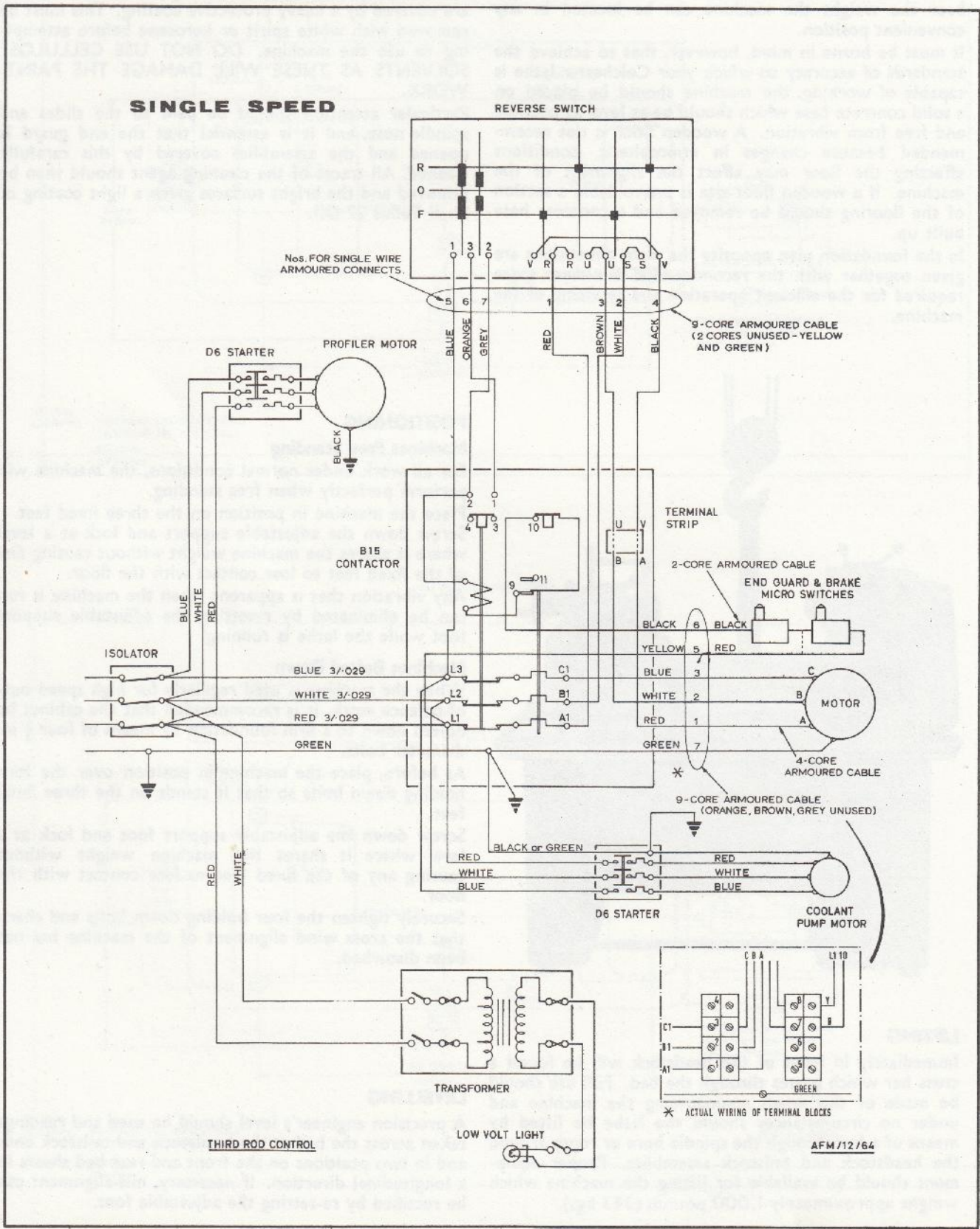
LEVELLING

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.

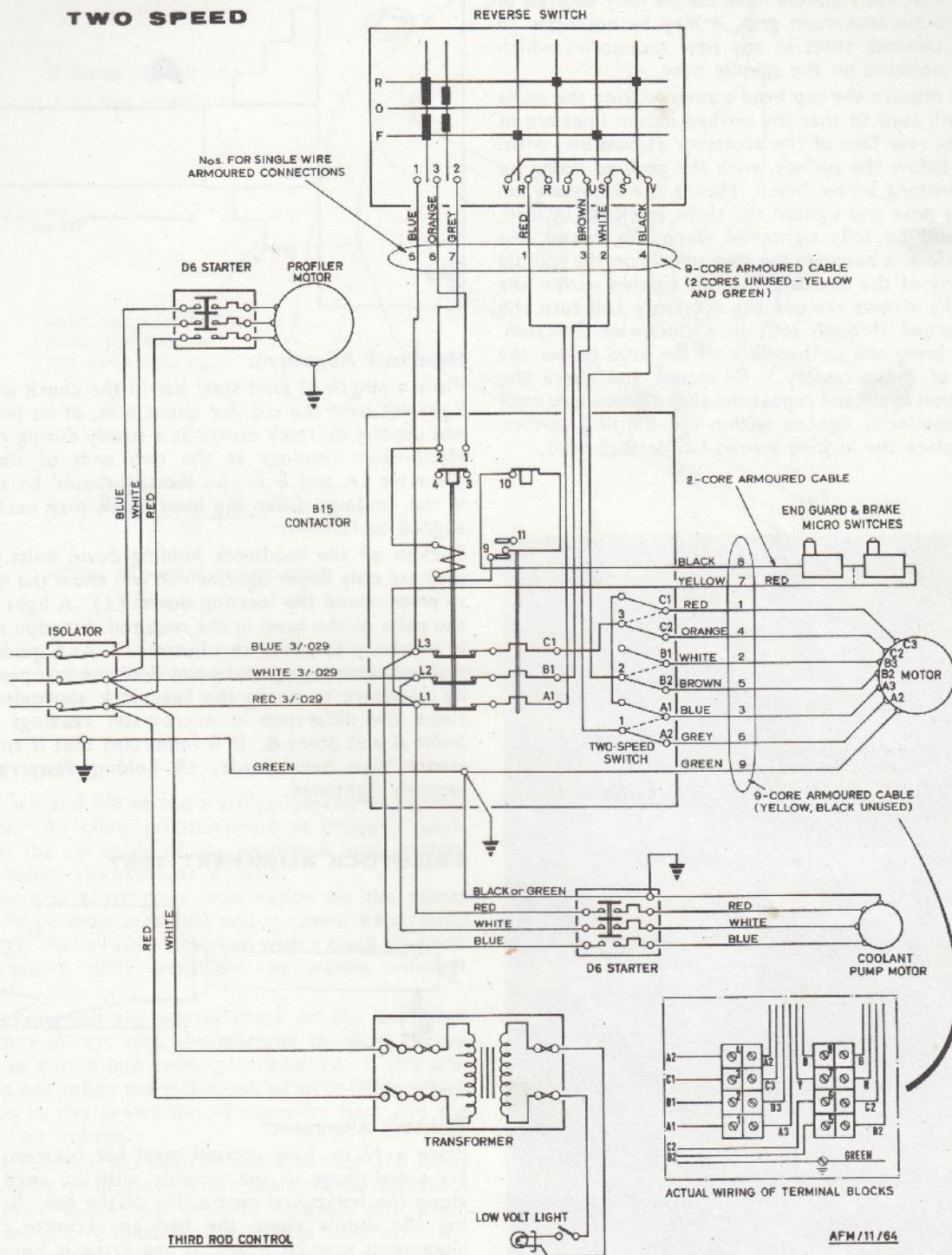
ELECTRICAL WIRING

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

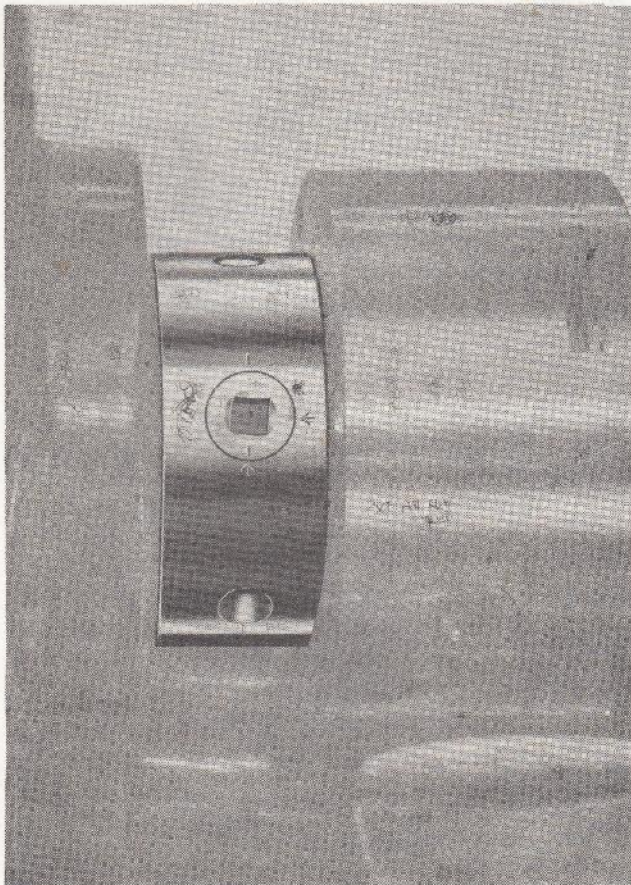
The American type D1-3 in. Camlock spindle nose has been selected to overcome the danger of chucks or faceplates becoming detached whilst rotating.

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.

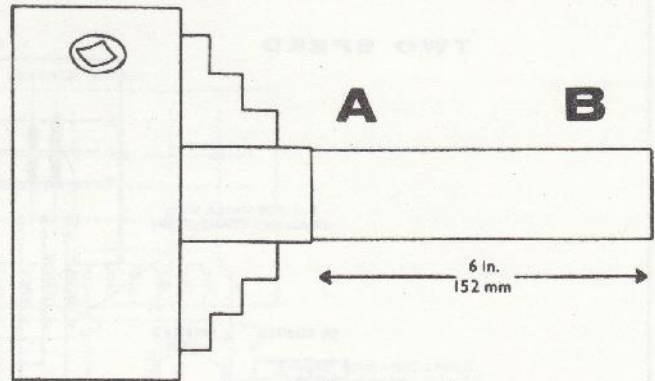
To do this remove the cap head screws locking the studs and set each stud so that the scribed datum lines are as close to the rear face of the accessory as possible, without being below the surface, with the grooves lining up with the locking screw holes. Mount the accessory on the spindle nose and tighten 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

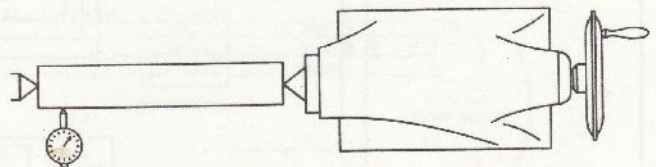


Headstock Alignment:

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.

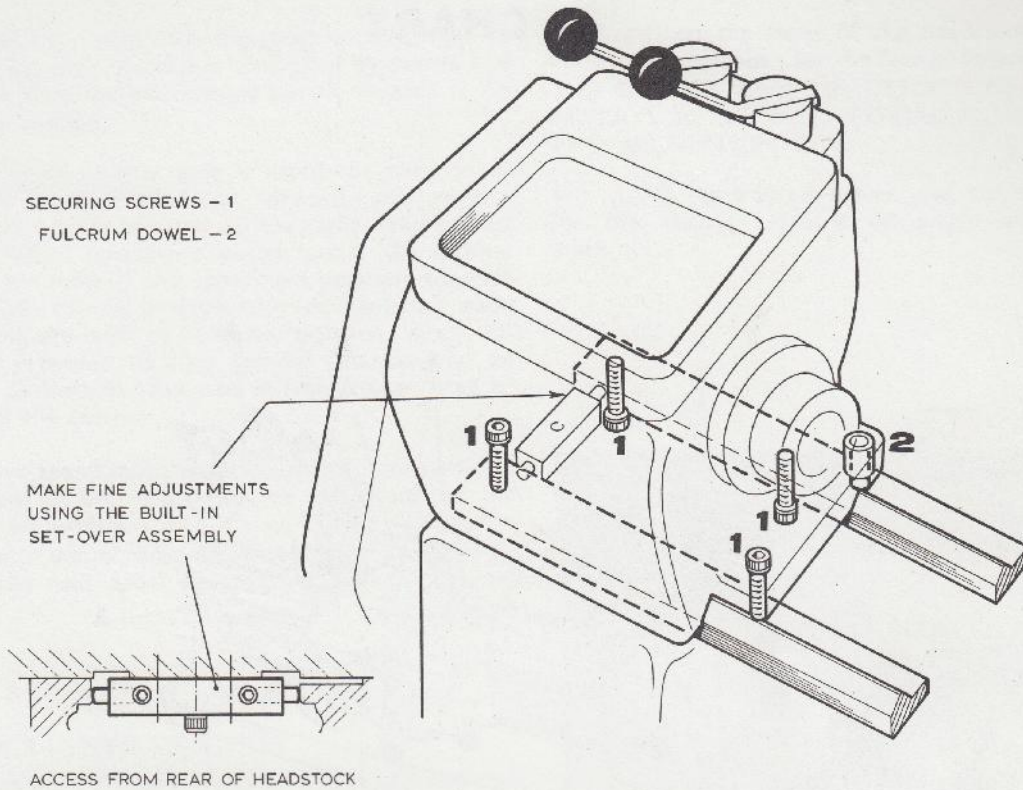
TAILSTOCK ALIGNMENT TEST



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:

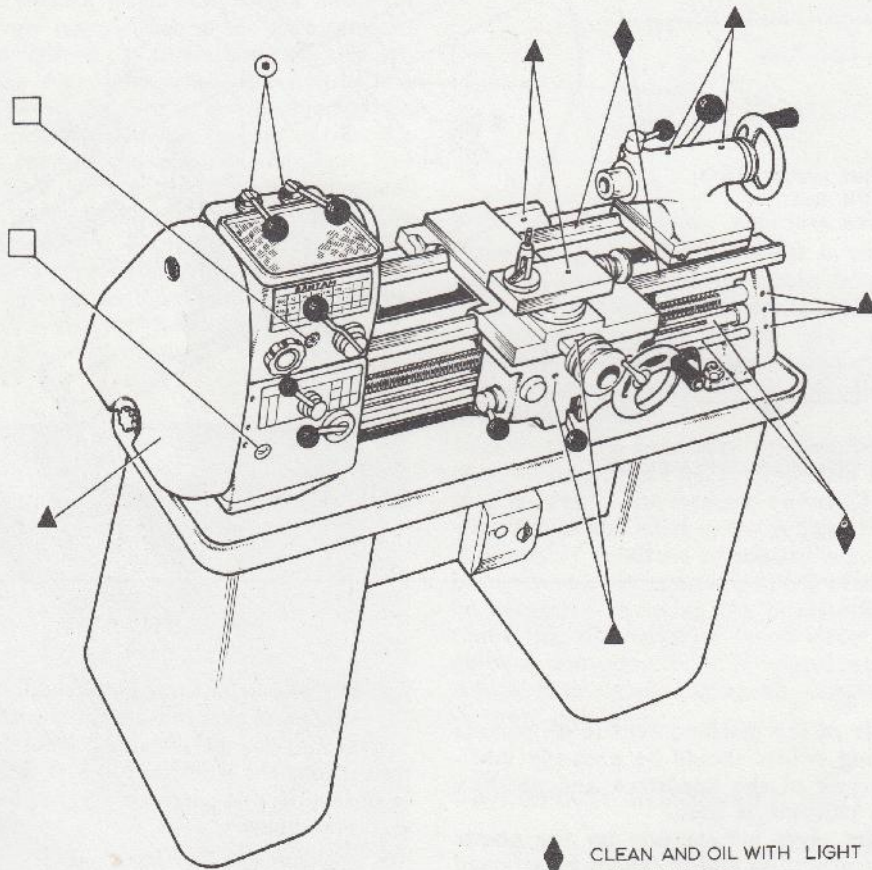
Specific Gravity at 60°F	0.870
Flash point closed	390°F
Pour point	- 20°F
Viscosity	
Redwood No. 1:	
70°F	310 secs
140°F	68 secs
200°F	41 secs

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

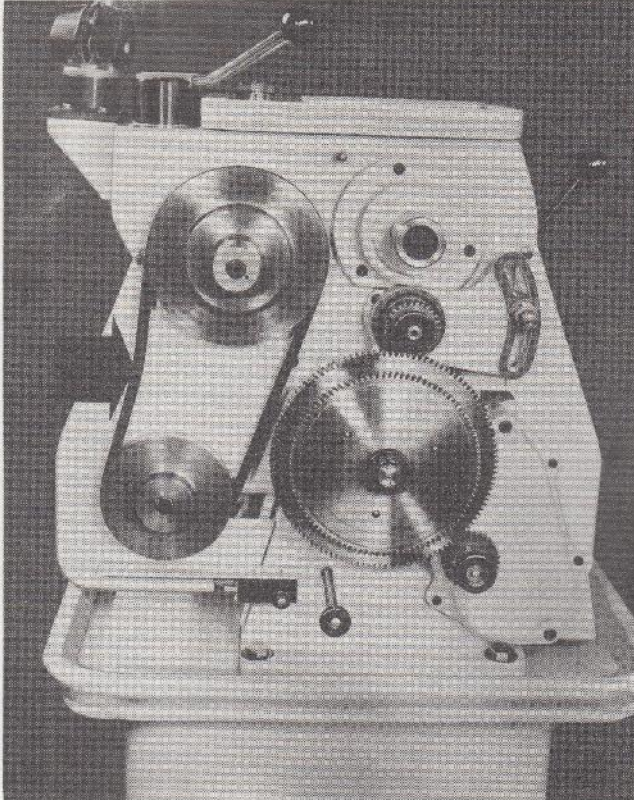
36	58	86	139	206	334	510	800
SHELL TELLUS OIL 27							0470

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.



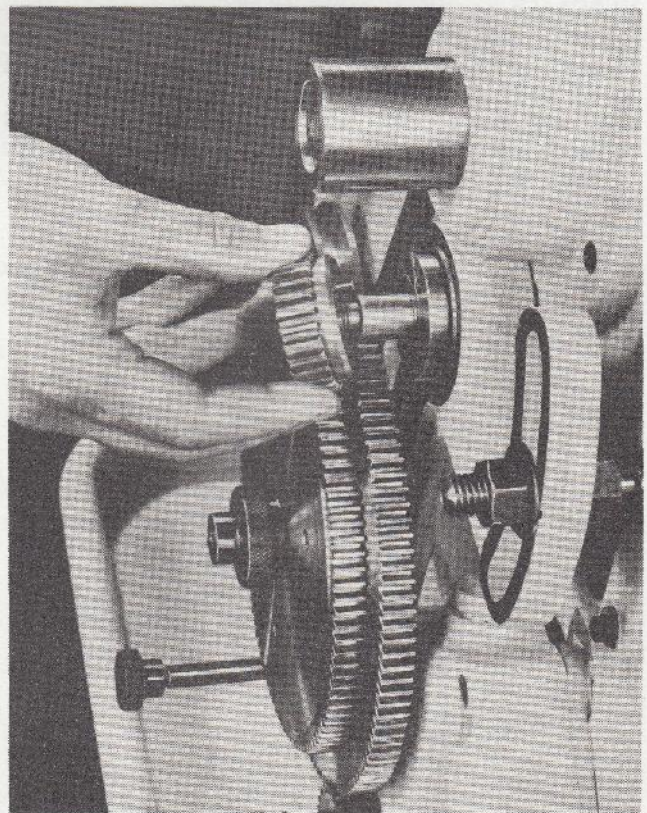
SWING FRAME ASSEMBLY

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).

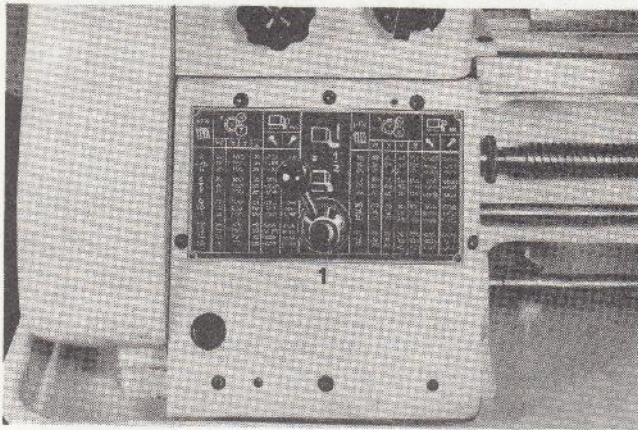
A shear pin device is fitted as a precautionary measure to protect the leadscrew against overload in the low speed range. A broken pin can easily be replaced by removing the top gear in the end train and then the splined sleeve which carries the gear. The broken pin can then be tapped out of the sleeve. 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.



FEEDS AND THREADS—NON-GEARBOX MODEL

On the Bantam Hawk, a special two-speed feed box is incorporated. The two feeds are selected by means of the lever located on the front cover (1), when moved to the right the fine feed range is selected and the coarse feed range is obtained by moving it to the left. The knob situated on the front of the headstock controls the direction of the feeds, reversing them as necessary. Illustrated below are the screwcutting charts from which the combination of gears for all normal threads can be read at a glance.



MM	X Y Z W			
	W	X	Y	Z
0.5	20	60	30	127
0.6	20	50	30	127
0.7	20	50	35	127
0.75	30	60	30	127
0.8	32	60	30	127
0.9	36	60	30	127
1.0	20	- 50 -		127
1.25	50	60	30	127
1.5	50	60	36	127
1.75	35	- 50 -		127
2.0	60	30	20	127
2.5	50	- 30 -		127
3.0	60	- 30 -		127
3.5	60	30	35	127
4.0	50	20	32	127
4.5	60	20	30	127
5.0	60	30	50	127
5.5	60	30	55	127
6.0	60	25	50	127

SHELL TELLUS OIL 27

1"	X Y Z W				INS		1"	X Y Z W				INS	
	W	X	Y	Z	↔	↔		W	X	Y	Z	↔	↔
4	30	100	30	.028	.014	= 1/2	18	32	72	50	100	.0065	.003
4.5	32	100	36	.025	.013		19	20	57	60	100	.006	.003
5	20	100	25	.022	.011		20	20	72	100	.0055	.003	
6	20	100	30	.019	.009		22	20	55	50	100	.005	.0025
7	20	100	35	.016	.008		24	20	60	50	100	.005	.0025
8	30	100	60	.014	.007		26	20	65	50	100	.0045	.002
9	32	100	72	.012	.0065		28	20	70	50	100	.004	.002
10	20	100	50	.011	.006		32	36	72	25	100	.0035	.002
11	20	100	55	.010	.0055		36	32	72	25	100	.003	.0015
12	20	100	60	.009	.005		40	20	72	36	100	.003	.0015
13	20	100	65	.0085	.0045		48	20	72	30	100	.0025	.001
14	20	100	70	.008	.004		56	20	70	25	100	.002	.001
16	25	72	100	.007	.0035								

SHELL TELLUS OIL 27

ADDITIONAL THREADS FROM NON-GEARBOX MODEL

English Threads

In order to obtain English threads between those listed the necessary information may be calculated as follows:—

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

Example:

To cut 26 t.p.i.

Since these machines are fitted with 4 t.p.i. leadscrews, the following is obtained:—

$$\frac{4}{26} = \frac{\text{Driver}}{\text{Driven}}$$

As there is no 4T gear, each figure should be multiplied by a common factor so that the value of at least one of the figures corresponds with the available change wheels. For example:—

$$\frac{4 \times 5}{26 \times 5} = \frac{20}{130} = \frac{\text{Driver}}{\text{Driven}}$$

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

$$\frac{20}{130} = \frac{20 \times 50}{65 \times 100} = \frac{\text{Driver}}{\text{Driven}}$$

Metric Thread Pitches

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

$$\text{t.p.i.} = \frac{25.4}{\text{Pitch in mm}}$$

Multi Start Threads

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

1. By re-positioning the compound slide one pitch forward for each start. It will be realised, however, that the accuracy of this method depends upon the operator.
2. By using an accurately divided driver plate and turning the workpiece one division forward for each start.
3. By advancing the driver gear a calculated number of teeth to advance the spindle by one pitch of the thread to be cut. The accuracy of this method is that of the machine. 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 4 start thread with the 20T gear in the driver position:—

- (i) Cut one start.
Dividing 4 into 20 gives 5 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 driving gear through the calculated number of teeth and replace the idler gear, making sure that the meshing marks between the idler and driven gear correspond exactly.
- (iv) Cut the next start and repeat for each remaining start.

GEARBOX

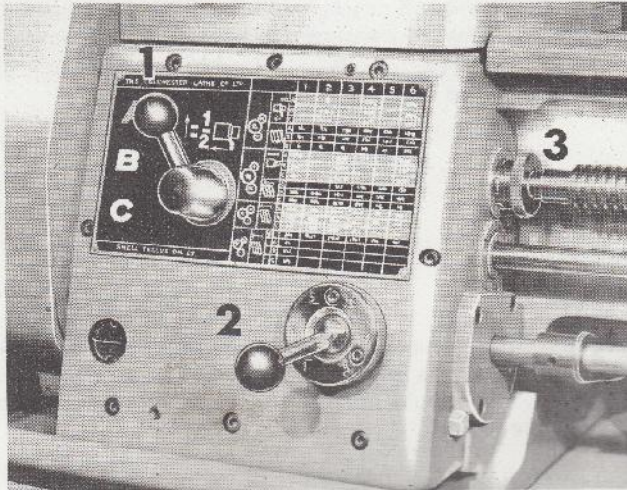
Two alternative types of quick change gearbox may be fitted in place of the two-feed box.

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		0.468 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>		INS.	A		.005		.006		.008
			B		.010		.012		.016
			C		.020		.025		.032
			A	24	22	20	18	16	14
			B	12	11	10	9	8	7
			C	6		5	4.5	4	3.5
		INS.	A	.001		.001			.002
			B	.002		.003			.004
			C	.005		.006			.008
			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., 11½ 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

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

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

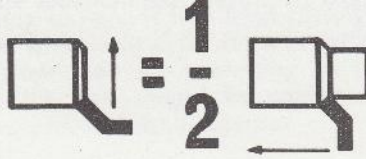

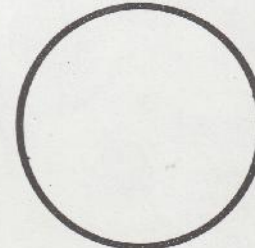
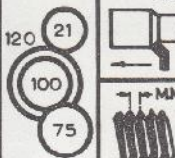
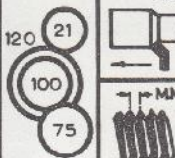

1. Threads available from the gearbox

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.

						0.450			
	X	Y		X	Y				MM
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				127		120	
		X				X		33	
		120				120		45	
		Y				Y		18	
								55	
								100	
								18	

SHELL TELLUS OIL 27

THE COLCHESTER LATHE CO. LTD.		1	2	3	4	5	6
A 	MM.	A 0.35		0.30			0.20
		B 0.20		0.15			0.10
		C 0.10		0.07			0.05
B 	MM.	A 3.0		2.5		2.0	1.75
		B 1.5		1.25		1.0	
		C 0.75				0.5	
C 	MM.	A 0.70		0.60			0.40
		B 0.40		0.30			0.20
		C 0.20		0.15			0.10
	MM.	A 6.0	5.5	5.0	4.5	4.0	3.5
		B 3.0		2.5		2.0	1.75
		C 1.5		1.25		1.0	
	MM.	A 0.15		0.12			0.08
		B 0.07		0.06			0.04
		C 0.04		0.03			0.02
	MM.	A 1.2	1.1	1.0	0.9	0.8	0.7
		B 0.6		0.5	0.45	0.4	0.35
		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.

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

$$10 \times 2 \times 12$$

$$3 - B$$

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.

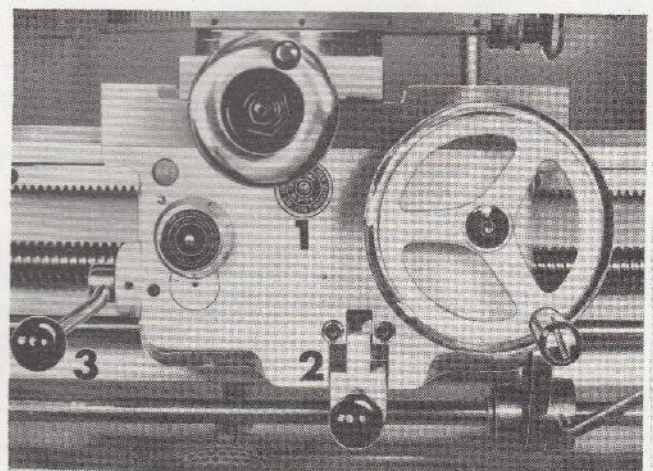
NOTE. Whichever method is used, the leadnut should be engaged to cut the first thread and not released until all starts have been completed.

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.

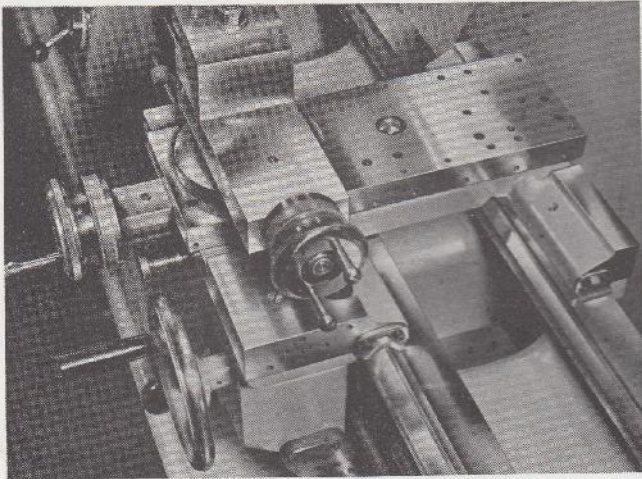
When screw cutting the lead nut is controlled by lever (3).

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 0.001 in. or 0.05 mm divisions. The compound slide is radially graduated $90^{\circ} - 0^{\circ} - 90^{\circ}$ each side for accurate setting. The American pillar type toolpost is fitted as standard suitable for $\frac{1}{2}$ in. x 1 in. tools. As an alternative the Colchester quick change toolpost is available as additional equipment.



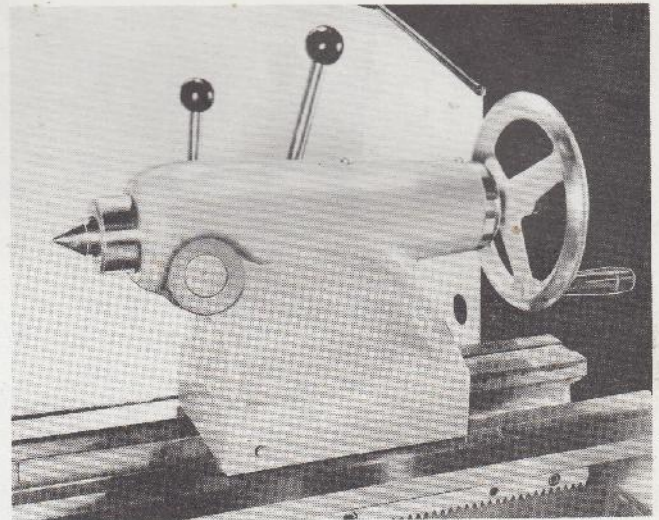
THE BED

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.

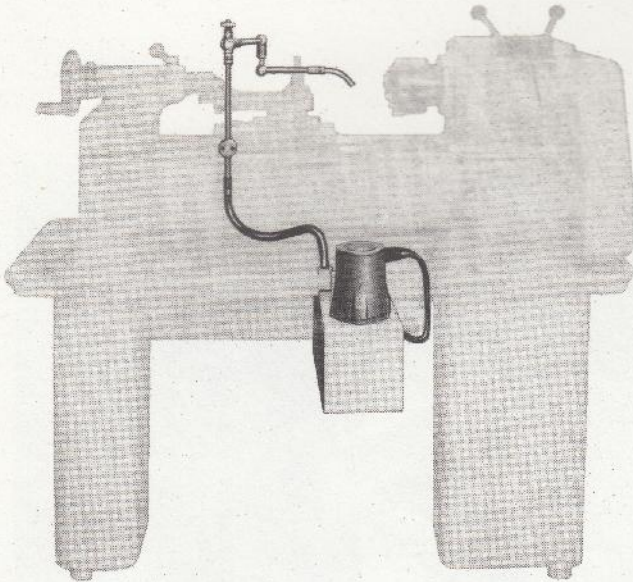
A brief list of these is given below and more detailed information on certain items is given in subsequent pages. All these accessories can be fitted to the machine after it has left the works.

5-station hand-operated inclined head capstan slide with adjustable rotating stops and maximum working stroke of $4\frac{1}{2}$ in. bored to receive $\frac{3}{4}$ in. dia. shank toolholder	661	Jacobs type drill chuck with 3 M.T. arbor $0\frac{1}{2}$ in. capacity	622
5-station capstan slide as above with maximum working stroke of 114 mm bored to receive 20 mm dia. shank toolholders	686	Perspex chuck/chip guard for fitting to lathe bed or saddle	664
Colchester type No. 259 quick change toolpost complete with 4 standard toolholders, 1 vee holder, 1 morse taper holder and 2 wrenches	671	Single-type bed stop	697
Additional standard toolholders No. 83116 for above	672	Micrometer bed stop	695
Additional vee holders No. 83117 for above	673	5-position turret type bed stops for automatic cut-out on cross feeds	624
Additional morse taper holders No. 83118 for above	674	5-position turret type bed stops for automatic cut-out on longitudinal feeds	625
Rear toolposts	646	Electric coolant pump, tank and fittings	608
125 mm dia. Burnerd 3-jaw geared scroll D.I. Camlock chuck (no backplate required).	601	3-point stationary steady $3\frac{1}{2}$ in. dia. capacity	609
205 mm dia. Burnerd 4-jaw independent D.I. Camlock chuck (no backplate required).	602	50 volt 48 watt low volt lighting for standard A.C. supply only	610
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	Telescopic taper turning attachment	632
Burnerd $1\frac{1}{2}$ in. capacity key operated 'Multisize' collet chucks	652	G.M.T. type 3 RC/I No. 3 M.T. rotating centre	617
Flexible round bore E Type collets for 'Multisize' collet chuck: each having $\frac{1}{8}$ in. capacity in steps from $1/16$ in. to $1\frac{1}{2}$ in. Price each also suitable for hexagonal bore up to $1\frac{1}{4}$ in. AF	653	Gearbox conversion set consisting of complete gearbox, leadscrew, spline shaft, etc., for converting non-gearbox model Product Code HAWK to gearbox model Product Code EAGLE in field, plus installation charge at cost	694

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.

The wiring from the pump is connected to a small starter attached to the front panel which is wired to the input side of the contactor on terminals L1, L2 and L3.



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.

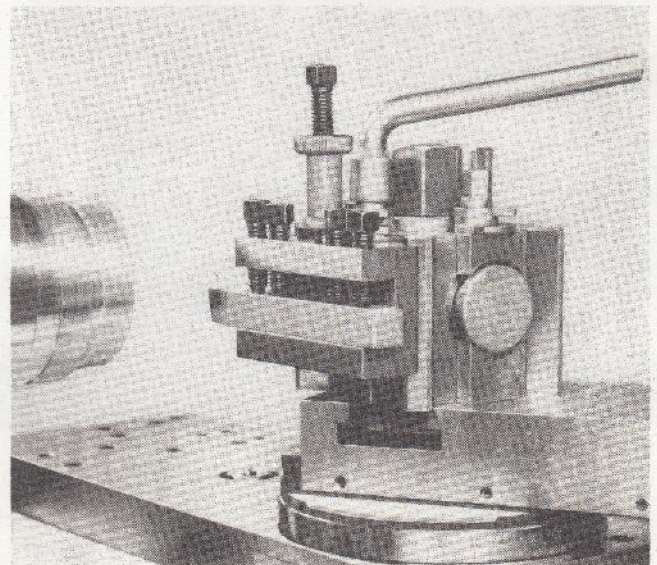
Shell Dromus Oil 908—extreme pressure oil mixed with water in the ratio 10/15:1.

Soluble oils and machine maintenance

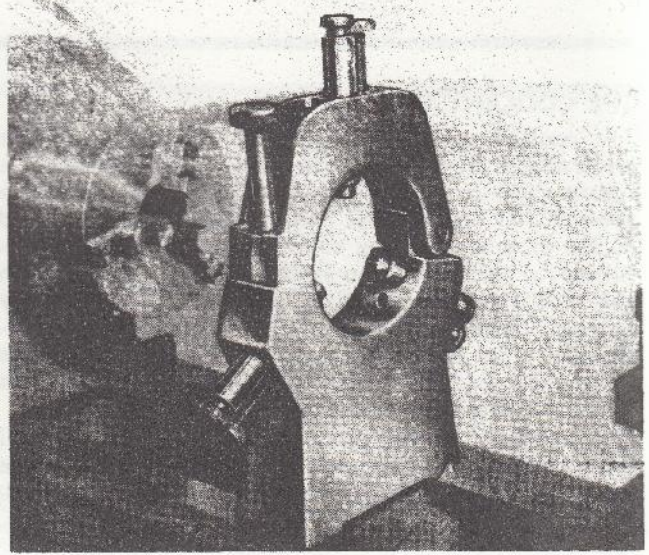
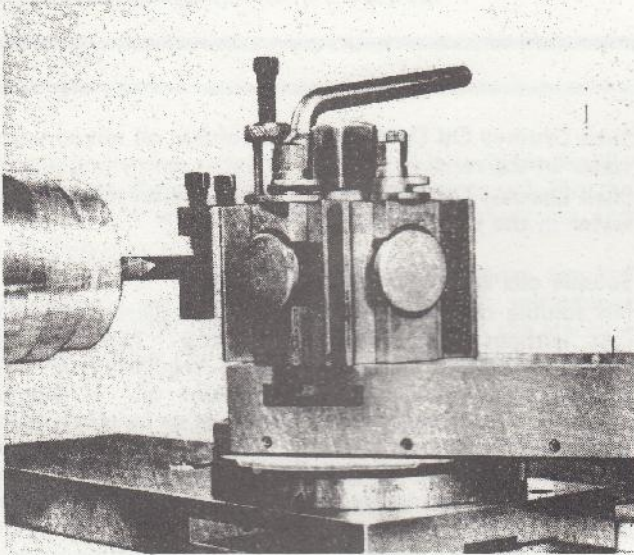
No soluble oil, however good, can completely prevent rust without help from the operator. The machine should therefore be cleaned down regularly and the bright parts wiped over with machine oil. It should never be left, especially over weekends or holidays, with wet swarf on the bed or slides. When the 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.

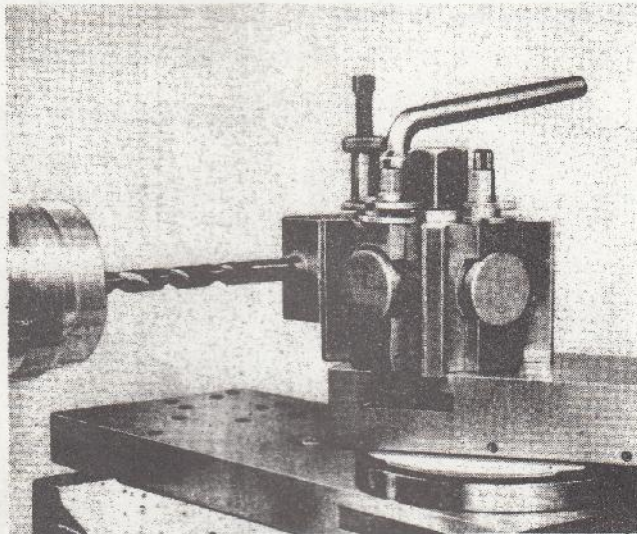


Each toolholder has a vertical adjusting screw and when a tool in its holder has been set to centre height it may be removed and replaced any number of times in the sure knowledge that the tool will be at exact centre height each time it is returned to the clamping head.



Three types of toolholder are available.

The standard toolholder will accommodate all normal types of tool up to a maximum size of $\frac{3}{8}$ 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 4 in. (102 mm) 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

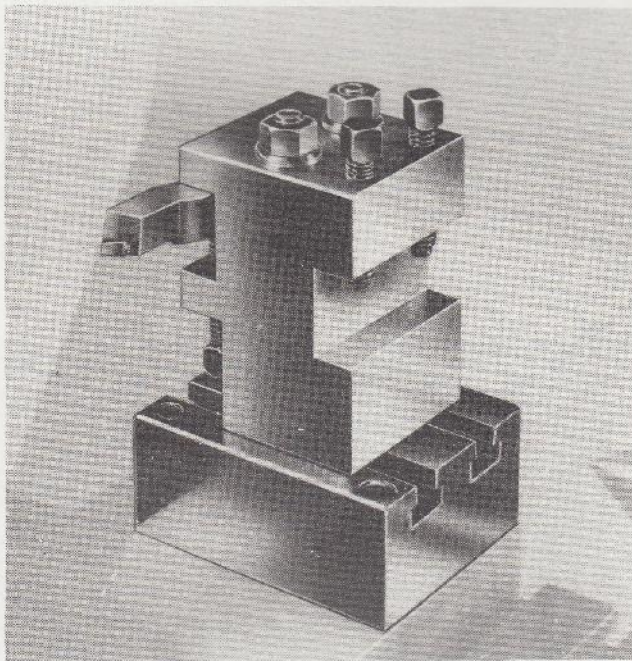
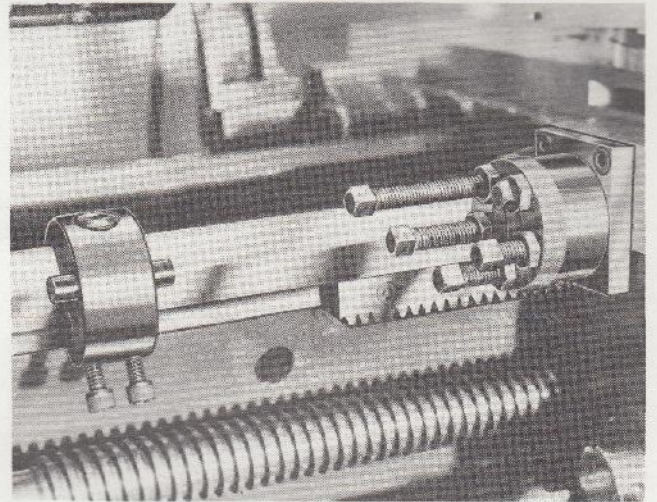
As an aid to production, a rear toolpost is available for fitting direct to the cross slide which is drilled and tapped ready to receive it.

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 $\frac{3}{8}$ in. (16 mm).

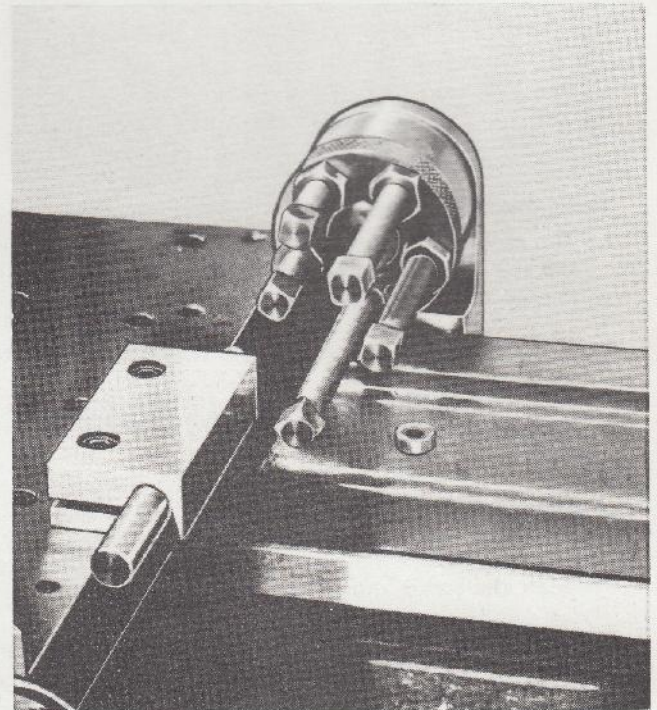
The standard Allen keys and spanners supplied with the machine will fit all the nuts and screws in this assembly.



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 $\frac{1}{4}^\circ$ of arc and in $\frac{1}{8}$ in. taper per foot and great sensitivity of control is obtained when setting a taper by the use of the micro adjustment screw.

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

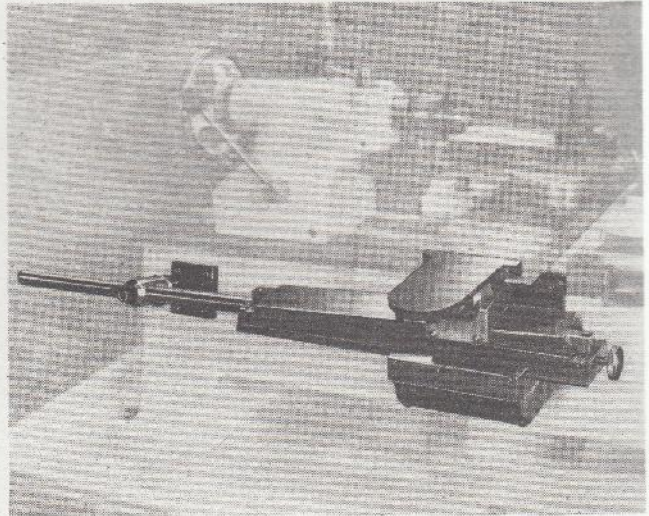
The attachment will deal with a length of 10 in. (254 mm) of taper at any one setting.

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

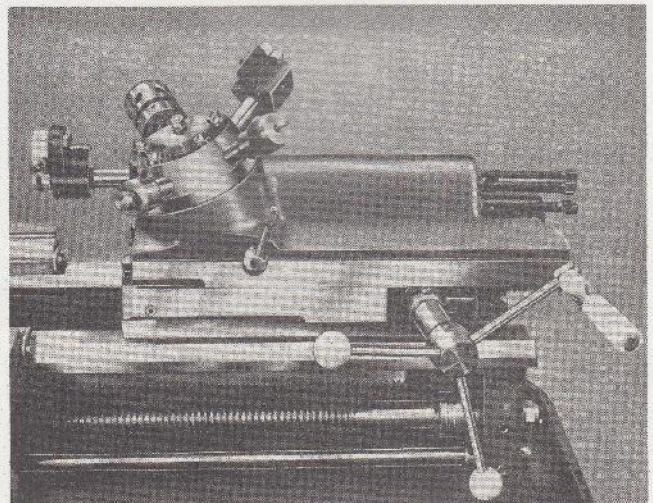
1. The saddle and cross slide are ready drilled to receive the attachment, the necessary holes being drilled and tapped during manufacture.
2. Clean down the rear end of the saddle to receive the taper turner bracket.
3. Release the locknut in the centre of the cross slide handwheel.
4. Slide the cross 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 tool-holders 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.

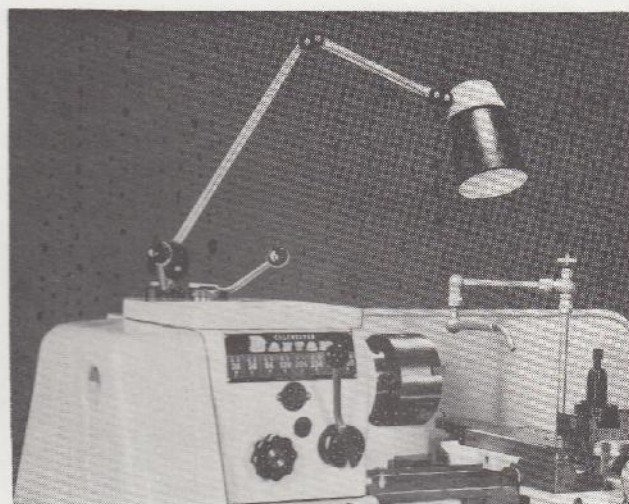
LOW VOLT LIGHTING UNIT

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.

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

PHYSICS 354
LECTURE 10
MAY 19, 1994

1. Introduction
2. Review of the previous lecture
3. Discussion of the new material
4. Summary of the lecture

LECTURE 10: THE QUANTUM THEORY OF LIGHT

1. The quantum theory of light
2. The photoelectric effect
3. Compton scattering
4. The wave-particle duality of light
5. The uncertainty principle
6. The quantum theory of the atom
7. The quantum theory of the solid state
8. The quantum theory of the superconductor
9. The quantum theory of the semiconductor
10. The quantum theory of the laser
11. The quantum theory of the transistor
12. The quantum theory of the microprocessor
13. The quantum theory of the computer
14. The quantum theory of the internet
15. The quantum theory of the world wide web

16. The quantum theory of the future

SPARE PARTS SECTION



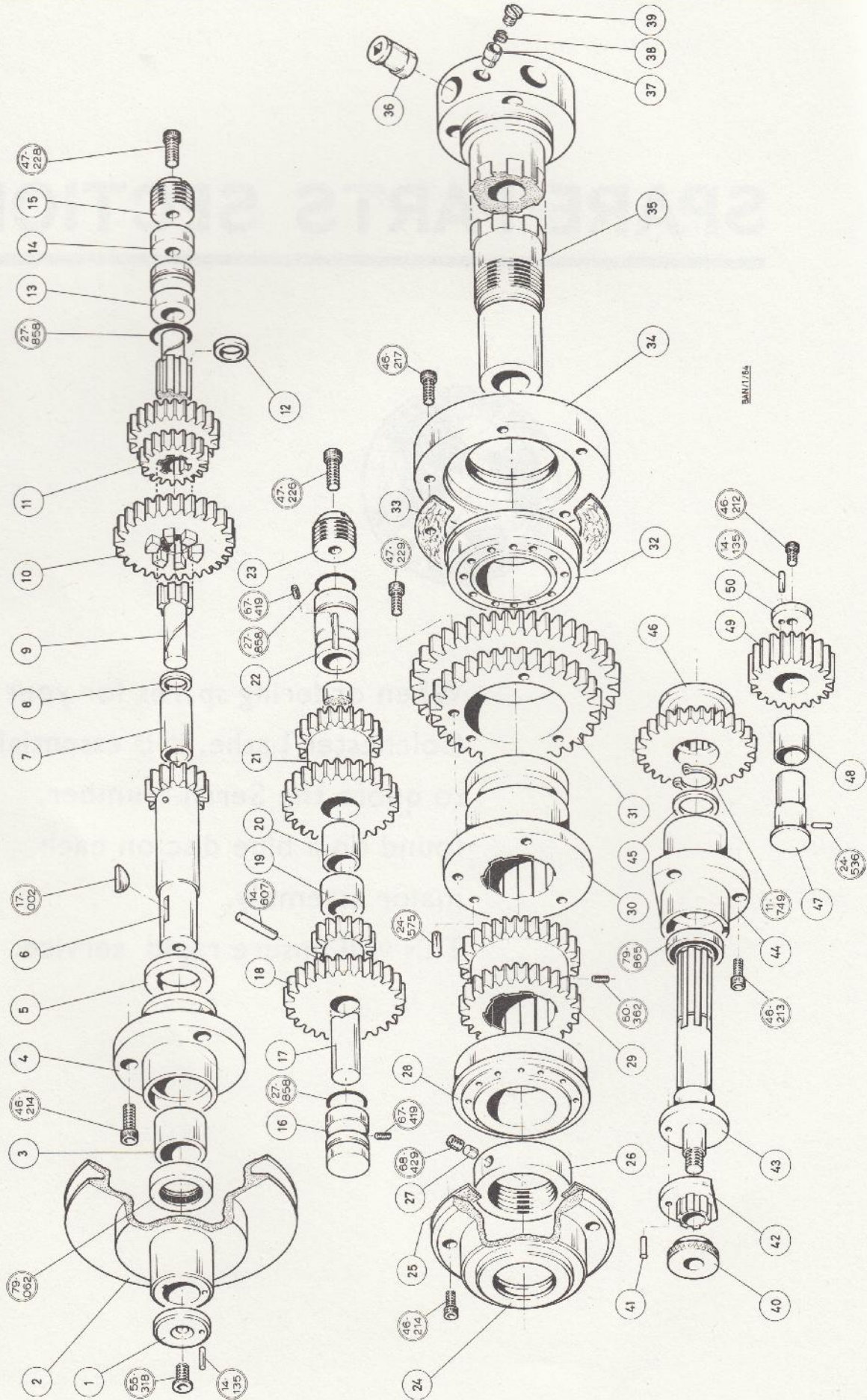
When ordering spares for your Colchester Lathe, it is essential to quote the Serial Number, found on a blue disc on each major assembly.

This will ensure rapid service.

**GRUPPO TESTA
ALBERI ED INGRANAGGI**

HEADSTOCK — gears and shafts

**SPINDELSTOCK
WELLEN — UND RÄDER — EINHEIT**



BAH17.64

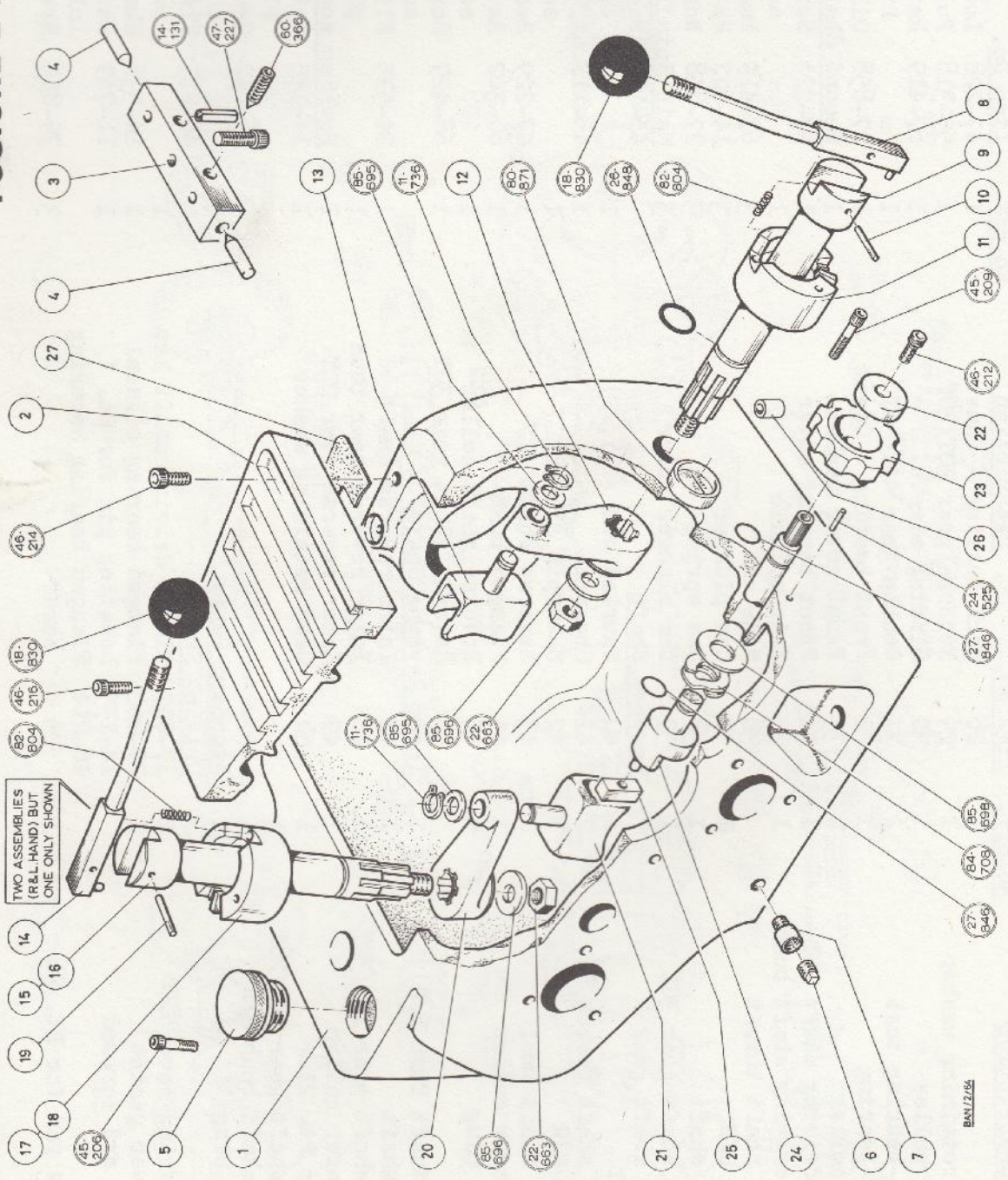
Item No.	Description	No.off.	Item No.	Description	No.off.	Item No.	Description	No.off.
<u>Driving Shaft</u>								
1	Pulley retaining washer	1	28	Back bearing - Gamet	1	47-228	Locking screw for Pt. 15	1
2	Driving pulley	1	29	Reverse gear 30T/30T	1	55-318	Pulley retaining screw	1
3	Flanged-bearing bush	2	30	Sliding sleeve	1	67-419	Retaining screw for Pt. 13	1
4	Flanged-bearing	1	31	Double gear 44T/51T	1	27-858	Oilring for Pt. 13	1
5	Thrust collar	1	32	Front bearing - Gamet	1	Second Shaft		1
6	Clutch driving shaft 12T	1	33	Front cover gasket	1	47-226	Screwed plug locking screw	1
7	Clutch driving shaft bush	1	34	Front bearing cover	1	67-419	Bush retaining screw	2
8	Driving shaft thrust collar L/H	1	35	Main spindle	1	14-607	Retaining pin for Pt. 18	1
9	Driving shaft	1	36	Nose cam	3	27-858	Bush oilring	2
10	Driving shaft gear 30T	1	37	Cam plunger	3	Main Spindle		
11	Driving shaft gear 14T/24T	1	38	Cam spring	3	46-214	Back bearing cover securing screw	3
12	Driving shaft spacer collar R/H	1	39	Cam plunger screw	3	46-217	Front bearing cover securing screw	3
13	Driving shaft bush	1	40	Reverse Shaft	1	47-229	Securing screw for Pt. 31	3
14	Bush spacer collar	1	41	Knurled nut	1	60-362	Reverse gear locating screw	2
15	Screwed plug	1	42	Shearpin	1	68-429	Screwed collar locking screw	1
<u>Second Shaft</u>			43	Shearpin sleeve	1	24-575	Sliding sleeve locating pin	1
16	Second Shaft Bush L/H	1	44	Reverse shaft	1	Reverse and Inter Reverse Shaft		
17	Second shaft	1	45	Flanged bush	1	14-135	Retaining washer locating pin	1
18	Second shaft gear 13T/30T	1	46	Reverse shaft collar	1	46-212	Gear retaining screw	1
19	Gear spacer collar	1	47	Reverse shaft gear 30T	1	46-213	Flanged bush securing screw	3
20	Bush for Pt. 21	1	48	Inter reverse shaft	1	24-536	Shaft locating pin	1
21	Second shaft gear 20T/28T	1	49	Inter reverse gear bush	1	11-749	Reverse shaft retaining clip	1
22	Second shaft bush R/H	1	50	Inter reverse gear 20T	1	79-865	Reverse shaft oilseal	1
23	Screwed plug	1		Gear retaining washer	1			
<u>Main Spindle</u>								
24	Back bearing cover	1	Standard Parts					
25	Back cover gasket	1	<u>Driving Shaft</u>					
26	Spindle end screwed collar	1	17-002	Clutch driving shaft key	1			
27	Pressure pad for Pt. 26	1	79-062	Flanged bearing oilseal	1			
			14-135	Locating pin for Pt. 1	1			
			46-214	Flanged bearing securing screw	3			

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

**SPINDELSTOCK
GEHÄUSE UND HEBEL — EINHEIT**

HEADSTOCK — castings and levers

**GRUPPO TESTA
FUSIONE E LEVE COMANDO**



HEADSTOCK - CASTINGS AND LEVERS

REFERENCE DWG. BAN/2/64

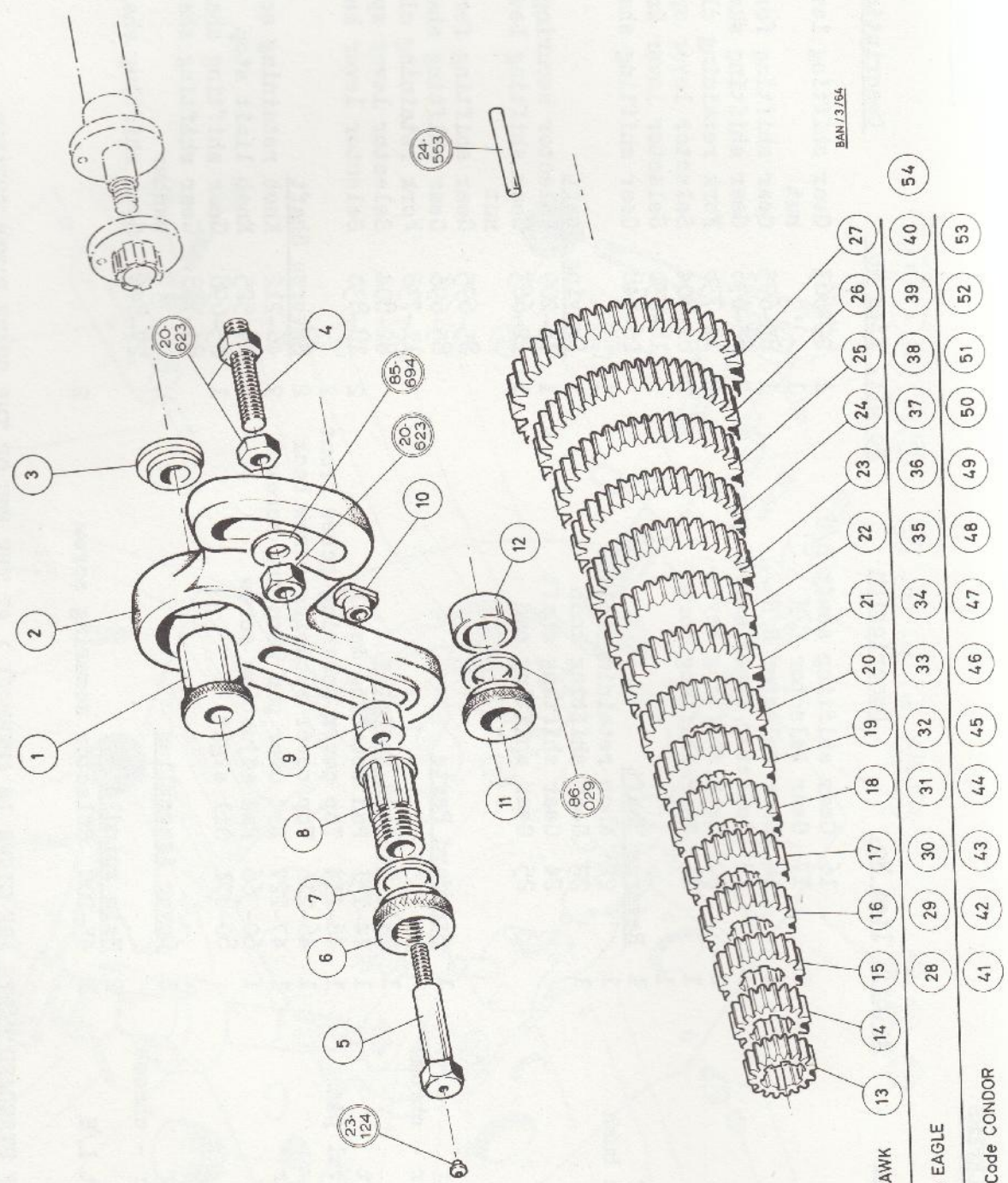
<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
<u>Main Casting Assembly</u>								
1	Main casting	1	16	Gear shifting shaft R/H	1	22-663	Gear shifting lever securing nut	1
2	Top cover	1	17	Gear selector L/H	1	85-695	Gear shifting fork washer	1
3	Set over pad	1	18	Gear selector R/H	1	85-696	Gear shifting shaft washer	1
4	Set over pin	2	19	Selector lever swivel pin	2	11-736	Fork retaining clip	1
5	Oil filler plug	1	20	Gear shifting lever	2	82-804	Selector lever spring	1
6	Oil drain plug	1	21	Gear shifting fork	2	18-830	Selector lever knob	1
7	Drain plug adaptor	1	<u>Reverse Shaft</u>		1	26-848	Gear shifting shaft oilring	1
26	Headstock location bush	1	22	Knob retaining collar	1	<u>Driving Shaft</u>		4
27	Top cover gasket	1	23	Gear shifting knob	1	45-209	Selector securing screw	2
<u>Lever Assemblies</u>								
			24	Gear shifting shaft	1	22-663	Gear shifting lever securing nut	2
			25	Gear shifting pad	1	85-695	Gear shifting fork washer	2
<u>Main Spindle</u>								
8	Gear selector lever	1	<u>Standard Parts</u>		2	85-696	Gear shifting shaft washer	2
8	Gear selector lever - chrome finish	1	1	<u>Main Casting Assembly</u>	2	11-736	Fork retaining clip	2
9	Gear shifting shaft	1	14-131	Pad locating dowel	2	82-804	Selector lever spring	2
10	Selector lever swivel pin	1	46-214	Top cover securing screw front	2	18-830	Selector lever knob	2
11	Gear selector	1	46-216	Top cover securing screw back	2	<u>Reverse Shaft</u>		1
12	Gear shifting lever	1	47-227	Set over pad securing screw	2	46-212	Knob retaining screw	1
13	Gear shifting fork	1	60-366	Pad adjusting screw	2	24-525	Knob limit stop	1
			80-871	Oil sight	1	85-698	Gear shifting shaft washer	1
<u>Driving Shaft</u>								
14	Gear selector lever	2	<u>Lever Assemblies</u>		2	84-708	Gear shifting shaft spring washer	1
14	Gear selector lever - chrome finish	2	1	<u>Main spindle</u>	2	27-846	Gear shifting shaft oilring	2
15	Gear shifting shaft L/H	1	1	45-206	Selector securing screw			

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

**SCHWINGRAHMEN — EINHEIT
UND WECHSELRÄDER**

SWING FRAME AND CHANGE GEARS

**CAMBIO AUSILIARIO
INGRANAGGI SUPPLEMENTARI**



BAN/3/54

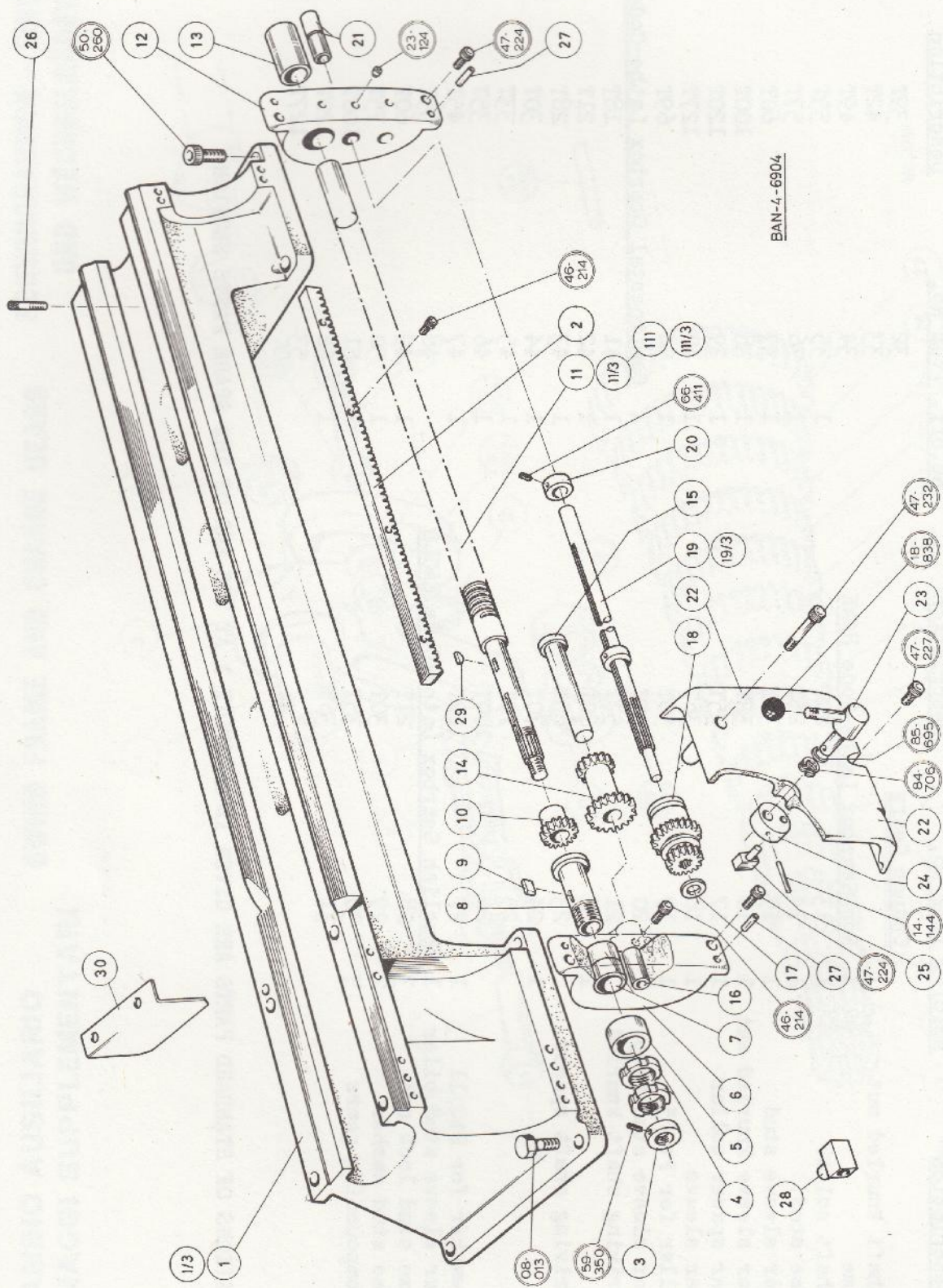
NON-GEARBOX LATHE - Code HAWK	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
ENGLISH GEARBOX LATHE - Code EAGLE	28	29	30	31	32	33	34	35	36	37	38	39	40	41	54
CONTINENTAL GEARBOX LATHE - Code CONDOR	41	42	43	44	45	46	47	48	49	50	51	52	53		

SWING FRAME ASSEMBLY AND CHANGE GEARS

REFERENCE DWG. BAN/3/64

<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
<u>Swing Frame</u>								
1	Reverse shaft knurled nut	1				32	39T	1
2	Swing frame	1				33	42T	1
3	Reverse shaft collar	1				34	49T	1
4	Swing frame stud	1				35	55T	1
5	Change gear sleeve stud	1				36	57T	1
6	Change gear sleeve knurled nut	1				37	60T	1
7	Change gear spacer collar	1				38	100T	1
8	Change gear sleeve	1				39	120T	1
9	Spacer collar for Pt. 5	1				40	127T	1
10	Change gear sleeve stud keep	1				54	69T	1
11	Gearbox driving shaft knurled nut.	1					<u>Continental Gearbox Lathe-Code CONDOR</u>	
						41	18T	1
						42	21T	1
						43	28T	1
12	Gearbox driving shaft spacer collar	1				44	30T	1
						45	33T	1
						46	35T	1
<u>Standard Parts</u>								
86-029	Fan disc washer for Pt. 11	1				47	45T	1
23-124	Change gear sleeve stud oiler	1				48	55T	1
20-623	Swing frame stud lock nut	3				49	60T	1
85-694	Swing frame stud washer	2				50	75T	1
24-553	Pin for compounding gears	3				51	100T	1
						52	120T	1
						53	127T	1
							<u>English Gearbox Lathe-Code EAGLE</u>	
						28	21T	1
						29	30T	1
						30	35T	1
						31	36T	1

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION



BAN-4-6904

**BED & SHAFTS ASSEMBLY
(NON GEARBOX LATHES)**

TWO-SPEED FEED BOX AND BED (NON GEARBOX LATHES)

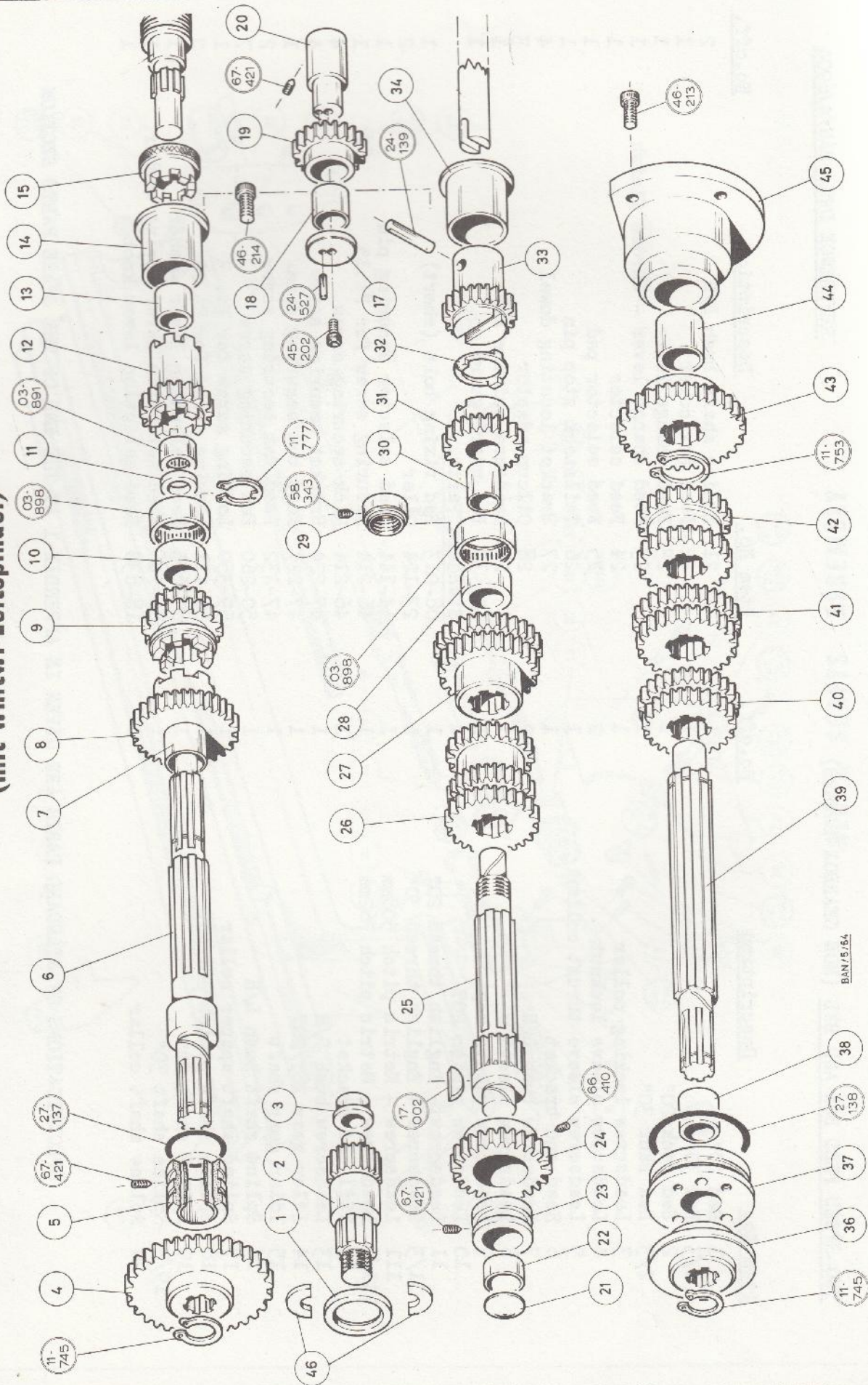
REFERENCE DWG. BAN/4/6904

<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
1	Bed 20"	1	21	Spline shaft bush R/H	2
1/3	Bed 30"	1	22	Feed box cover	1
2	Bed rack 20"	1	23	Feed change lever	1
2/3	Bed rack 30"	1	23	Feed change lever - Chrome finish	1
3	Leadscrew locking collar	1	24	Feed selector	1
4	Leadscrew sleeve locknut	2	25	Feed selector pad	1
5	Leadscrew sleeve thrust collar	1	26	Tailstock stop pin	1
6	Head end bracket	1	27	Bracket locating dowel	4
7	Leadscrew bush L/H	2	28	Oilcup adaptor	3
8	Leadscrew sleeve	1	29	Leadscrew pinion key	1
9	Leadscrew sleeve key	1	30	Bed swarf guard	1
10	Leadscrew pinion 20T	1	<u>Standard Parts.</u>		
11	Leadscrew - English thread 20"	1	08-013	Bed fixing bolt (short)	1
11/3	Leadscrew - English thread 30"	1	23-124	Oiler	2
111	Leadscrew - Metric pitch 508mm	1	14-144	Feed selector securing pin	1
111/3	Leadscrew - Metric pitch 762mm	1	46-214	Securing screw for Pt.15	1
12	Tail end bracket	1	46-214	Rack securing screw	4
13	Leadscrew bush R/H	1	47-224	Bracket securing screw	4
14	Idler gear 28T/20T	1	47-227	Feed box securing screw	1
15	Idler gear shaft	1	47-232	Feed box securing screw	2
16	Spline shaft bush L/H	1	50-260	Bed securing screw	7
17	Spline shaft spacer collar	1	59-350	Locking screw for Pt. 3	1
18	Spline shaft pinion 20T/28T	1	66-411	Locking screw for Pt.20	2
19	Spline shaft 20"	1	85-695	Feed selection lever washer	1
19/3	Spline shaft 30"	1	84-706	Feed selection lever spring washer	1
20	Spline shaft collar	2	18-838	Feed selection lever knob	1

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

**SCATOLA NORTON INGLESE
INGRANAGGI ED ALBERI**

**VORSCHUBGETRIEBE
RÄDER — UND WELLEN — EINHEIT
(mit Whitw.-Leitspindel)**



BAN/5.54

GEARBOX — Standard gears and shafts

GEARBOX - GEARS AND SHAFTS

REFERENCE DWG. BAN/5/64

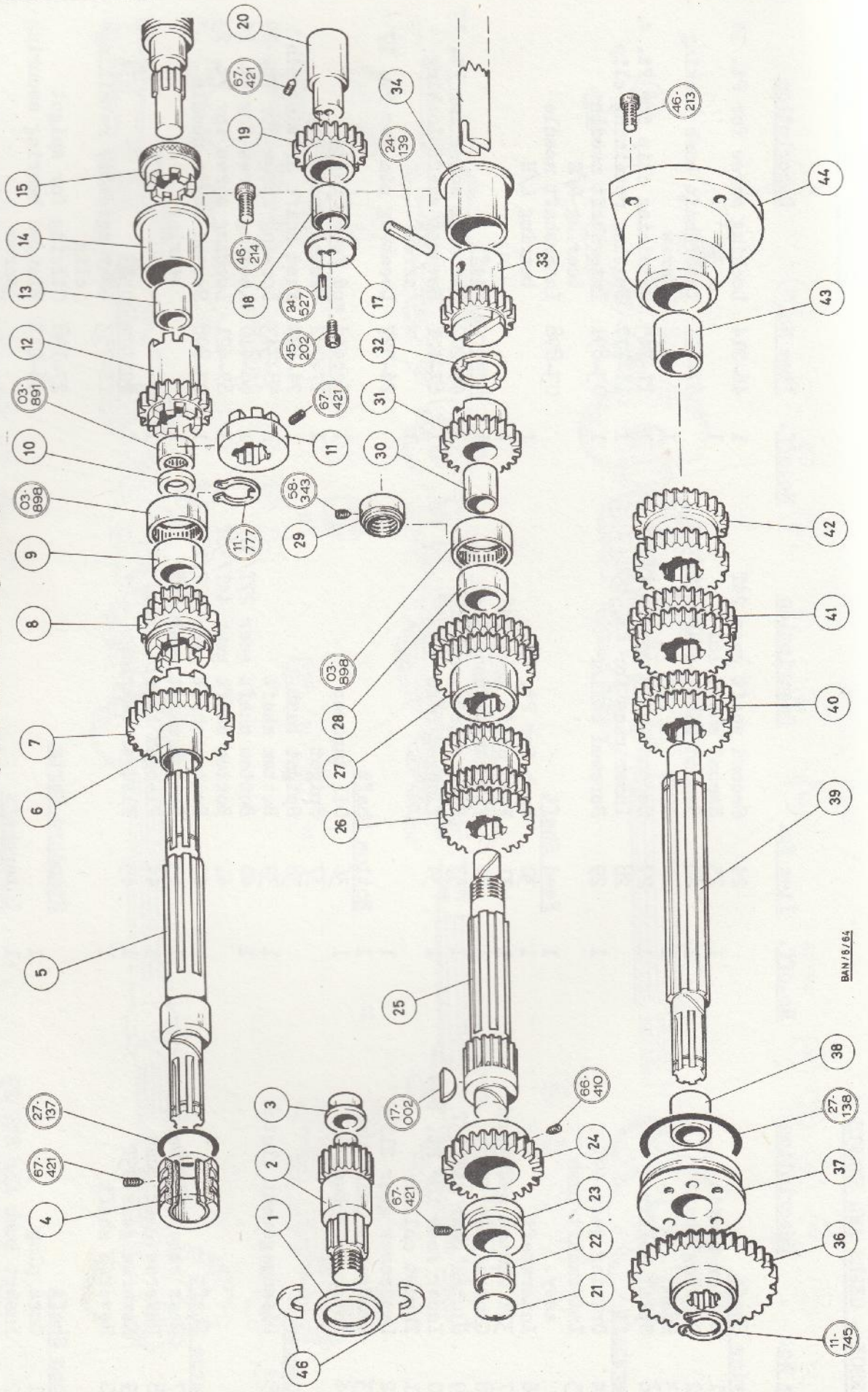
<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
<u>Driving Shaft</u>								
1	Collar seating	1	24	Second shaft gear 24T	1	46-214	Locking screw for Pt. 14 & 34	1
2	Driving shaft	1	25	Second shaft 16T	1	67-421	Intershaft bush locking screw	1
3	Bush	1	26	Second shaft gear 24T/32T, 24T	1	11-745	Retaining clip for Pt. 4	1
4	Split collar	1	27	Second shaft gear 30T/32T	1	11-777	Bearing retaining clip	1
<u>Intershaft</u>								
4	Driving gear 49T	1	28	Inner race for Pt. 898	1	03-891	Intershaft needle bearing R/H	1
5	Intershaft bush	1	29	Screwed collar	1	03-898	Intershaft needle bearing L/H	1
6	Intershaft assy.	1	<u>Feed Shaft</u>		1			
7	32T Clutch gear bush	1	30	Bush for Pt. 31	1			
8	Clutch gear 32T	1	31	Feed shaft gear 24T	1			
9	Clutch gear 24T/15T	1	32	Feed shaft coupling	1			
10	Inner race for Pt. 898	1	33	Feed shaft gear 21T	1			
11	Thrust collar	1	34	Flanged bush	1			
12	Leadscrew gear 21T	1	<u>Bottom Shaft</u>		1			
13	Leadscrew gear bush	1	36	Oil thrower	1			
14	Intershaft bush R/H	1	37	Spigot	1			
<u>Leadscrew</u>								
15	Disengagement clutch	1	38	Spigot bush	1			
<u>Reverse Shaft</u>								
17	Gear retaining washer	1	39	Bottom shaft	1			
18	Reverse gear bush	1	40	Bottom shaft gear 27T/30T	1			
19	Reverse gear 23T	1	41	Bottom shaft gear 44T/36T	1			
20	Reverse shaft	1	42	Bottom shaft gear 30T/28T	1			
<u>Second Shaft</u>								
21	Core plug	1	43	Bottom shaft gear 36T	1			
22	Insert bush for Pt. 23	1	44	Flanged bearing bush	1			
23	Second shaft bush assy.	1	45	Flanged bearing	1			
<u>Standard Parts</u>								
<u>Intershaft</u>								
27-137	Intershaft oilring for Pt. 5	1						
<u>Bottom Shaft</u>								
11-753	Gear assembly retaining clip	1						
27-138	Oilring for spigot	1						
46-213	Flanged bearing securing screw	3						
11-745	Retaining clip for Pt. 36	1						

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THIS SPARE PARTS SECTION

**SCATOLA NORTON METRICA
INGRANAGGI ED ALBERI**

**VORSCHUBGETRIEBE
RÄDER — UND WELLEN — EINHEIT
(mit metr. Leitspindel)**

**GEARBOX — Continental gears
and shafts**



GEARBOX (CONTINENTAL) - GEARS AND SHAFTS

REFERENCE DWG. BAN/6/64

<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
<u>Driving Shaft</u>								
1	Collar seating	1	21	Core plug				
2	Driving shaft	1	22	Insert bush for Pt. 23				
3	Bush	1	23	Second shaft bush assembly				
46	Split collar		24	Second shaft gear 24T				
<u>Intershaft</u>								
4	Intershaft bush	1	25	Second shaft 16T				
5	Intershaft	1	26	Second shaft gear 24T/32T, 24T				
6	32T Clutch gear bush	1	27	Second shaft gear 30T/32T				
7	Clutch gear 32T	1	28	Inner race for Pt. 03-898				
8	Clutch gear 24T/15T	1	29	Screwed collar				
9	Inner race for Pt. 03-898	1						
10	Thrust collar	1						
11	Intershaft coupling	1						
12	Leadscrew gear 21T	1						
13	Leadscrew gear bush	1						
14	Intershaft bush r/h	1						
<u>Leadscrew</u>								
15	Disengagement clutch	1						
<u>Reverse shaft</u>								
17	Gear retaining washer	1						
18	Reverse gear bush	1						
19	Reverse gear 23T	1						
20	Reverse shaft	1						
<u>Standard Parts</u>								
<u>Intershaft</u>								
1	Intershaft oilring for Pt. 4.	1						
1	Locking screw for Pts. 14 & 34	1						
1	Locking screw for Pts. 4 & 11	1						
1	Bearing retaining clip	1						
1	Intershaft needle bearing r/h	1						
1	Intershaft needle bearing l/h	1						
<u>Reverse shaft</u>								
1	Securing screw for Pt. 17	1						
1	Reverse shaft locking screw	1						
1	Locating pin for Pt. 17	1						
<u>Second and Feed shafts</u>								
1	Second shaft key	1						
1	Feed shaft driving pin	1						
1	Locking screw for Pt. 29	1						
1	Locking screw for Pt. 24	1						
1	Locking screw for Pt. 23	1						
1	Second shaft needle bearing	1						
<u>Bottom shaft</u>								
1	Oilring for spigot	1						
1	Flanged bearing securing screw	3						
1	Retaining clip for Pt. 36	1						
<u>Bottom shaft</u>								
1	Driving gear 49T	1						
1	Spigot bush	1						
1	Bottom shaft gear 27T/30T	1						
1	Bottom shaft gear 44T/36T	1						
1	Bottom shaft gear 30T/28T	1						
1	Flanged bearing bush	1						
1	Flanged bearing	1						

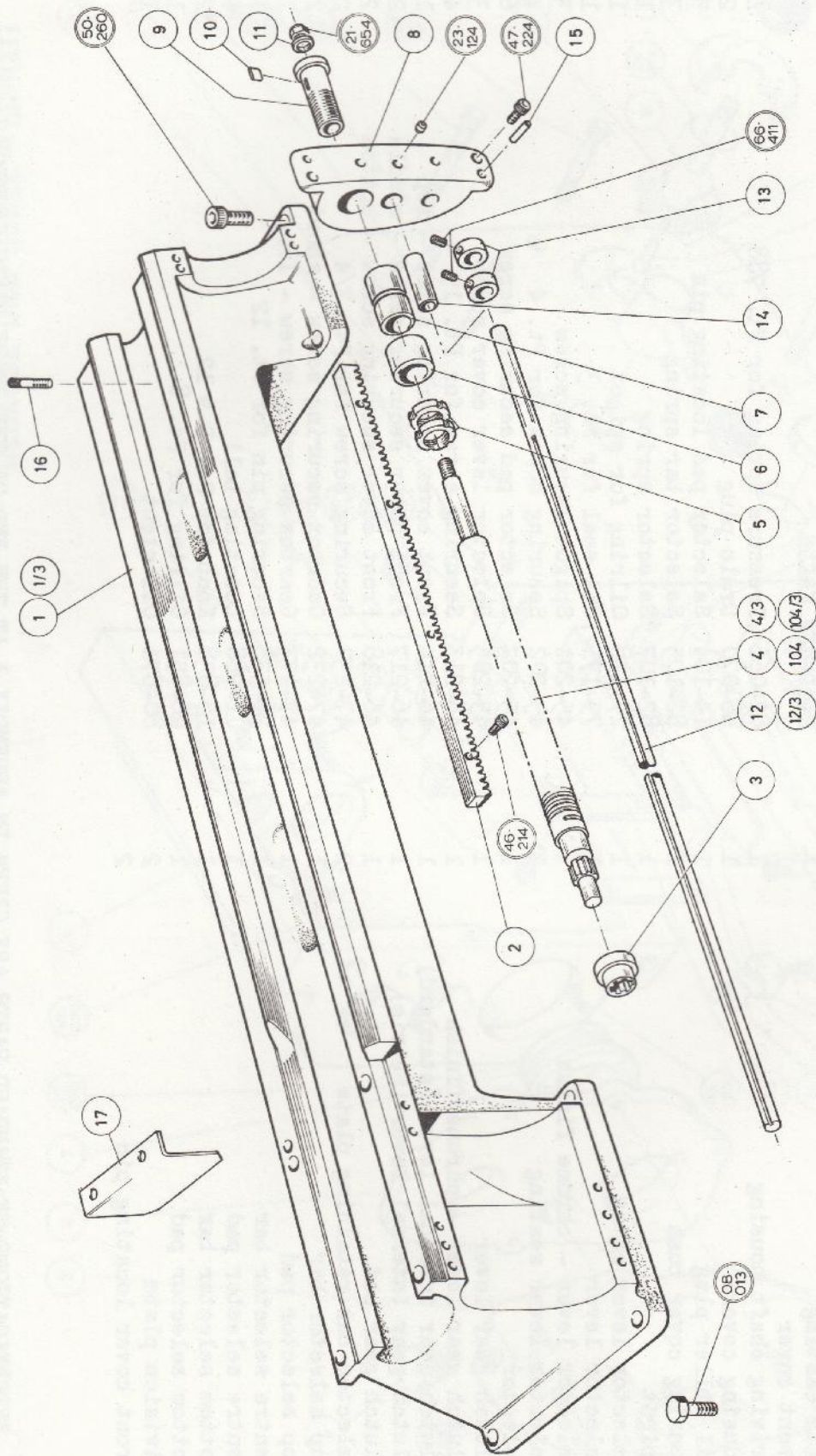
SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

GEARBOX - CASTINGS AND LEVERS

REFERENCE DWG. BAN/7/64

<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
1	Main casting	1	Standard Parts		
2	Front cover	1	82-066	Pressure spring for Pt. 788	1
3	Driving shaft housing	1	88-070	Drain plug	2
4	Housing cover	1	14-104	Selector pad locating pin	3
5	Oil filler plug	1	82-105	Selector bar spring	3
6	Housing cover bush	1	82-107	Selector spring	1
7	Spigot	1	27-138	Oilring for spigot	1
8	Selector lever cover	1	79-171	Oil seal for Pt. 3	1
9	Selector lever	1	45-201	Spigot securing screw	1
9	Selector lever - chrome finish	1	45-202	Securing screw for Pt. 4	3
10	Selector lever seating	1	45-203	Selector pad securing screw	4
11	Selector	1	45-205	Selector lever cover screw	6
12	Clutch gear lever	1	46-213	Selector lever cover screw	3
12	Clutch gear lever - chrome finish	1	46-214	Securing screw for Pt. 15	4
13	Clutch gear internal lever (standard)	1	46-217	Front cover securing screw - top	1
13	Clutch gear internal lever (metric)	1	46-218	Front cover securing screw - middle	2
14	Clutch gear pad	1	47-230	Front cover securing screw - bottom	2
15	Selector bar retaining plate	2	47-232	Securing screw for Pt. 3/4	2
16	Top selector bar	1	47-233	Gearbox securing screw - short	2
17	Top selector pad	1	47-233	Gearbox securing screw - long	1
18	Centre selector bar	1	24-538	Securing pin for Pt. 12	1
19	Centre selector pad	1	01-788	Locating ball	4
20	Bottom selector bar	1	18-838	Knob for Pt. 9 & 12	2
21	Bottom selector pad	1	26-851	Oilring for Pt. 8	1
22	Division plate	2	80-871	Oil sight	1
23	Front cover locating pin	2			1

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION



BED & SHAFTS ASSEMBLY
(GEARBOX LATHES)

BAN-B-6904

BED ASSEMBLY (GEARBOX LATHES)

REFERENCE DWG. BAN/8/6904

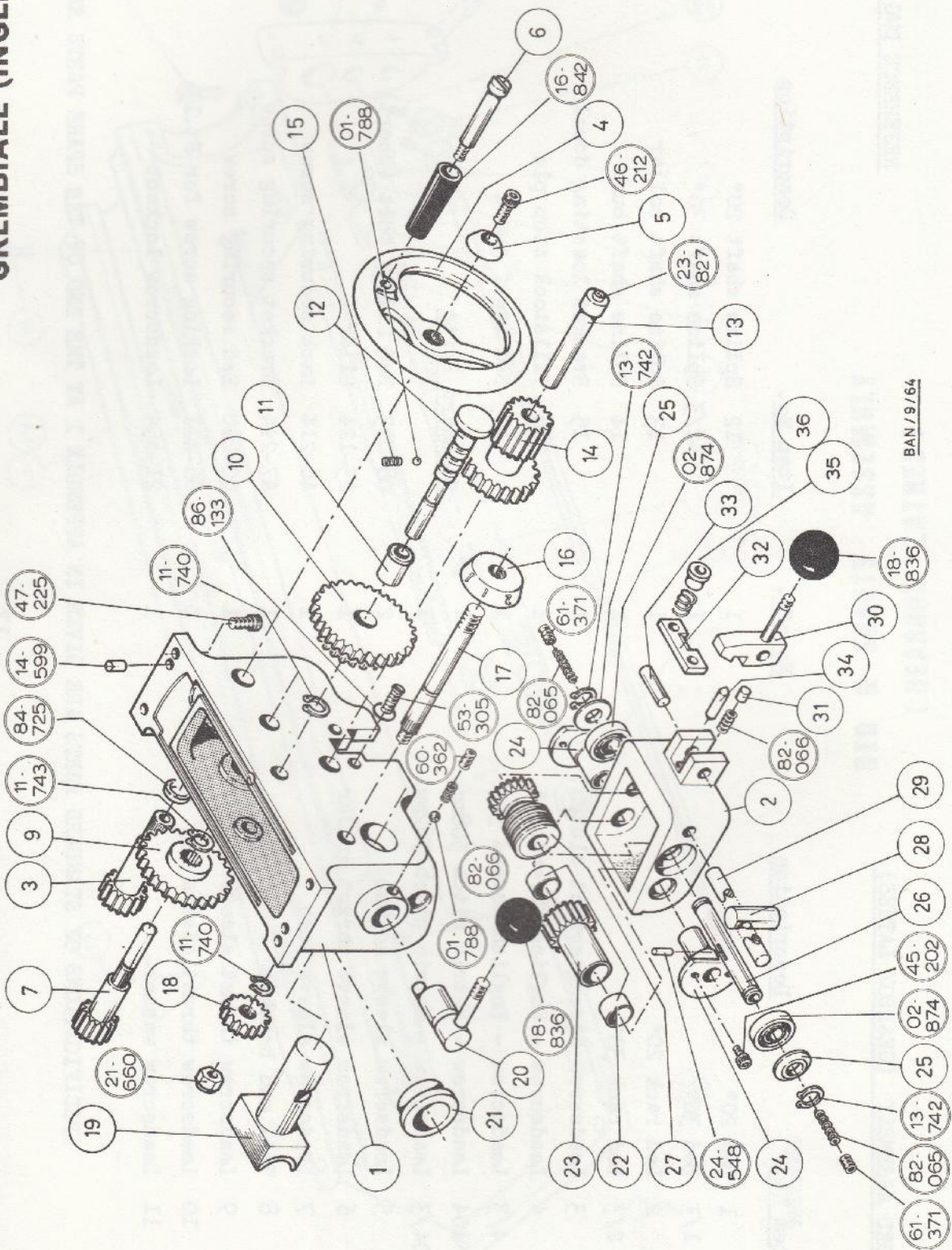
<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
1	Bed 20"	1	12	Spline shaft 20"	1
1/3	Bed 30"	1	12/3	Spline shaft 30"	1
2	Bed rack 20"	1	13	Spline shaft collar	2
2/3	Bed rack 30"	1	14	Spline shaft bush	1
3	Leadscrew disengagement clutch	1	15	Bracket loacting dowel	2
4	Leadscrew - English thread 20"	1	16	Tailstock stop pin	1
4/3	Leadscrew - English thread 30"	1	17	Bed swarf guard	1
104	Leadscrew - Metric pitch 508mm.	1			
104/3	Leadscrew - Metric pitch 762mm.	1			
5	Leadscrew sleeve locknut	2			
6	Leadscrew sleeve thrust collar	1	08-013	Bed fixing bolt (short)	1
7	Leadscrew sleeve bush	1	23-124	Oiler	1
8	Tail end bracket	1	46-214	Rack securing screw	4
9	Leadscrew thrust sleeve	1	47-244	Bracket securing screw	2
10	Leadscrew thrust sleeve key	1	50-260	Bed securing screw	7
11	Leadscrew washer	1	66-411	Locking screw for Pt.13	2
			21-654	Leadscrew locknut	1

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

SCHLOSSKASTEN — EINHEIT
 (Maschinen mit Whitw.-Leitspindel)

STANDARD APRON

GREMBIALE (INGLESE)



BAN/9/64

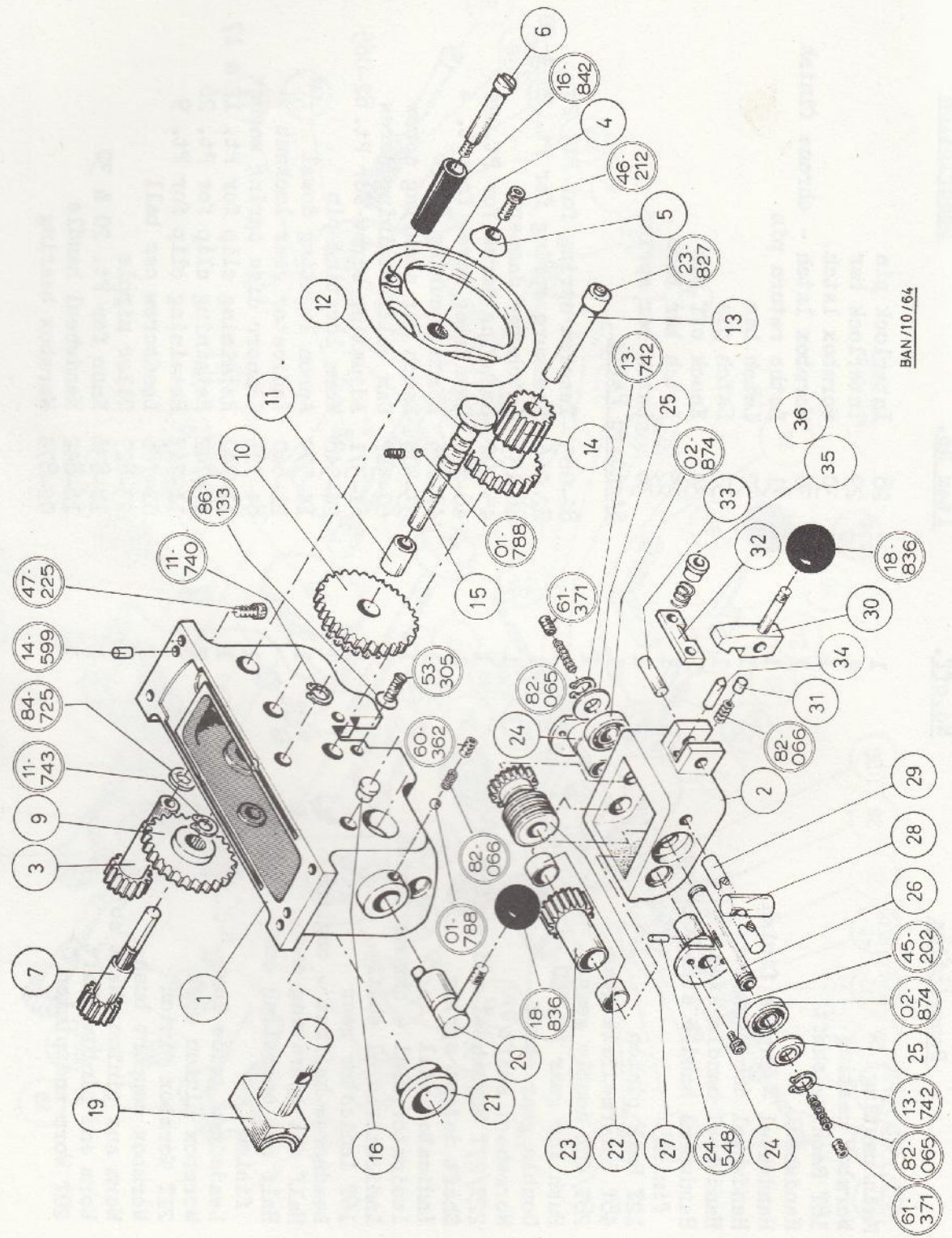
<u>Item No.</u>	<u>Description</u>	<u>No. off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No. off.</u>
1	Main casting	1	28	Interlock pin	1
2	Wormbox casting	1	29	Interlock bar	1
3	18T Racking shaft	1	30	Wormbox latch	1
4	Handwheel	1	30	Wormbox latch - chrome finish	1
4	Handwheel - chrome finish	1	31	Lathic return pin	1
5	Handwheel domed washer	1	32	Latch bar	1
6	Handwheel handle stem	1	33	Latch pin	1
6	Handwheel handle stem - chrome finish	1	34	Knock off pin	1
7	12T Rack pinion	1	35	Latch bar bush	2
9	48T Intermediate gear	1	36	Latch bar spring	2
10	28T/48T double gear	1	<u>Standard Parts</u>		
11	Bush for gear Pt. 10	1	82-065	Tension spring for Pt. 26	2
12	Double gear shaft	1	82-066	Pressure spring for Pt. 20 & 30	2
13	Wormwheel shaft	1	86-133	Latch bar damper	1
14	22T/27T Wormwheel and pinion	1	45-202	Securing screw for Pt. 24	4
15	Shaft detent spring	1	46-212	Retaining screw for Pt. 4	1
16	Indicator dial	1	47-225	Apron securing screw	4
16	Indicator dial - chrome finish	1	53-305	Latch bar securing screw	2
17	Indicator dial shaft	1	60-362	Cam ball retaining screw	1
18	16T Indicator gear	1	61-371	Adjusting screw for Pt. 82-065	2
19	Leadscrew halfnut - english	1	24-548	Worm locating pin	1
20	Half nut operating cam	1	14-599	Apron locating dowel	2
20	Half nut operating cam - chrome finish	1	21-660	Indicator gear locknut	1
21	Leadscrew guide bush	1	84-725	Schnorr disc spring washer	1
22	Wormbox pinion bush	1	11-740	Retaining clip for Pt. 12 & 17	1
23	21T Wormbox pinion	2	13-742	Retaining clip for Pt. 26	2
24	Wormbox support bush	1	11-743	Retaining clip for Pt. 9	1
25	Worm and pinion shaft collar	2	01-788	Leadscrew cam ball	2
26	Worm and pinion shaft	2	23-827	Oiler nipple	1
27	20T Worm and pinion	1	18-836	Knob for Pt. 20 & 30	1
		1	16-842	Handwheel handle	1
		1	02-874	Wormbox bearing	2

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

SCHLOSSKASTEN — EINHEIT
 (Maschinen mit metr. Leitspindel)

APRON (CONTINENTAL LATHES)

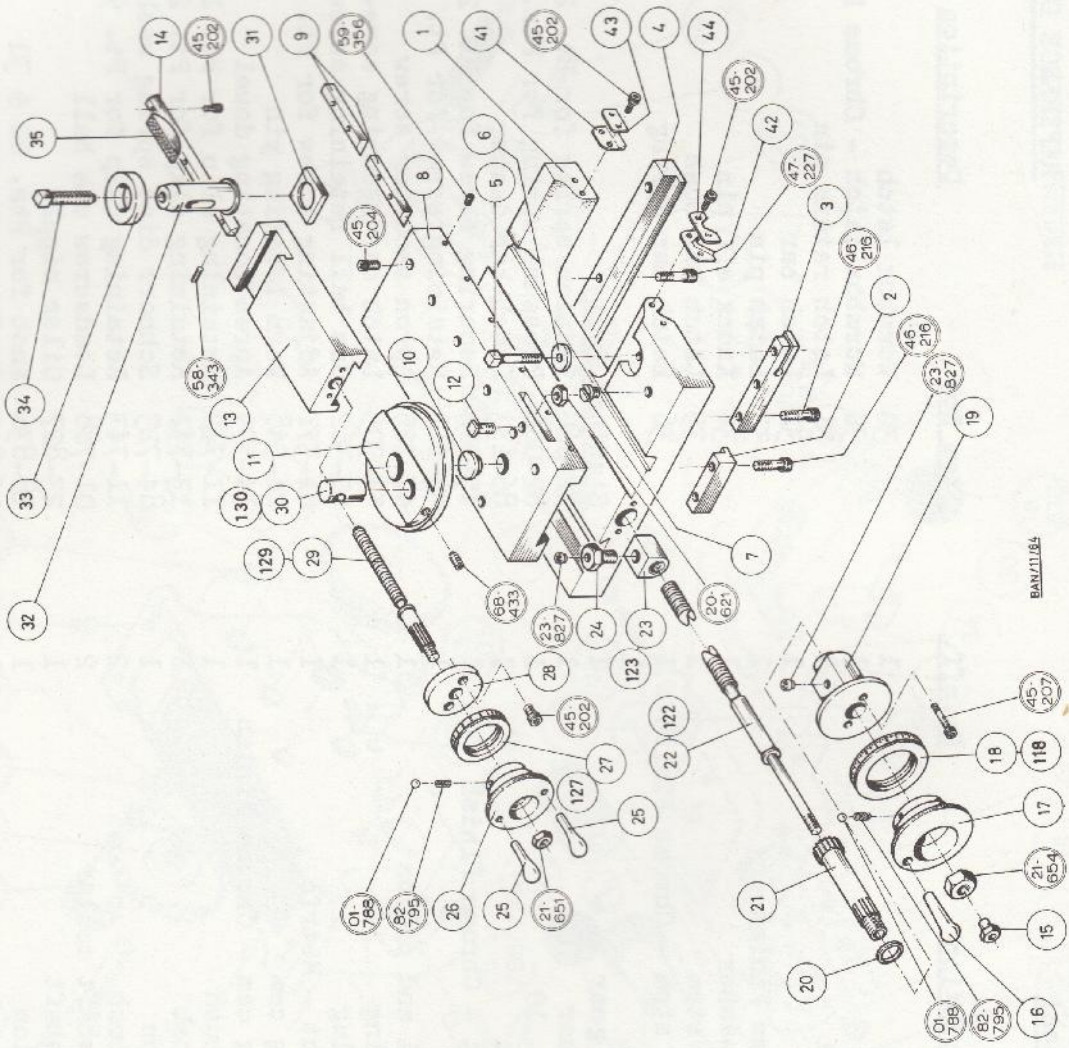
GREMBIALE METRICO



CARRO E CARRINO

SADDLE AND SLIDES

SCHLITTEN — EINHEIT



SADDLE AND SLIDES

REFERENCE DWG. BAN/11/64

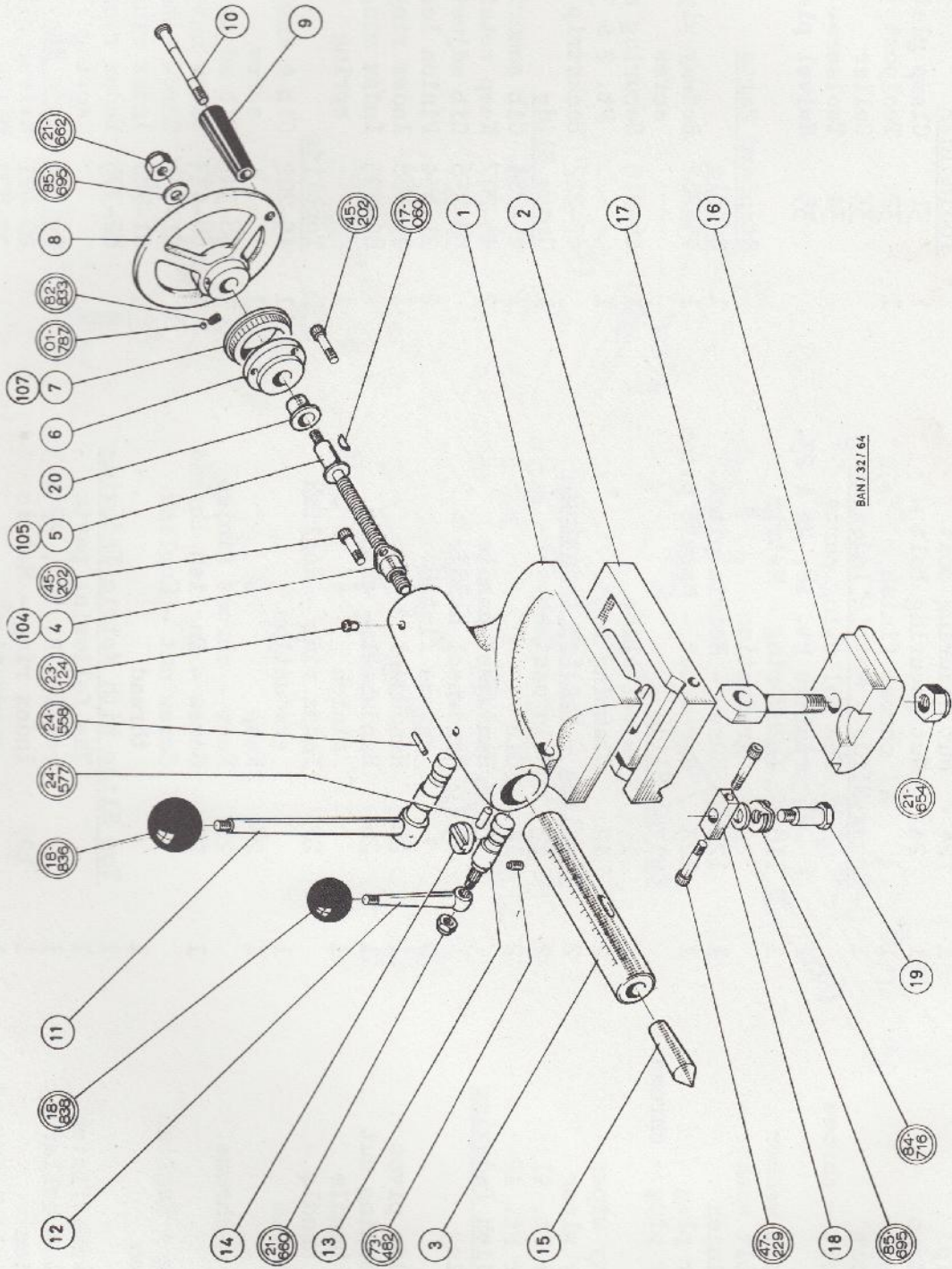
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1	Main casting	1	23	Screw nut - English thread	1	129	Screw - Metric pitch	1
2	Front strip	1	24	Nut securing bolt	1	130	Screw nut - Metric pitch	1
3	Locking strip	1	24	Nut securing bolt - chrome finish	1	<u>Toolholder</u>		
4	Back strip	1				31	Clamp plate	1
5	Locking bolt	1				32	Toolpost	1
5	Locking bolt - chrome finish	1				33	Collar	1
6	Locking bolt washer - chrome	1				34	Toolscrew	1
6	Locking bolt washer - chrome finish	1	118	The following parts replace Pt. 18, 22 & 23. Index ring - Metric graduation	1	35	Swivel piece	1
7	Oil filler plug	1	122	Screw - Metric pitch	1	<u>Standard Parts</u>		
7	Oil filler plug - chrome	1	123	Screw nut - Metric pitch	1	<u>Saddle</u>		
41	Flat bedway wiper	2				45-202	Bedway wiper securing screw	8
42	Vee bedway wiper	2				46-216	Securing screw for Pt. 2 & 3	4
43	Shield for Pt. 41	2				47-227	Backstrip securing screw	3
44	Shield for Pt. 42	2				<u>Cross Slide</u>		
8	<u>Cross Slide - English Indexing</u>	2	13	Main casting	1	45-204	Gib securing screw	6
9	Main casting	2	14	Gib	2	45-207	Keep retaining screw	2
10	Swivel slide pivot	2	25	Handwheel handle - chrome finish	2	59-356	Gib adjusting screw	6
15	Screw retaining nut	1	25	Handwheel handle - chrome finish	1	21-654	Pinion locking nut	1
16	Handwheel handle	1	26	Handwheel	1	01-788	Index ring pressure ball	3
16	Handwheel handle - chrome finish	1	26	Handwheel - chrome finish	1	82-795	Index ring pressure spring	3
17	Handwheel	1	27	Index ring - English graduation	1	<u>Topslide</u>		
17	Handwheel - chrome	1	28	Keep	1	45-202	Gib & keep securing screw	6
18	Index ring - English graduation	1	28	Keep - chrome finish	1	58-343	Gib adjusting screw	4
19	Keep	1	29	Screw - English thread	1	68-433	Screw nut securing screw	1
19	Keep - chrome finish	1	30	Screw nut - English thread	1	21-651	Screw retaining nut	1
20	Screw pinion collar	1				01-788	Index ring pressure ball	3
21	Screw pinion	1				82-795	Index ring pressure spring	3
22	Screw - English thread	1				<u>Swivel Slide Etc.</u>		
			127	The following parts replace Pt. 27, 29 & 30. Index ring - Metric graduation	1	20-621	Swivel slide clamping nut	2
						23-827	Oiler	5

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

REITSTOCK

TAILSTOCK

CONTROPUNTA



BAN./32.7.64

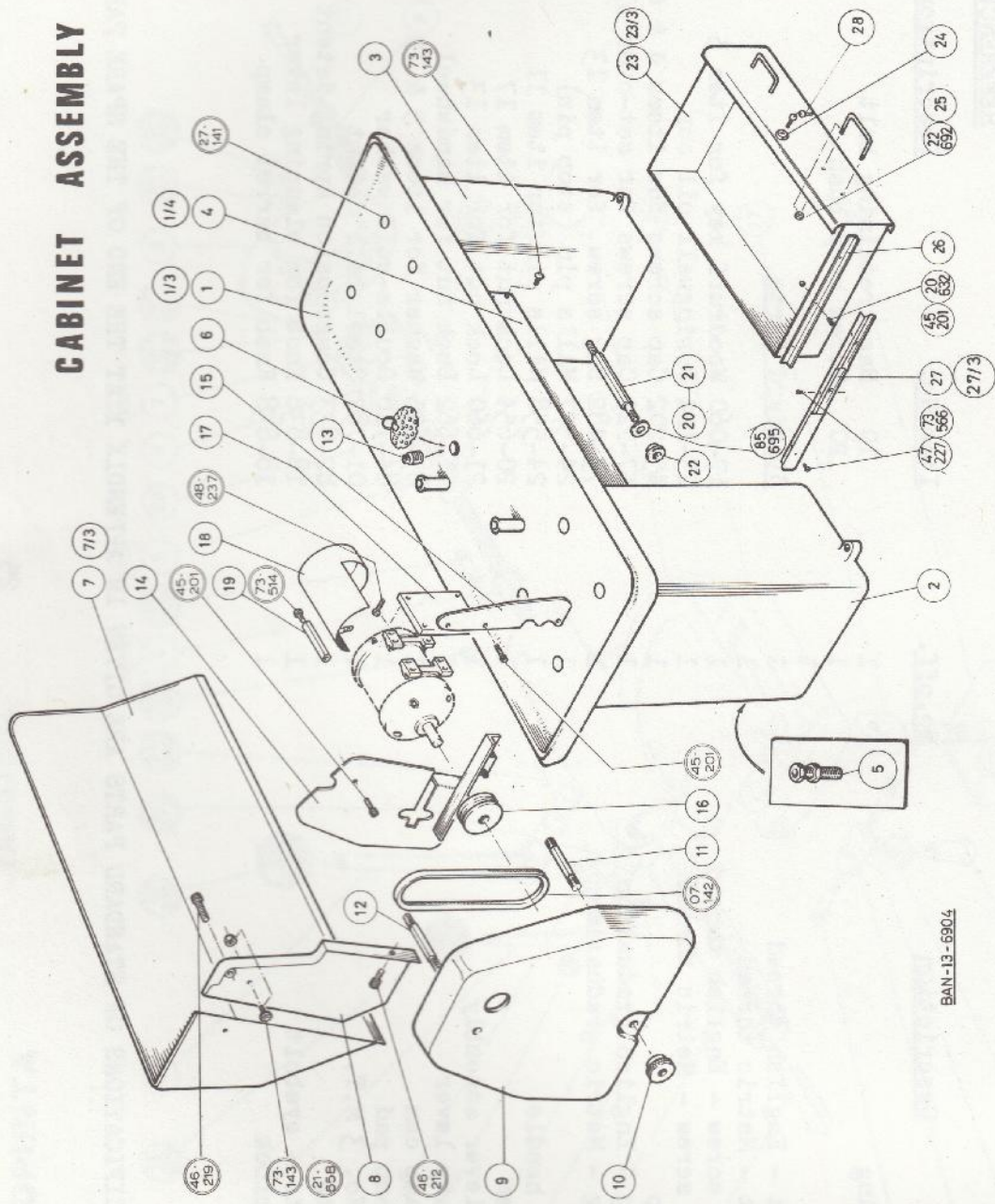
TAILSTOCK

REFERENCE DWG. BAN/32/64

<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
1	Main casting	1	19	Base retaining bolt	2
2	Base	1	20	Screw keep bush	1
3	Barrel	1		<u>Standard Parts</u>	
4	Barrel nut - English thread	1	17-060	Woodruff key for item 5	1
104	Barrel nut - Metric thread	1	23-124	Springwell oil cup	2
5	Operating screw - English thread	1	45-202	Cap screws for items 4 & 6	5
105	Operating screw - Metric thread	1	47-229	Cap screws for set-over block	2
6	Screw keep	1	73-482	Dog screw for item 13	1
7	Index ring - English graduation	1	24-577	Mills pin (stop pin)	1
107	Index ring - Metric graduation	1	24-558	Mills pin for item 11	1
8	Handwheel	1	20-654	Lock nut for item 17	1
9	Handwheel handle	1	21-660	Lock nut for item 13	1
10	Handle stem	1	21-662	Lock nut for handwheel	1
11	Clamping lever assembly	1	85-695	Washer for items 5 & 19	3
12	Barrel clamp lever	1	84-716	Double-coil washer	2
13	Barrel clamp cam	1	01-787	Steel ball detent	1
14	Barrel clamp pad	1	82-833	Compression spring-detent	1
15	Centre - No. 3 M.T.	1	18-836	Knob for clamping lever	1
16	Clamp plate	1	18-838	Knob for barrel clamp	1
17	Clamp plate - eyebolt	1			
18	Set-over block	1			

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

CABINET ASSEMBLY



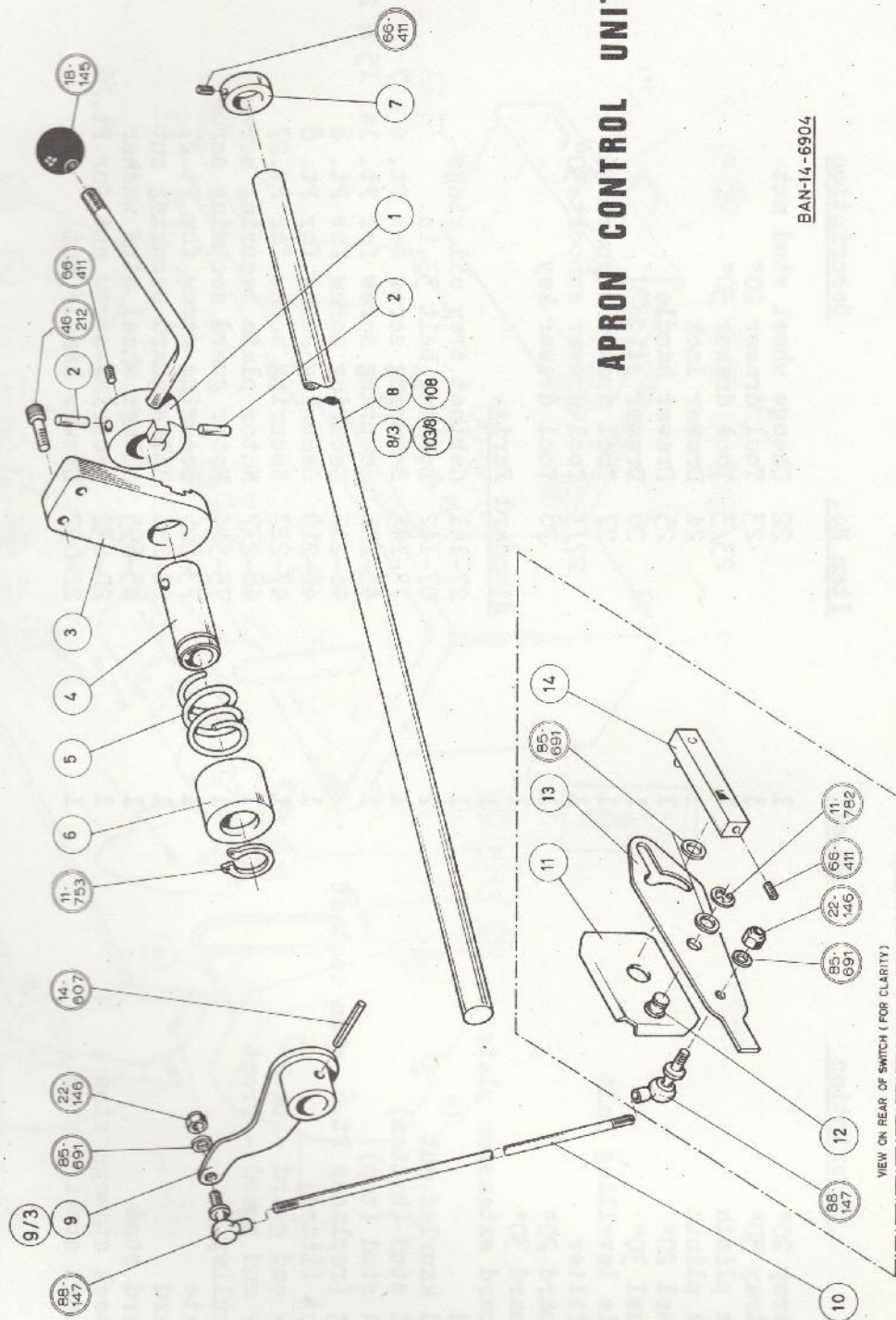
BAN-13-6904

CABINET ASSEMBLY

REFERENCE DWG. BAN/13/6904

<u>Item No.</u>	<u>Description</u>	<u>No. off</u>	<u>Item No.</u>	<u>Description</u>	<u>No. off</u>
1	Cabinet tray 20"	1	22	Change wheel stud nut	1
1/3	Cabinet tray 30"	1	23	Tool drawer 20"	1
2	Headstock plinth	1	23/3	Tool drawer 30"	1
3	Tailstock plinth	1	24	Drawer lock	1
4	Front panel 20"	1	25	Drawer handle	1
4/3	Front panel 30"	1	26	Drawer slide	1
5	Adjustable levelling bolt	1	27	Tool drawer support 20"	1
6	Coolant filter	1	27/3	Tool drawer support 30"	1
7	Splash guard 20"	1	28	Tool drawer key	1
7/3	Splash guard 30"	1			
8	Splash guard extension plate	1		<u>Standard Parts.</u>	
9	End guard	1	27-141	Cabinet tray oil rings	8
10	End guard knurled nut	1	07-142	Driving belt 33.in.	1
11	End guard stud (bottom)	2	73-143	Securing screw for Pt. 4 & 7	7
12	End guard stud (top)	1	45-201	Securing screw for Pt. 14, 15 & 26	12
13	Tray plug (replaces Pt.6. when coolant system not fitted)	1	46-212	Securing screw for Pt. 8	1
14	Auxiliary end guard - back	1	46-219	Securing screw for Pt. 8	1
15	Auxiliary end guard - front	1	47-227	Securing screw for Pt.27	6
16	Driving pulley	1	48-237	Motor plate securing screw	4
17	Motor plate	1	73-514	Motor guard securing screw	2
18	Motor guard	1	73-566	Securing screw for Pt.27	6
19	Motor guard stud	1	21-658	Splashguard securing nut	1
20	Change wheel stowage stud	1	85-695	Change wheel stud washer	1
21	Change wheel stowage stud	1	20-632	Securing screw nut for Pt.26	6
			22-692	Drawer handle nut	4

SPECIFICATION OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION



APRON CONTROL UNIT

BAN-14-6904

VIEW ON REAR OF SWITCH (FOR CLARITY)

APRON CONTROL UNIT

REFERENCE DWG. BAN/14/6904

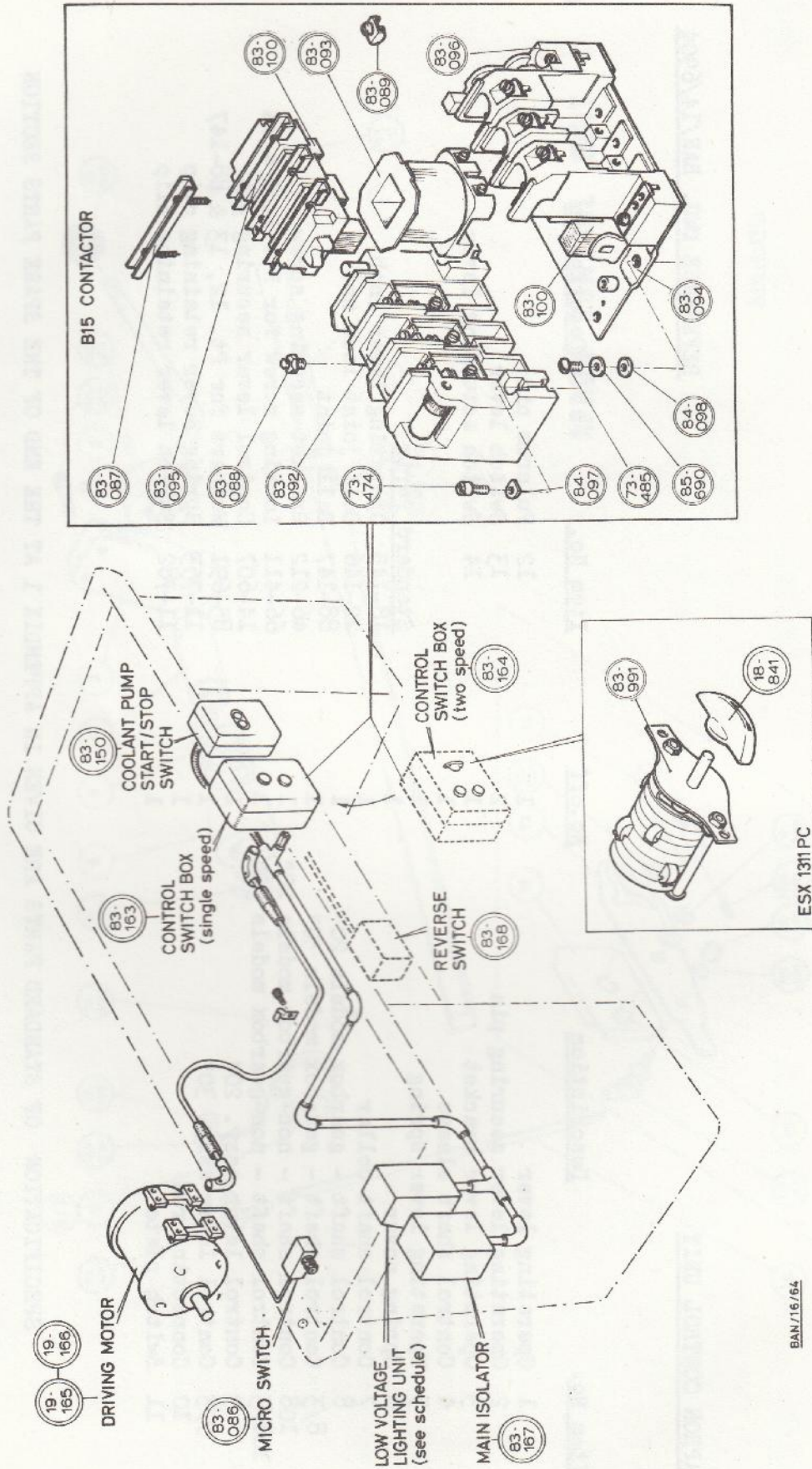
<u>Item No.</u>	<u>Description</u>	<u>No.off</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off</u>
1	Operating lever	1	12	Fulcrum pin	1
2	Operating lever securing pin	2	13	Switch lever	1
3	Operating lever bracket	1	14	Switch actuating lever	1
4	Control shaft sleeve	1			
5	Operating lever spring	1			
6	Spring cover	1			
7	Control shaft collar	1			
8	Control shaft - gearbox models 20"	1			
8/3	Control shaft - gearbox models 30"	1			
108	Control shaft - non-gearbox models 20"	1			
108/3	Control shaft - non-gearbox models 30"	1			
9	Control lever Assy. 20"	1			
9/3	Control lever Assy. 30"	1			
10	Connecting rod	1			
11	Switch plate	1			
<u>Standard Parts</u>					
			18-145	Operating lever knob	1
			22-146	Ball joint lock nut	2
			88-147	Ball joint	2
			46-212	Bracket securing screw	2
			66-411	Locking screw for Pt. 1, 7 & 14	4
			14-607	Control lever securing pin	1
			85-691	Washers for Pt. 12, 13 & 88-147	6
			11-753	Spring cover retaining clip	1
			11-782	Switch lever retaining clip	1

SPECIFICATION OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

ELEKTRO — TEILE

ELECTRICAL EQUIPMENT

EQUIPAGGIAMENTO ELETTRICO



BAN/16/64

ESX 1311 PC

ELECTRICAL EQUIPMENT

REFERENCE DWG. BAN/16/64

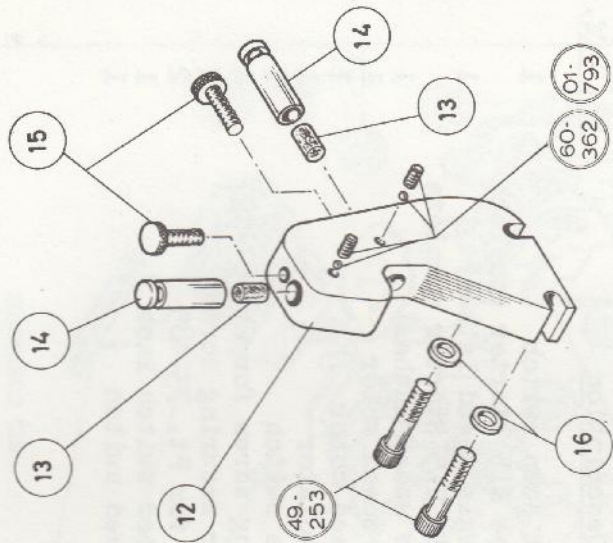
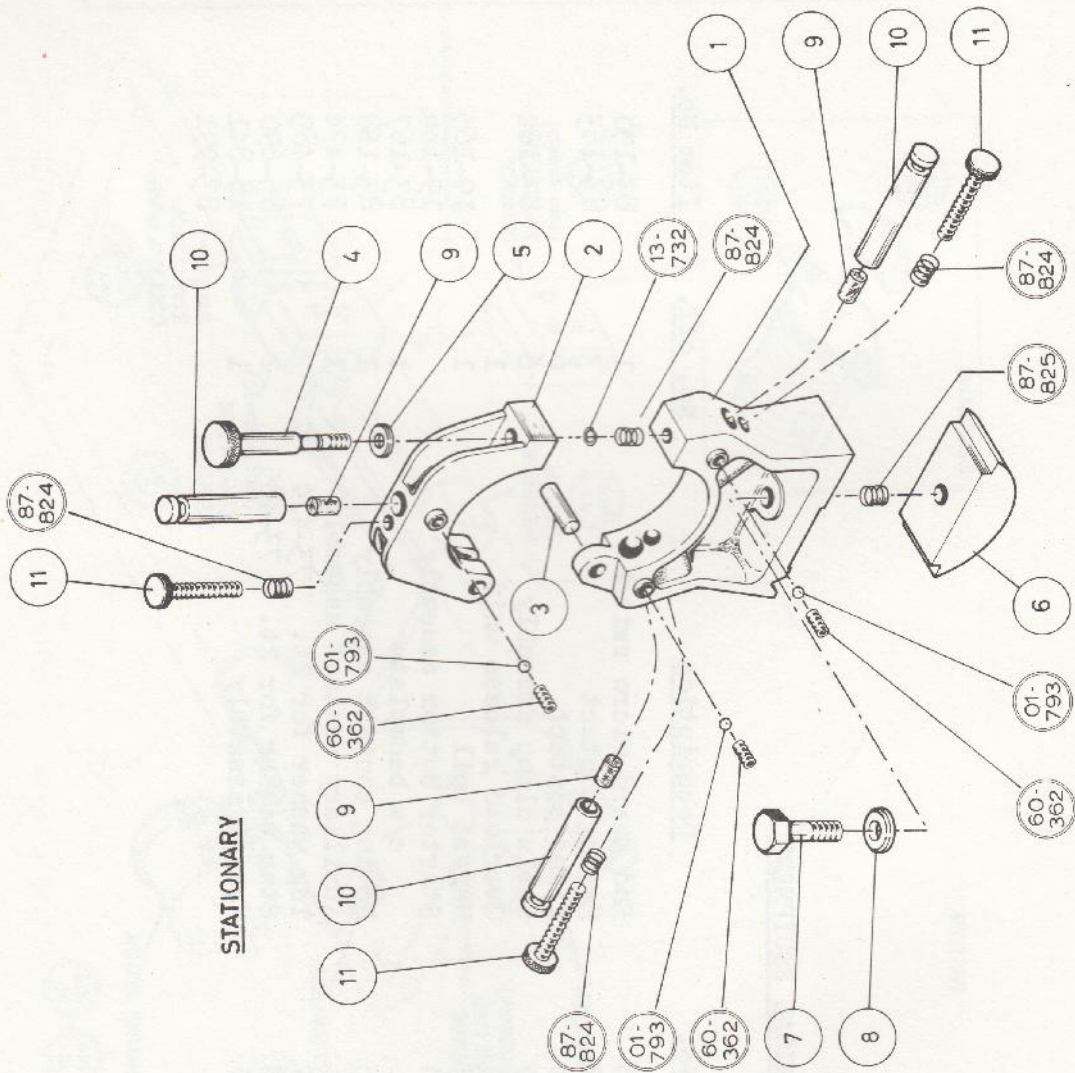
<u>Item No.</u>	<u>Description</u>	<u>No. off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No. off.</u>
83-086	End guard micro switch	1	83-150	Coolant pump switch	1
83-087	Moving contact	3	83-163	Crabtree B15 starter complete (Single speed lathes)	1
83-088	Fixed contact	6	83-164	Crabtree B15 Starter complete (two speed lathes)	1
83-089	Cable clamp assembly	6	19-165	Single speed motor	1
83-092	Overload release unit	1	19-166	Two speed motor	1
83-093	Magnet coil	1	83-167	Main isolator	1
83-094	Starter bottom assembly c/w baseplate	1	83-168	Reverse switch	1
83-095	Moving contact assembly	1	73-474	Securing screw for Pt. 83-092	2
83-096	Auxiliary contact assembly	1	73-485	Starter securing screw	2
84-097	Tag washer for Pt. 73-474	2	85-690	Washer for Pt. 73-485	2
84-098	Star washer for Pt. 73-485	2	18-841	Two speed switch knob	1
83-100	Magnet assembly	1	83-991	Two speed switch	1

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION.

LÜNETTEN

STEADIES

LUNETTE



BAN/17/64

STEADY RESTS (STEADIES) REFERENCE DWG. BAN/17/64

<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
<u>Stationary Steady</u>					
1	Main casting	1	01-793	Finger locking ball	3
2	Top casting	1	87-824	Screw insert for Pts. 4 & 11	4
3	Hinge pin	1	87-825	Clamp plate bolt insert	1
4	Top clamping screw	1	<u>Travelling Steady</u>		
5	Top clamping washer	1	12	Main casting	1
6	Bed clamp plate	1	13	Finger insert	2
7	Clamp plate bolt	1	14	Finger	2
8	Clamp plate washer	3	15	Finger adjusting screw	2
9	Finger insert	3	16	Clamping screw washer	2
10	Finger	3	<u>Standard Parts</u>		
11	Finger adjusting screw	3	49-253	Steady clamping screw	2
<u>Standard Parts</u>					
60-362	Finger ball clamping screw	3	60-362	Finger ball clamping screw	2
13-732	Retaining clip for Pt. 4	1	01-793	Finger locking ball	2

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

TAPER TURNING ATTACHMENT

REFERENCE DWG. MISC/4/63

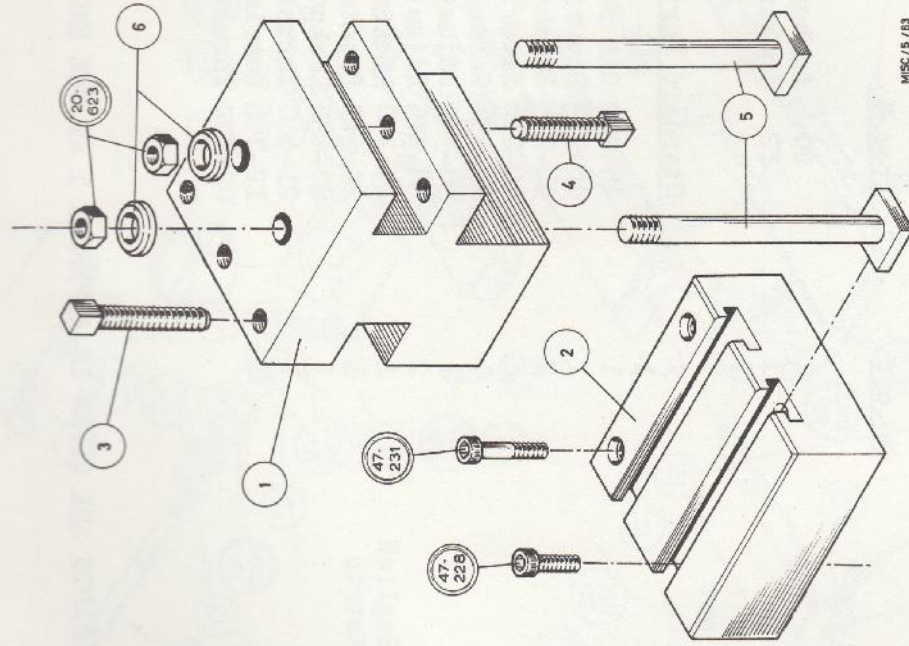
<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
1	Taper turner bracket	1	20	Anchor bracket extension	1
2	Bracket gib	1	22	Locking screw, pressure pad	1
3	Taper turner plate	1			
4	Swivel slide adjusting screw nut	1		<u>Standard Parts</u>	
5	Swivel slide adjusting screw	1	45-202	Gib securing screw	5
6	Adjusting screw keep	1	46-213	Securing screw for Pt. 9 & 17	6
7	Swivel slide pivot	1	46-215	Bracket securing screw	2
8	Swivel slide	1	46-216	Securing screw for Pt. 15	2
9	Slideway clamp	1	48-238	Connecting rod locking screw	1
10	Slide block	2	58-344	Adjusting screw for Pt. 11	2
11	Slide block gib	1	58-345	Adjusting screw for Pt. 2	3
12	Bearing housing	1	59-350	Locking screw for Pt. 19 & 20	4
13	Thrust washer	2	24-542	Bracket locating pin	2
14	Taper turner saddle screw - English	1	20-632	Locknut for Pt. 58-344	2
114	Taper turner saddle screw - Metric	1	21-660	Thrust bearing adjusting nut	1
15	Cross slide extension	1	12-766	Bearing retention clip	2
16	Connecting rod	1	02-872	Thrust bearing	2
17	Anchor bracket	1			
19	Eccentric pin	1			

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

PORTAUTENSILI POSTERIORE

REAR TOOL POST

RÜCKWÄRTIGER STAHLHALTER



MBC/5/83

REAR TOOLPOST

REFERENCE DWG. MISC/5/63

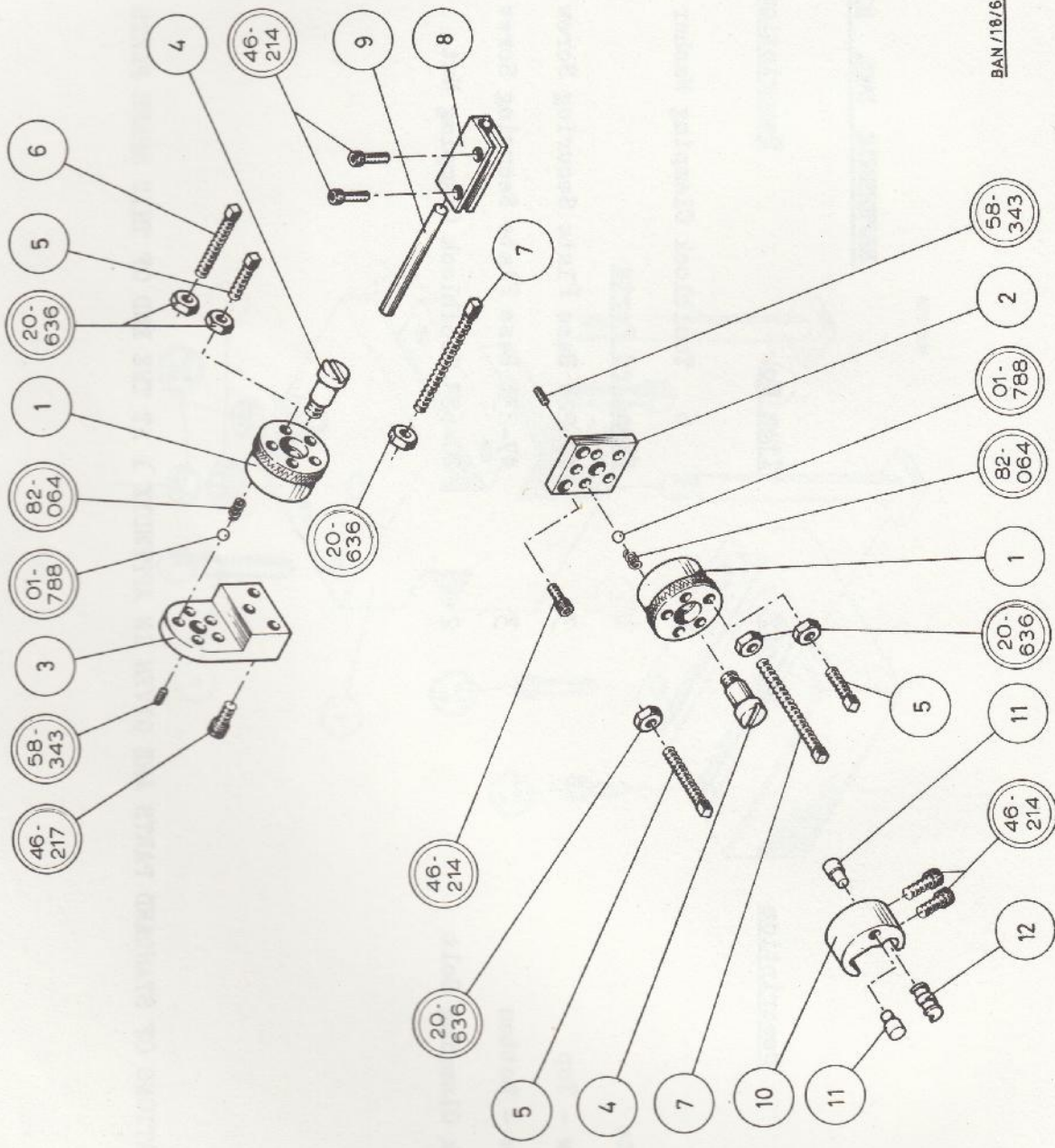
<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
1	Block	1	6	Toolblock Clamping Washer	2
2	Base Plate	1		<u>Standard Parts</u>	
3	Toolscrew - Top	3	47-228	Base Plate Securing Screw	2
4	Toolscrew - Bottom	3	47-231	Base Plate Securing Screw	2
5	Toolblock Clamping Bolt	2	20-623	Toolblock Clamping Nut	2

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THIS SPARE PARTS SECTION

FERMI

FEED STOPS

TROMMELANSCHLÄGE



BAN/18/64

FEED STOPS

REFERENCE DWG. BAN/18/64

<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
<u>Longitudinal Feed Stop</u>					
1	Turret		4	Turret spindle	1
2	Turret plate	1	5	Stop screw - 1.1/8in long	2
4	Turret spindle	1	6	Stop screw - 2.1/4in long	2
5	Stop screw - 1.1/8in long	1	7	Stop screw - 3 in long	1
6	Stop screw - 2.1/4in long	2	8	Stop bar clamp	1
7	Stop screw - 3in long	2	9	Stop bar	1
10	Bed stop	1			
11	Bed stop pad	1			
12	Bed stop locking piece	2			
		1			
<u>Cross Feed Stop</u>					
1	Turret	1			
3	Turret plate	1			
				<u>Standard Parts</u>	
			82-064	Turret location spring	2
			46-214	Securing screw for Pt. 2	2
			46-214	Clamping screw for Pt. 8 & 10	4
			46-217	Securing screw for Pt. 3	3
			58-343	Turret spindle locking screw	2
			20-636	Stop screw lock nut	10
			01-788	Turret location ball	2

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
<u>Main Casting Assemblies</u>								
1	Turret slide - top	1	28	Indexing worm	1	1	<u>Standard Parts</u>	1
2	Taper gib for Pt. 1	1	29	Core plug for Pt. 20	1	1	<u>Main Casting Assemblies</u>	1
3	Taper gib adjusting screw	1	<u>Clamp Assemblies</u>		1	48-249	Clamp plate screw	2
4	Turret slide - bottom	1	30	Slide locking pad	1	45-202	Rack securing screw	3
5	Turret base plate	1	31	Slide locking lever	1	23-827	Oiler	4
6	Clamp plate	2	32	Base clamping bolt	2	<u>Turret Assembly</u>		
7	Rack	1	33	Base clamping collar	1	23-896	Turret bearing - large	1
<u>Turret Assembly</u>								
8 *	Turret	1	<u>Handwheel Assembly</u>		1	24-534	Securing pin for Pt. 10	1
9	Turret shaft	1	35	Rack pinion	1	12-767	Bearing retaining clip	1
10	Turret shaft gear	1	36	Extension sleeve	1	23-892	Turret bearing - small	1
11	Turret shaft gear	1	37	Handwheel	1	55-318	Retaining screw for Pt. 9	1
12	Bearing cap	1	38	Handwheel retaining collar	1	82-802	Plunger spring	1
13	Shaft locking peg	1	39	Fixed block	1	20-621	Tool locking stud nut	1
14	Ejecting collar for Pt. 15	5	40	Fixed block securing pin	5	<u>Indexing & Timing Assembly</u>		5
15	Locating bush for Pt. 15	5	41	Fixed block screw	5	20-636	Stop screw lock nut	5
16	Indexing plunger	1	42	Pivot lock screw	1	11-737	Retaining clip for spring	1
17	Plunger bush	1	43	Pivot block	1	82-807	Actuating worm spring	1
18 *	Plunger spring screw	1	44	Handle stem	1	24-535	Worm ratchet securing pin	1
19	Tool locking stud	1	<u>Trip Assembly</u>		1	24-533	Securing pin for Pt. 27	1
20	Locking stud washer	1	45	Trip lever	1	<u>Clamp & Trip Assemblies</u>		
<u>Indexing & Timing Assembly</u>								
21	Connecting shaft	1	46	Trip	1	85-699	Washer for Pt. 32	2
22	Stop screw	5	47	Pivot pin	5	48-243	Locking screw for Pt. 33	2
23	Stop screw guide plate	1	48	Trip spring	1	67-419	Retaining screw for Pt. 44	1
24	Stop screw bush	1	34	Trip housing	1	46-211	Locking screw for Pt. 34	1
25	Bush securing nut	1		Trip plunger	1	85-691	Washer for Pt. 211	1
26	Actuating worm	1			1	<u>Handwheel Assembly</u>		
27	Worm ratchet	1			1	59-350	Securing screw for Pt. 36	2
	Connecting shaft ratchet	1			1	53-305	Handwheel retaining screw	1
						18-837	Handwheel knob	2
						82-063	Pivot lock screw spring	1
						24-531	Pivot pin	1
						16-842	Handwheel handle	1

* Please quote 'STANDARD' or 'METRIC' when ordering items 8 or 18.

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

COOLANT EQUIPMENT

REFERENCE DWG. BAN/19/64

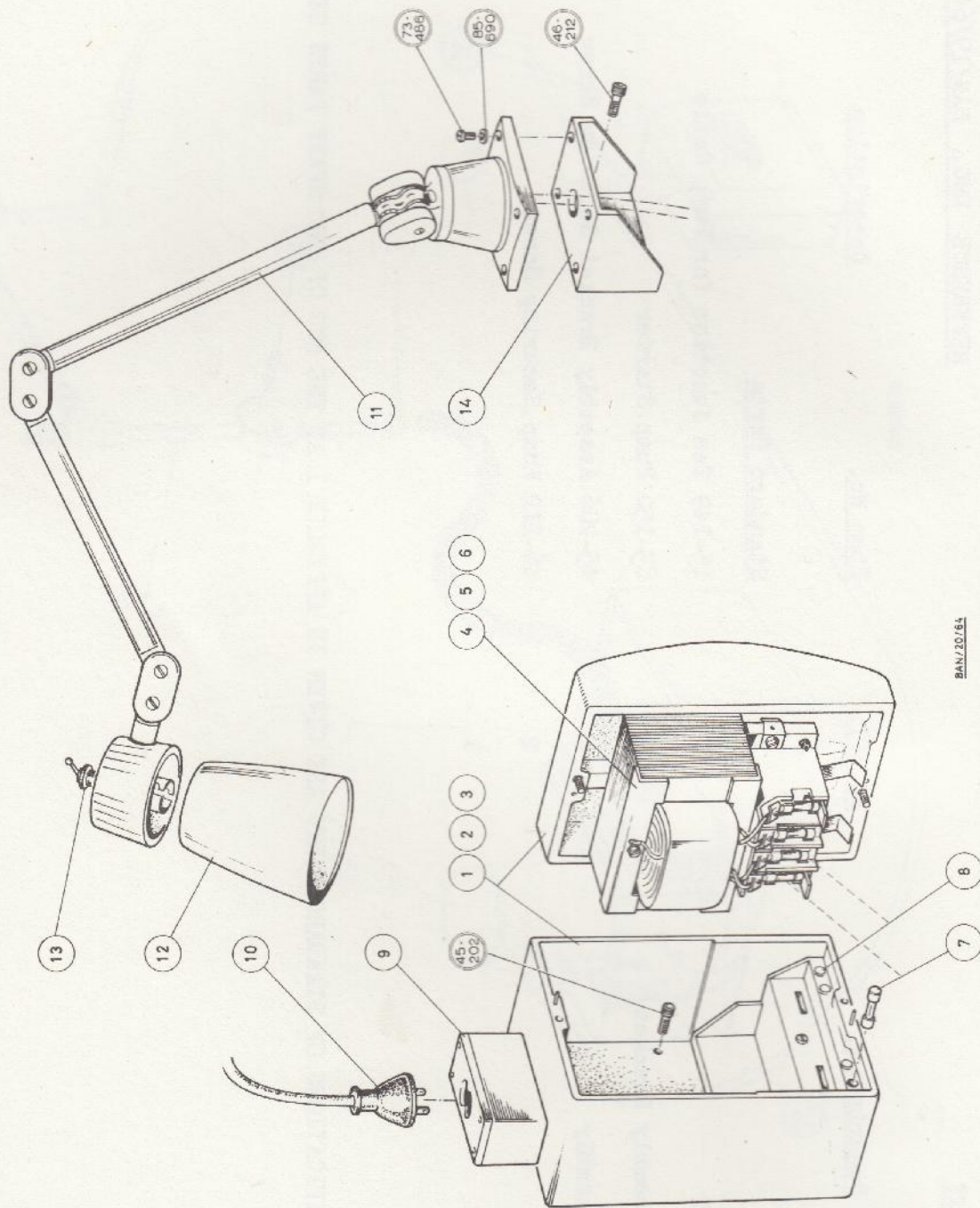
<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
1	Pump	1	<u>Standard Parts</u>		
2	Coolant Tank	1	15-149	Tee Junction for Pump Cable	1
3	Delivery Assembly Bracket	1	83-150	Pump Starter	1
4	Delivery Assembly	1	45-206	Assembly Bracket Securing Screw	2
5	Hose Clip	2	46-212	Pump Securing Screw	3
6	Hose	1			

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

**IMPIANTO DI ILLUMINAZIONE
A BASSA TENSIONE**

LOW VOLT LIGHT

NIEDERVOLT — BELEUCHTUNGS — ANLAGE



BAN/20/84

LOW VOLT LIGHTING

REFERENCE DWG. BAN/20/64

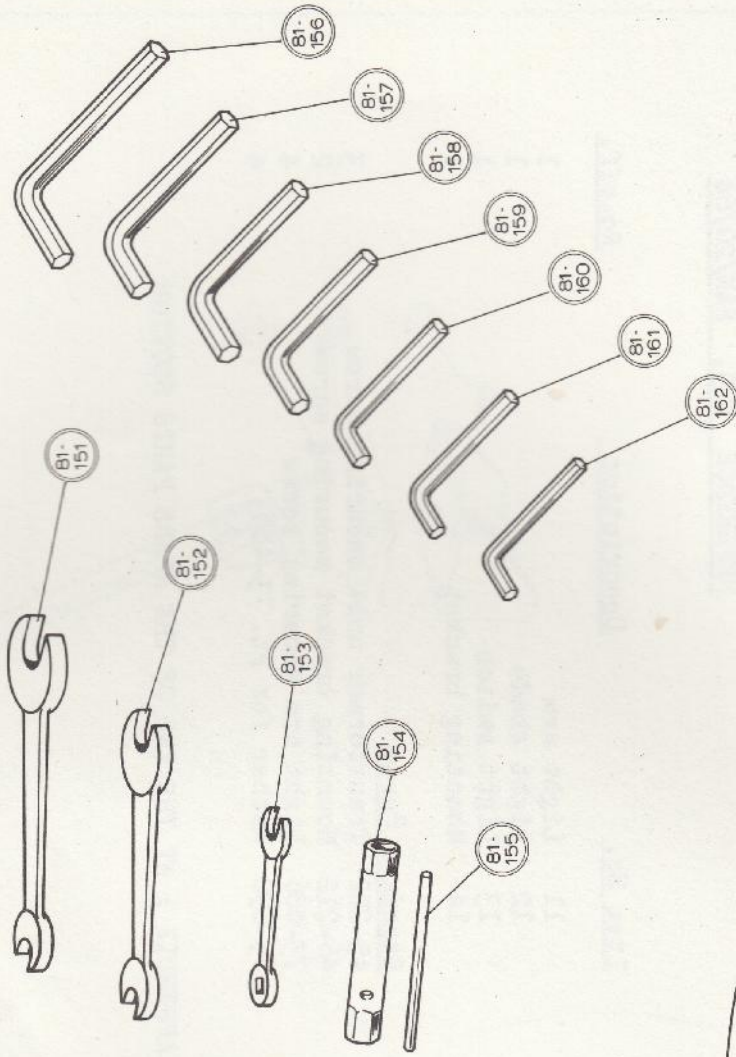
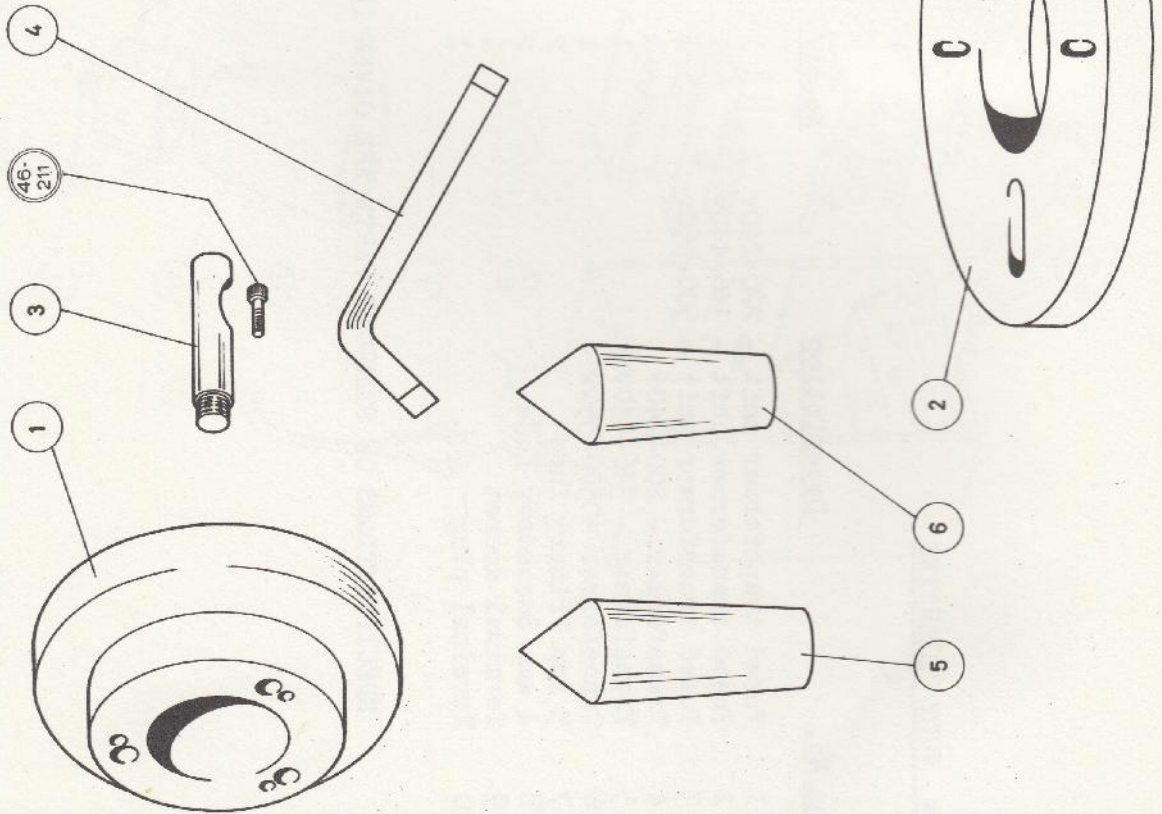
<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
1	Fused transformer unit - 220-240v	1	11	Light arm	1
2	Fused transformer unit - 346-440v	1	12	Light shade	1
3	Fused transformer unit - 500-550v	1	13	Light switch	1
4	Transformer - 200-240v	1	14	Mounting bracket	1
5	Transformer - 346-440v	1			
6	Transformer - 500-550v	1			
7	5 amp Primary fuse	2		<u>Standard Parts</u>	
8	4 amp Secondary fuse	2	45-202	Transformer unit securing screw	3
9	Terminal socket	1	46-212	Mounting bracket securing screw	2
10	Terminal plug	1	73-486	Light arm securing screw	4
			85-690	Washer for Pt. 73-486	4

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

ZUBEHÖR

MISCELLANEOUS EQUIPMENT

ATTREZZATURA MISCELLANEA



BAN / 21 / 64

MISCELLANEOUS EQUIPMENT

REFERENCE DWG. BAN/21/64

<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
1	Driving plate	1	81-153	Spanner 7/16" Sq. x 1/2" A/F	1
2	Face plate	1	81-154	Box spanner 15/16" A/F x 11/16" A/F	1
3	Camlock stud for Pts. 2 & 3	6	81-155	Box spanner Tommy bar	1
4	Spindle nose cam key	1	81-156	Allen key 3/8" A/F	1
5	Headstock centre - 4 M.T.	1	81-157	Allen key 5/16" A/F	1
6	Tailstock centre - 3 M.T.	1	81-158	Allen key 7/32" A/F	1
			81-159	Allen key 3/16" A/F	1
			81-160	Allen key 5/32" A/F	1
			81-161	Allen key 1/8" A/F	1
			81-162	Allen key 3/32" A/F	1
			46-211	Camlock stud securing screw	6
				1/4" UNC x 3/8" long	

Standard Parts

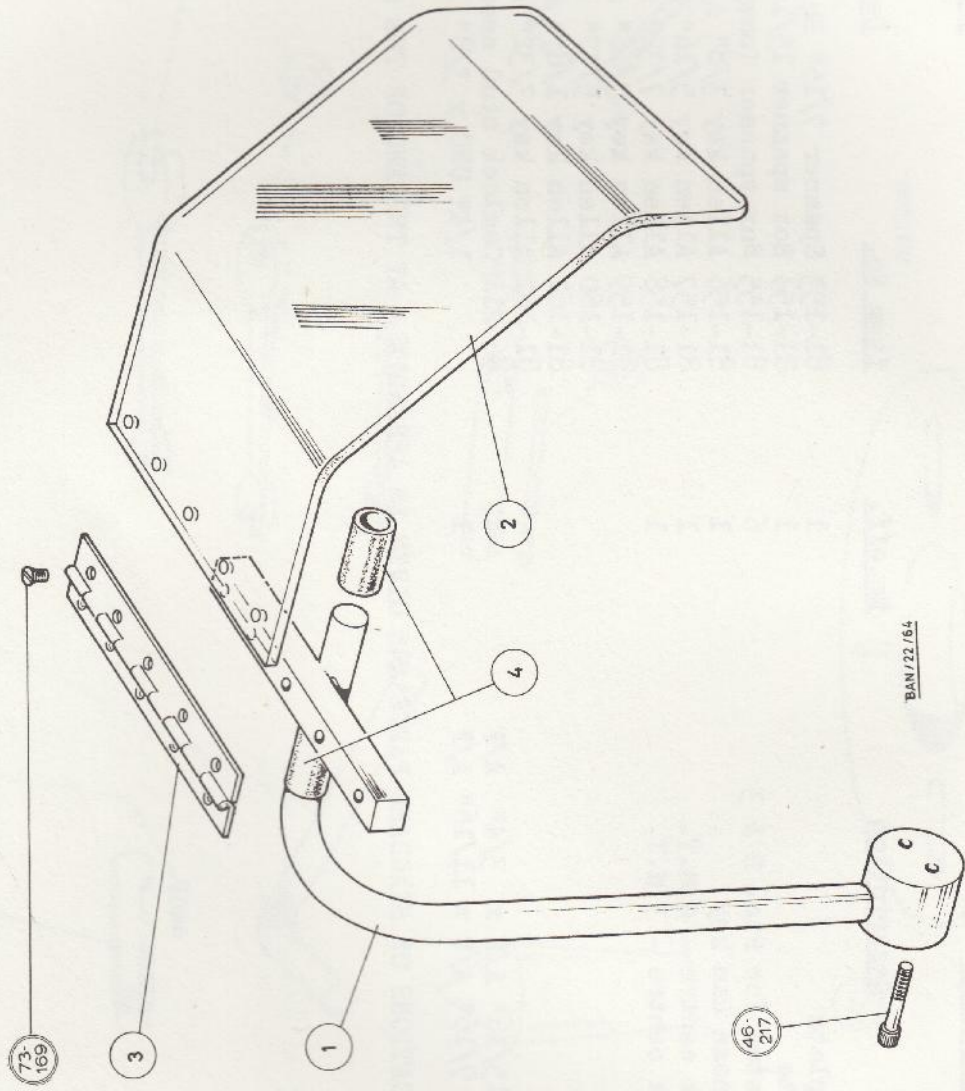
81-151	Spanner 15/16" A/F x 3/4" A/F	1
81-152	Spanner 9/16" A/F x 11/16" A/F	1

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION

SPÄNESCHUTZ

CHIP GUARD

PARA SPRUZZI



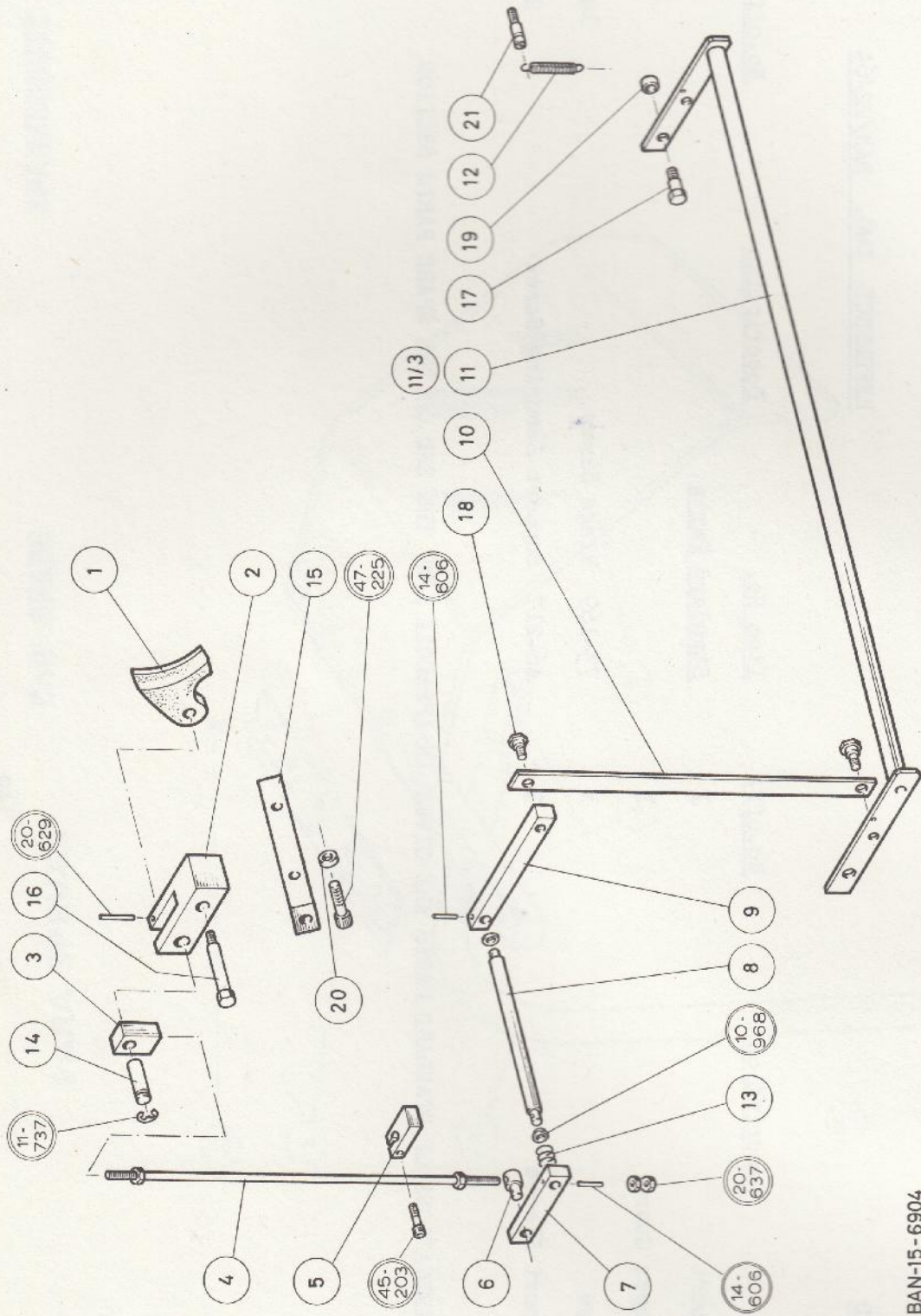
BAN/22/164

CHIP GUARD

REFERENCE DWG. BAN/22/64

<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>	<u>Item No.</u>	<u>Description</u>	<u>No.off.</u>
1	Support	1	<u>Standard Parts</u>		
2	Perspex Guard	1			
3	Hinge	1	73-169	Hinge Screw	10
4	Support Sleeve	2	46-217	Support Securing Screw	2

SPECIFICATIONS OF STANDARD PARTS ARE GIVEN IN APPENDIX 1 AT THE END OF THE SPARE PARTS SECTION



PEDAL BRAKE ASSEMBLY

BAN-15-6904

SPECIFICATION OF STANDARD PARTS

<u>Item</u>		
17-002	Woodruff Key	No. 9
84-029	Fan Disc Washer	3/4" I/D
82-063	Compression Spring - Flexo 163208	1" F.L. over 11/32" rod
82-064	Compression Spring	.240" dia. x 9/16" F.L.
82-065	Compression Spring	.312" dia. x 1.7/16" F.L.
82-066	Compression Spring	.237" dia. x 1.1/8" F.L.
88-070	Solid Gas Plug	3/8"
83-086	Micro Switch	Burgess MK.3BR. 600v 2A.
83-087	Crabtree Moving Contact	16000/13
83-088	Crabtree Fixed Contact	16000/11
83-089	Crabtree Cable Clamp Assembly	16000/19
83-092	Crabtree Overload Release Unit	16007
83-093	Crabtree Magnet Coil	
	200/220 V.	16000/ 1A
	220/240 V.	16000/ 2B
	240/265 V.	16000/ 3C
	275/300 V.	16000/ 4D
	330/365 V.	16000/ 5E
	365/400 V.	16000/ 6F
	380/420 V. (Standard)	16000/ 9J
	400/440 V.	16000/ 7G
	440/480 V.	16000/10K
	500/550 V.	16000/ 8H
83-094	Crabtree Air Brake Starter	Interior Type B.15
83-095	Crabtree Moving Contact Assembly	28011
83-096	Crabtree Auxiliary Contact Assembly	16021
84-097	Tag Washer	4 B.A.
84-098	Shakeproof Washer	3/16"
83-100	Crabtree Magnet Assembly	16000/20
14-104	Spring Dowel	1/8" dia. x 3/4"
82-105	Compression Spring	Flexo 82504
82-107	Compression Spring	Flexo 62604
86-118	Leather Washer	1.1/4" O/D x 7/8" I/D x 1/8"
82-122	Compression Spring	707.0025
82-123	Compression Spring	707.0020
86-133	Rubber Washer	Dowty GD 1321-3
79-134	Oilseal	Weston W.16211237
14-135	Spring Dowel	1/8" x 1/2"
11-136	External Circlip - Anderton 1400	1" dia.
26-137	Oilring - Dowty Mk 7, List 4	PP73C
26-138	Oilring - Dowty Mk24, List 5	PP49C
24-139	Mills Pin G.P.11	1/4" dia. x 3/4"
23-140	Oil Cup - Springwell	1/4" O/D
26-141	Oilring - Superfect	SH 96/16
07-142	Vee Belt	A33
72-143	Domed Head Screw	1/4" UNC x 3/8"
14-144	Spring Dowel	3/16" dia. x 1.1/4"
18-145	Plastic Knob - Red	1.1/4" dia. x 3/8" UNC
22-146	Nyloc Nut - Simmonds Type T	1/4" B.S.F.
88-147	Ball Joint	1/4" B.S.F.
15-149	Tee Junction	A.E.I. 3/4" Conduit Thread Type
83-150	Crabtree Starter - Type D6	0.75 - 1.2A

SPECIFICATION OF STANDARD PARTS (CONTINUED)

<u>Item</u>				
81-151	Open End Spanner	15/16"	A/F x	3/4" A/F
81-152	Open End Spanner	9/16"	A/F x	11/16" A/F
81-153	Combination Spanner	7/16"	Sq. x	1/2" A/F
81-154	Box Spanner	15/16"	A/F x	11/16" A/F
81-155	Tommy Bar			
81-156	Hex. Key - Allen	3/8"	A/F	
81-157	Hex. Key - Allen	5/16"	A/F	
81-158	Hex. Key - Allen	7/32"	A/F	
81-159	Hex. Key - Allen	3/16"	A/F	
81-160	Hex. Key - Allen	5/32"	A/F	
81-161	Hex. Key - Allen	1/8"	A/F	
81-162	Hex. Key - Allen	3/32"	A/F	
83-163	Crabtree B15 Starter c/w Case	16104/J		
83-164	Crabtree B15 Starter & 2-Speed Switch	16199		
19-165	1 H.P. Motor 200/240/380/440/3/50/60C	A.E.I. BK 2410C		
19-166	2/1 H.P. 2 Speed Motor	A.E.I. K.4KC		
83-167	Isolator - M.E.M. 1315 AX	15A. Unfused		
83-168	Reverse Switch - Klockner Moeller	Type T2-4/60-102/7-1		
73-169	Countersunk Head Screw (Slotted)	No. 10-24 t.p.i. x	1/4"	
45-201	Socket Cap Head Screw	No. 10-24 t.p.i. x	1/2"	
45-203	Socket Cap Head Screw	No. 10-24 t.p.i. x	5/8"	
45-204	Socket Cap Head Screw	No. 10-24 t.p.i. x	3/4"	
45-205	Socket Cap Head Screw	No. 10-24 t.p.i. x	7/8"	
45-206	Socket Cap Head Screw	No. 10-24 t.p.i. x	1"	
45-207	Socket Cap Head Screw	No. 10-24 t.p.i. x	1.1/4"	
46-211	Socket Cap Head Screw	1/4" UNC x	3/8"	
46-212	Socket Cap Head Screw	1/4" UNC x	1/2"	
46-213	Socket Cap Head Screw	1/4" UNC x	5/8"	
46-214	Socket Cap Head Screw	1/4" UNC x	3/4"	
46-215	Socket Cap Head Screw	1/4" UNC x	7/8"	
46-216	Socket Cap Head Screw	1/4" UNC x	1"	
46-217	Socket Cap Head Screw	1/4" UNC x	1.1/4"	
46-218	Socket Cap Head Screw	1/4" UNC x	1.1/2"	
46-219	Socket Cap Head Screw	1/4" UNC x	1.3/4"	
47-224	Socket Cap Head Screw	5/16" UNC x	5/8"	
47-225	Socket Cap Head Screw	5/16" UNC x	3/4"	
47-227	Socket Cap Head Screw	5/16" UNC x	1"	
47-228	Socket Cap Head Screw	5/16" UNC x	1.1/4"	
47-229	Socket Cap Head Screw	5/16" UNC x	1.1/2"	
47-230	Socket Cap Head Screw	5/16" UNC x	1.3/4"	
47-231	Socket Cap Head Screw	5/16" UNC x	2"	
47-232	Socket Cap Head Screw	5/16" UNC x	2.1/4"	
47-233	Socket Cap Head Screw	5/16" UNC x	2.1/2"	
48-237	Socket Cap Head Screw	3/8" UNC x	5/8"	
48-243	Socket Cap Head Screw	3/8" UNC x	1.3/4"	
48-249	Socket Cap Head Screw	3/8" UNC x	4"	
49-253	Socket Cap Head Screw	7/16" UNC x	2"	
50-260	Socket Cap Head Screw	1/2" UNC x	1.1/2"	
51-273	Socket Cap Head Screw	5/8" UNC x	3"	
51-276	Socket Cap Head Screw	5/8" UNC x	4.1/2"	

SPECIFICATION OF STANDARD PARTS (CONTINUED)

<u>Item</u>			
53-305	Socket Countersunk Head Screw	No. 10-24 t.p.i. x	3/4"
55-318	Socket Countersunk Head Screw	5/16" UNC x	3/4"
58-343	Socket Head Set Screw - Cup Point	No. 10-24 t.p.i. x	1/4"
58-344	Socket Head Set Screw - Cup Point	No. 10-24 t.p.i. x	5/16"
58-345	Socket Head Set Screw - Cup Point	No. 10-24 t.p.i. x	3/8"
59-350	Socket Head Set Screw - Cup Point	1/4" UNC x	1/4"
59-352	Socket Head Set Screw - Cup Point	1/4" UNC x	7/8"
59-356	Socket Head Set Screw - Cup Point	1/4" UNC x	3/4"
60-362	Socket Head Set Screw - Cup Point	5/16" UNC x	3/8"
61-371	Socket Head Set Screw - Cup Point	3/8" UNC x	1/2"
66-410	Socket Head Set Screw - Standard	No. 10-24 t.p.i. x	3/16"
66-411	Socket Head Set Screw - Standard	No. 10-24 t.p.i. x	1/4"
67-418	Socket Head Set Screw - Standard	1/4" UNC x	5/16"
67-419	Socket Head Set Screw - Standard	1/4" UNC x	3/8"
67-421	Socket Head Set Screw - Standard	1/4" UNC x	1/2"
68-429	Socket Head Set Screw - Standard	5/16" UNC x	3/8"
68-433	Socket Head Set Screw - Standard	5/16" UNC x	3/4"
73-474	Cheese Head Screw	4 B.A. x	3/4"
73-485	Cheese Head Screw	2 B.A. x	3/8"
73-486	Cheese Head Screw	2 B.A. x	1/2"
24-525	Mills Pin G.P. 3.	1/8" dia.x	9/16"
24-527	Mills Pin G.P. 4.	1/8" dia.x	3/8"
24-531	Mills Pin G.P. 3.	5/32" dia.x	3/8"
24-533	Mills Pin G.P. 3	5/32" dia.x	3/4"
24-534	Mills Pin G.P. 3	5/32" dia.x	1"
24-535	Mills Pin G.P. 3	5/32" dia.x	1.1/4"
24-536	Mills Pin G.P. 1	3/16" dia.x	1/2"
24-538	Mills Pin G.P. 1	3/16" dia.x	1.1/8"
24-542	Mills Pin G.P. 3	3/16" dia.x	3/4"
24-545	Mills Pin G.P. 3	3/16" dia.x	1.1/4"
24-548	Mills Pin G.P. 11	3/16" dia.x	1.1/16"
24-549	Mills Pin G.P. 3	3/16" dia.x	1.3/4"
24-553	Mills Pin G.P. 2	1/4" dia.x	1"
24-572	Mills Pin G.P. 3	5/16" dia.x	1"
24-575	Mills Pin G.P. 3	5/16" dia.x	1.3/4"
14-607	Spring Dowel	3/16" dia.x	1.5/16"
20-620	Standard Nut - Steel	1/4" UNC	
20-621	Standard Nut - Steel	5/16" UNC	
20-622	Standard Nut - Steel	3/8" UNC	
20-623	Standard Nut - Steel	7/16" UNC	
20-632	Standard Nut - Steel	No. 10-24 t.p.i.	
21-636	Thin Locknut	5/16" UNC	
21-637	Thin Locknut	3/8" UNC	
21-651	Standard Self Locking Nut	7/16" UNF	
21-654	Nyloc Nut	5/8" UNF	
21-658	Standard Self Locking Nut	1/4" UNC	
21-660	Simmonds Aero Nut	3/8" UNC	
21-663	Wedglok Nut	1/2" UNC	
21-667	Simmonds Type T - NT/N 282	7/8" UNC	

SPECIFICATION OF STANDARD PARTS (CONTINUED)

<u>Item</u>						
85-690	B.S. Steel Washer	3/4"	I/D			
85-691	B.S. Steel Washer	1/4"	I/D			
85-694	B.S. Steel Washer	7/16"	I/D			
85-695	B.S. Steel Washer	1/2"	I/D	x	1" O/D	
				x	.092"	
85-696	B.S. Steel Washer	1/2"	I/D	x	1.1/8" O/D	
				x	.062"	
85-698	B.S. Steel Washer	5/8"	I/D			
85-699	B.S. Steel Washer	3/4"	I/D			
84-706	Single Coil Spring Washer	1/2"	I/D			
84-708	Single Coil Spring Washer	5/8"	I/D			
84-716	Double Coil Spring Washer	1/2"	I/D			
11-732	External Circlip-Type 700/37A-					
	Anderton	3/8"	dia.			
11-736	External Circlip-Type 1400-Anderton	1/2"	dia.			
11-740	External Circlip	1/2"	dia.			
	-Seeger					
11-742	External Circlip-Type 5101/65-					
	Salter Bowed	9/16"	dia.			
11-743	External Circlip-Type 1400-Anderton	5/8"	dia.			
11-745	External Circlip-Type 5101/66-					
	Salter	3/4"	dia.			
11-749	External Circlip-Type 1400-Anderton	7/8"	dia.			
11-753	External Circlip-Type 1400-Anderton	1"	dia.			
12-766	Internal Circlip-Type 1300-Anderton	28 mm	dia.			
11-777	External Circlip-Type 1500E					
	-Anderton	3/4"	dia.			
11-782	External Circlip-Type E210-Anderton	1/4"	dia.			
01-787	Steel Ball	3/16"	dia.			
01-788	Steel Ball	1/4"	dia.			
01-793	Phosphor Bronze Ball	1/4"	dia.			
82-795	Compression Spring	1/4"	O/D	x	1/2" F.L.	
				x	22 SWG	
82-802	Compression Spring - Flexo 93016	1/4"	O/D	x	2" F.L.	
82-804	Compression Spring - Flexo 123106	3/8"	O/D	x	3/4" F.L.	
82-807	Compression Spring - Flexo 223413	11/16"	O/D	x	1.1/2" F.L.	
				x	16G	
87-824	Helicoil Insert	3/8"	UNC	x	9/16"	
87-825	Helicoil Insert	1/2"	UNC			
23-827	Garland Diaphragm Oiler	1/4"	dia.			
18-830	Plastic Knob - Black	1.1/2"	dia.x		7/16" UNC	
18-837	Plastic Knob - Cream	1.1/4"	dia.x		3/8" UNC	
18-838	Plastic Knob - Black	1"	dia.x		3/8" UNC	
18-841	Two Speed Switch Knob					
18-842	Plastic Handle	7/8"	dia.x		3"	
26-846	Oilring - Pioneer P.O. 06204310	.424"	I/D	x	.103" thick	
26-848	Oilring - Pioneer P.O. 08706810	.647"	I/D	x	.070" thick	
26-851	Oilring - Pioneer P.O. 12510013	.984"	I/D	x	.070" thick	
26-858	Oilring - Pioneer PO/52506/MP/658					

SPECIFICATION OF STANDARD PARTS (CONTINUED)

<u>Item</u>					
79-865	Oilseal - Weston - W 16210631 R4	11/16"	I/D	x 1.5/8"	O/D
				x 3/8"	
80-871	Oilsight - Tecalemit I.C. 4610	1.1/4"	O/D		
02-872	Ball Journal	Hoffman	A10		
02-874	Ball Journal	Hoffman	A15		
03-891	Needle Roller - INA Sc.98	9/16"	Bore	x 3/4"	O/D
				x 1/2"	
03-892	Taper Roller K.G.S., K.E.30203	17 mm	Bore	x 40 mm	O/D
				x 13 mm	
03-896	Taper Roller K.G.S., K.E.30205	25 mm	Bore	x 52 mm	O/D
				x 16 mm	
03-898	Needle Roller - INA Sc.188	1.1/8"	Bore	x 1.3/8"	O/D
				x 1/2"	
83-991	Two Speed Switch - Santon SR 1311 PC				

Printed in England.

CLC/SSP/9/64.

