

OPERATORS INSTRUCTION HANDBOOK

FOR THE

ELLIOT

VICTORIA

MILLING MACHINES

MODELS

U2 UNIVERSAL,

P2 PLAIN

V2 VERTICAL

OPERATORS INSTRUCTION HANDBOOK

FOR THE

ELLIOTT

MODEL U2 UNIVERSAL

P2 PLAIN and V2 VERTICAL

MILLING MACHINES

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INSTALLATION

SLINGING (HORIZONTAL MODELS)

It is important that the machine be correctly slung and Figure 1 shows the method we recommend. Before lifting ensure that the overarm is locked to the column.

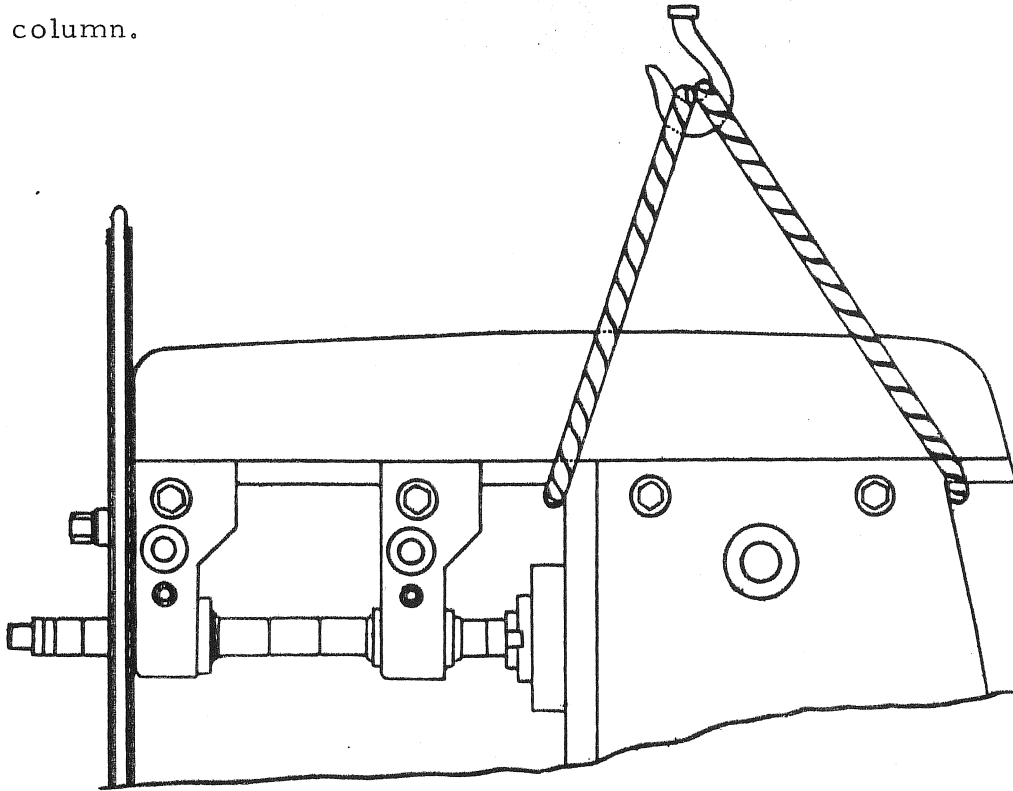


Figure 1

SLINGING (VERTICAL MODELS)

An eye-bolt is located on top of the column, and the machine can be easily slung from this point.

EXAMINATION

The machine should be carefully examined on arrival and any damage sustained in transit reported to the responsible authority without delay.

INSTALLATION (contd.),

CLEANING,

All machined surfaces are covered with a rust preventative which is soluble in oil. Do not use paraffin or thinners. After every trace of rust preventative has been removed the surfaces should be wiped with a clean dry cloth and coated with a film of light machine oil.

FOUNDATION,

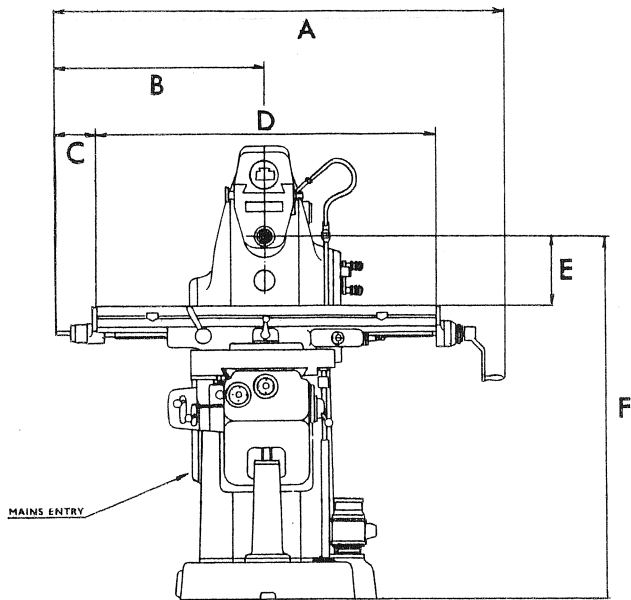
The foundations should be prepared in accordance with the plan shown in Figure 2, particular care being taken to leave room for the operator to move freely between machines and for the rear door to be opened.

Locate the mains entry to the machine as shown in Figs. 2 & 3. Suitable isolator and fuse protection for the direct starting 4 H. P. motor should be provided.

Lower the machine complete with rag bolts or bolts and plates onto suitable metal wedges or strips so that it may be correctly levelled before grouting down. Correct levelling is established by using a precision spirit level longitudinally on the table surface and transversely at each end.

After the wedges or strips have been adjusted, the usual procedure is to build a dam around the machine approximately 4" wide, by placing pieces of timber in position and filling up with grouting cement to 1" above the normal level of the floor. This procedure creates a 1" step around the machine which if considered objectionable may be overcome by laying the foundation 1" below normal floor level, leaving 4" all round for grouting.

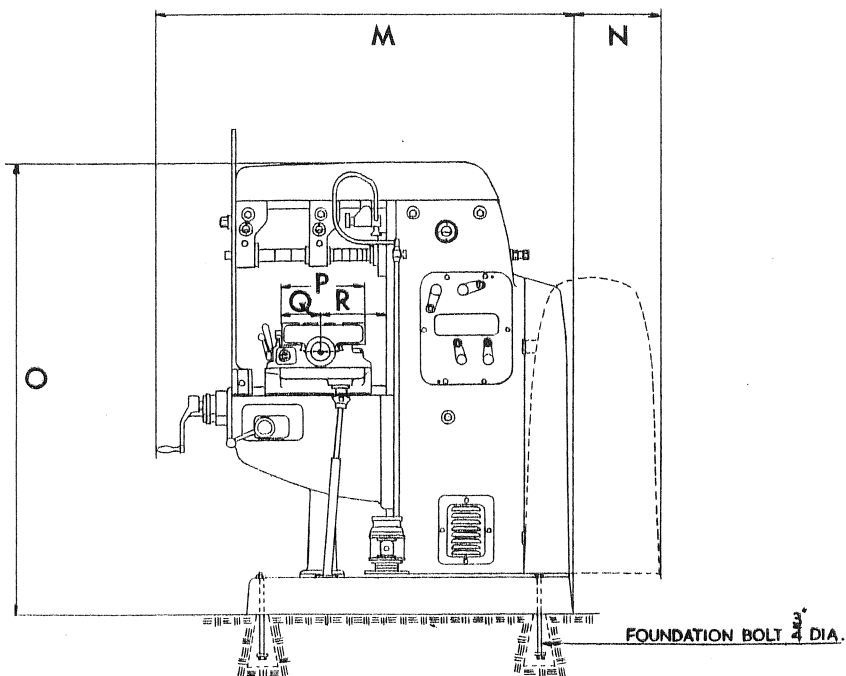
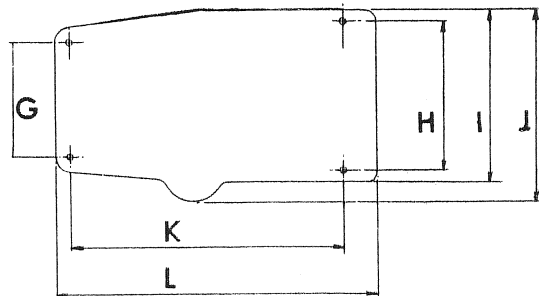
FOUNDATION PLAN MODEL P. 2. & U. 2.



- A - $60\frac{5}{8}$ "
- B - $45\frac{1}{2}$ " max.
- B - $15\frac{1}{2}$ " min.
- C - $5\frac{1}{2}$ "
- D - 45"
- E - $15\frac{3}{4}$ " max.
- E - $\frac{3}{4}$ " min.
- F - $48\frac{1}{4}$ "

3-T. SLOTS IN TABLE $1\frac{1}{2}$ " WIDE X $2\frac{1}{2}$ " PITCH

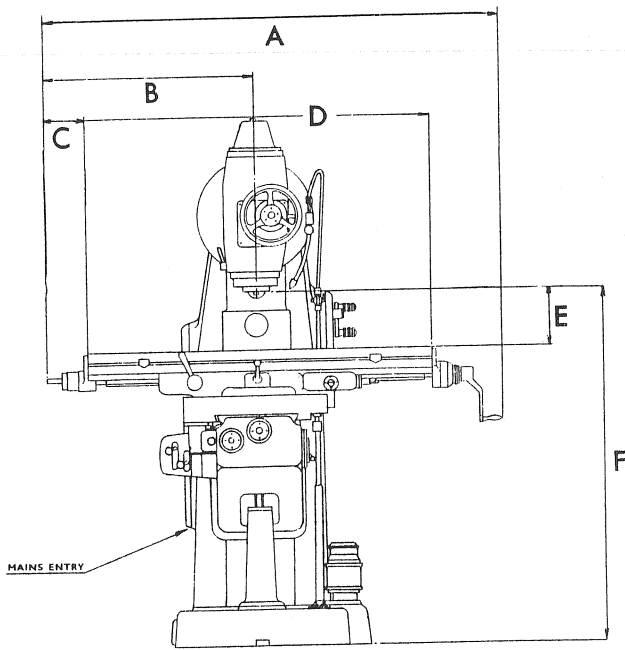
- G - $15\frac{1}{2}$ " cts.
- H - 20" cts.
- I - 23"
- J - 26"
- K - 37" cts.
- L - $43\frac{3}{4}$ "



- M - 59"
- N - 11"
- O - $60\frac{1}{4}$ "
- P - $11\frac{3}{8}$ "
- Q - $5\frac{1}{8}$ "
- R - $15\frac{1}{2}$ " max.
- R - $7\frac{1}{2}$ " min.

Figure 2

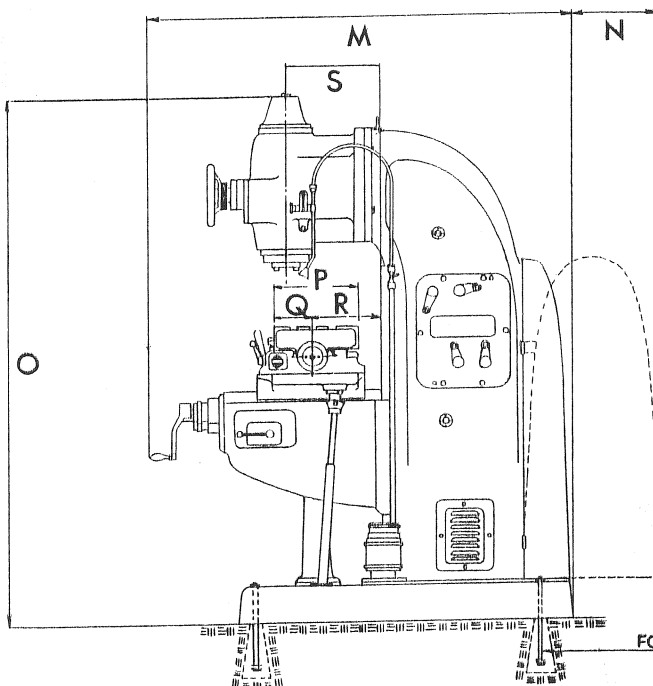
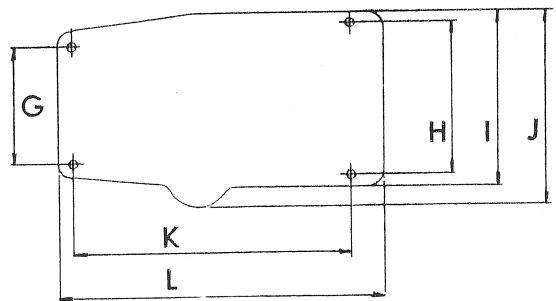
FOUNDATION PLAN MODEL V. 2.



- A - 60 "
- B - $45\frac{1}{2}$ " max.
- B - $15\frac{1}{2}$ " min.
- C - $5\frac{1}{2}$ "
- D - 45"
- E - 15" max. (15" table travel - 3" quill travel)
- F - $46\frac{3}{4}$ "

3-T. SLOTS IN TABLE $\frac{11}{16}$ " WIDE X $2\frac{1}{2}$ " PITCH

- G - $15\frac{1}{2}$ " cts.
- H - 20" cts.
- I - 23"
- J - 26"
- K - 37" cts.
- L - $43\frac{3}{4}$ "



- M - 55"
- N - $12\frac{3}{8}$ "
- O - $69\frac{1}{2}$ "
- P - $11\frac{3}{8}$ "
- Q - $5\frac{1}{8}$ "
- R - $15\frac{1}{2}$ " max.
- R - $7\frac{1}{2}$ " min.
- S - 12"

FOUNDATION BOLT $\frac{3}{4}$ " DIA.

Figure 3

Part Lubricated	Method of Lubrication	Period
Column gearing and Bearings. Vertical Head Gears	Oil pump and splash	Maintain oil level at sight glass
Arbor Supports	Push button oiling	Maintain oil level at glass. Depress buttons for 5 secs. daily
Table leadscrew, saddle gears, Saddle and knee slides	One-shot lubricator	Pull handle twice daily
Leadscrew end bearings	Oil nipple in table end brackets	Twice daily
Cross and Vertical Feed Box	Oil nipple	Maintain oil level
Feed drive worm and wormwheel	Splash	Maintain oil level through nipple above glass
Feed drive shaft top bearings	2 Oil Nipples on right hand side cover on knee, and 1 Oil Nipple on Universal joint drive shaft rear bearing	Twice daily
Vertical screw shaft and cross traverse screw bearings	Oil nipples at front of knee	Daily
Vertical knee gib	Oil nipple on top of gib	Weekly
Vertical knee slide (RH)	Oil nipple	Weekly
Vertical and cross-traverse screws	Oil direct	Daily
Column Slide	Oil direct	Daily

Suggested Lubricants:-

Shell Grade of Oil or Grease	:	Vitrea 37 Oil
Mobil Equivalent	:	Mobil Vactra Oil Heavy
Edgar Vaughan Equivalent	:	Cosmolubric E. H. A.
Wakefield Dick Equivalent	:	Perfecto R. R.

The grades of oils and grease recommended may be used as a guide as any "Branded" equivalent will be suitable.

Figs. 8, 9 and 10 indicate the various oiling and greasing points on the machine. The oil level in the sight glasses should be maintained at halfway.
INSTRUCTIONS FOR PRIMING THE COLUMN GEARING OIL PUMP (SEE FIG. 14)

Open the door on the left-hand side of the machine. Remove grub screw in centre of pump body then, using either oil can or oil gun, fill with oil. Replace grub screw and turn machine over by use of inching button. Oil pump should then operate satisfactorily.

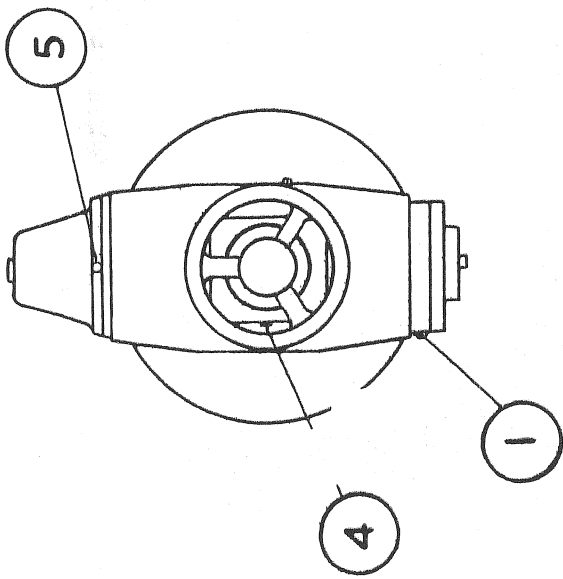
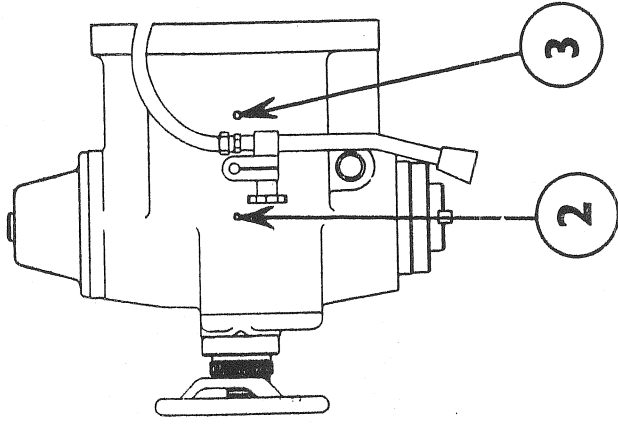


Figure 4



Index Number	Part Lubricated	Method of Lubrication	Period	Shell Grades of Oil or Grease	Mobil Grade of Oil or Grease	Edgar Vaughan Grade of Oil or Grease	Wakefield Dick Grade of Oil or Grease
1	Spindle Taper Roller Bearings	Grease Nipple	Only after new machine has been in use for two months. 2-3 shots only monthly	Alvania 2 Grease	Mobilux Grease No. 3	Evco B. B. No. 3 Grease	Spheerol A. P. 2
2	Top Spindle Roller Bearing	Grease Nipple	Weekly 2-3 shots only	Alvania 2 Grease	Mobilux Grease No. 3	Evco B. B. No. 3 Grease	Spheerol A. P. 2
3	Drive Gear Taper Roller Bearings and Bevel Gears	Grease Nipple	Weekly 2-3 shots only	Alvania 2 Grease	Mobilux Grease No. 3	Evco B. B. No. 3 Grease	Spheerol A. P. 2
4	Spindle Elevating Mechanism	Grease Nipple	Weekly	Alvania 2 Grease	Mobilux Grease No. 3	Evco B. B. No. 3 Grease	Spheerol A. P. 2
5	Spindle Spline	Oil Nipple	Daily	Vitrea 37 Oil	Mobil Vactra Oil Heavy	Cosmolubric E. H. A.	Perfecto R. R.

The precision bearings in the main spindle assembly are assembled with a full compliment of grease, this being good practice on a new machine, although it raises the work temperature until the surplus has worked out.

The grease must not be replenished until the machine has done two months of normal working and thereafter lubrication should be in accordance

OPERATING THE MACHINE

GENERAL

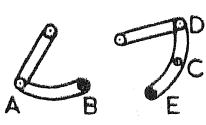

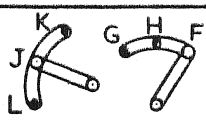

After connecting the machine with the mains, check that the direction of the spindle rotation corresponds with the directions shown on the spindle reversing switch on the electrical panel.

Reference to Figs. 8, 9 and 10 will make clear the functions of the various levers etc.

SPEEDS AND FEEDS

12 speeds are available from the combined gear and two-step pulley drive as well as 18 feed rates with a choice of 9 feeds for either pulley step. The speed and feed plate on the gear change panel indicates the appropriate lever positions relative to the pulley step, to obtain the selected speed or feed. The machine must be stopped before attempting to change gear. An "inching" button is mounted on the panel to facilitate the gear changing.

Check that oil is passing through the pump indicator on the column whilst the machine is running, to ensure that the gears and bearings are being fed with oil.

		C		D		E		
		A	B	C	D	E	F	
		31	43	55	77	102	141	
		223	308	397	548	731	1010	
		J		K		L		
		F	G	H	I	J	K	
		0.4	0.53	0.7	0.97	1.4	1.94	
		1.0	1.35	1.86	2.6	3.7	5.1	
		2.4	3.4	4.5	6.2	9.0	12.25	
		J		K		L		

Speed and Feed Plate - Universal and Plain Model

Figure 5

OPERATING THE MACHINE

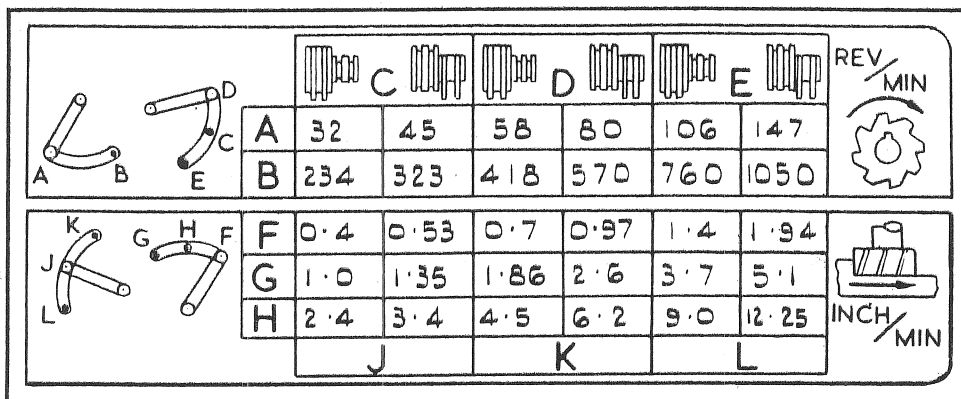
POWER FEED,

Power feed is available in all directions, and the longitudinal feed may be engaged by pushing the auto-feed lever in the direction of the desired feed when the spindle is rotating clock-wise and in the opposite direction to the desired feed when the spindle is rotating anti-clockwise. The trip dogs may be set to knock off the feed anywhere within the range of table traverse. Cross or vertical auto feed can also be selected by the feed selector lever and engaged in either direction by the feed engagement lever, and trip dogs for knocking off are provided.


The table hand feed is direct on the screw at each end of the table, one revolution of the handle advancing the table $\frac{1}{4}$ " (5m/m on metric machines). The graduated dials which are frictionally mounted for setting to zero are calibrated in .001" (.02 m/m on metric machines).

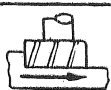
The cross and vertical hand feed dials are also frictionally mounted and are calibrated in .001" (.02 m/m on metric machines).

The dividing headgear register on the left-hand end of the table leadscrew is protected by a sleeve which may be withdrawn after removing the retaining collar (Fig. 8).



The diagram shows a speed and feed plate with two main sections. The top section is for speed (REV/MIN) and includes gear diagrams A, B, C, D, and E. The bottom section is for feed (INCH/MIN) and includes gear diagrams F, G, H, J, K, and L. The data tables are as follows:

	C	D	E	REV/MIN			
A	32	45	58	80	106	147	
B	234	323	418	570	760	1050	

	F	G	H	J	K	L	INCH/MIN
F	0.4	0.53	0.7	0.97	1.4	1.94	
G	1.0	1.35	1.86	2.6	3.7	5.1	
H	2.4	3.4	4.5	6.2	9.0	12.25	
		J		K		L	

Speed and Feed Plate - Vertical Model

Figure 6

OPERATING THE MACHINE

Longitudinal feed may be engaged with either cross or vertical feed which are selected by lever I (Figure 8) and engaged by lever J, but cross and vertical cannot be engaged simultaneously.

VERTICAL HEAD

The spindle traverse of 3" is obtained by the rotation of the large hand wheel on the front of the head, the frictionally mounted calibrated dial enabling accurate settings to be made. In order to increase the rigidity, it is advisable to clamp the spindle in position before commencing the cutting operation.

Swivelling of the head up to 45° each side of vertical is possible after the tapered locating dowel on the R. H. side of the head flange has been removed, and the tension on the 4 clamping bolts has been released.

Re-location in a true vertical position is easily obtained by replacing the dowel.

COOLANT

The coolant pump is operated by a switch situated on the electrical contactor panel on the left-hand side of the machine. The base of the machine serves as a reservoir for the coolant and should be cleaned out occasionally. This is effected by removing the drain cover-plate on the left-hand side of the base casting, after having allowed the pump to drain the reservoir as far as possible.

The pump and coolant return cover should now be removed so that a scoop may be used for cleaning. When cleaning out the base, it is advisable to remove the coolant pump and clean the strainer.

OPERATING THE MACHINE,

VEE BELTS,

It is a very simple matter to transfer the two vee belts from one step to the other by proceeding as follows :-

Referring to Fig. 7

1. Loosen the motor-plate locking bolt.
2. Fit the table traverse handle on to the swivel shaft: the collar mounted on the shaft has four holes to suit the pins in the handle.
3. Swing the handle over so that the lift pin raises the motor-plate.
4. Place a foot on the handle to maintain the plate in the "up" position, leaving both hands free to transfer the vee belts.
5. Set the tension of the belts in the new position and lock the motor-plate locking bolt.

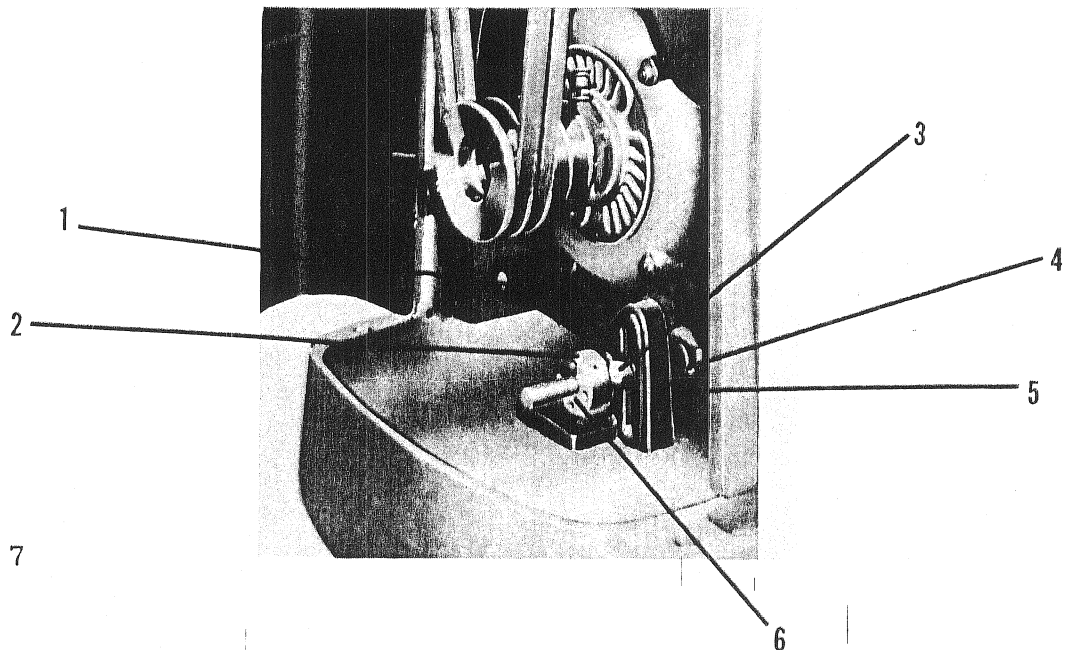
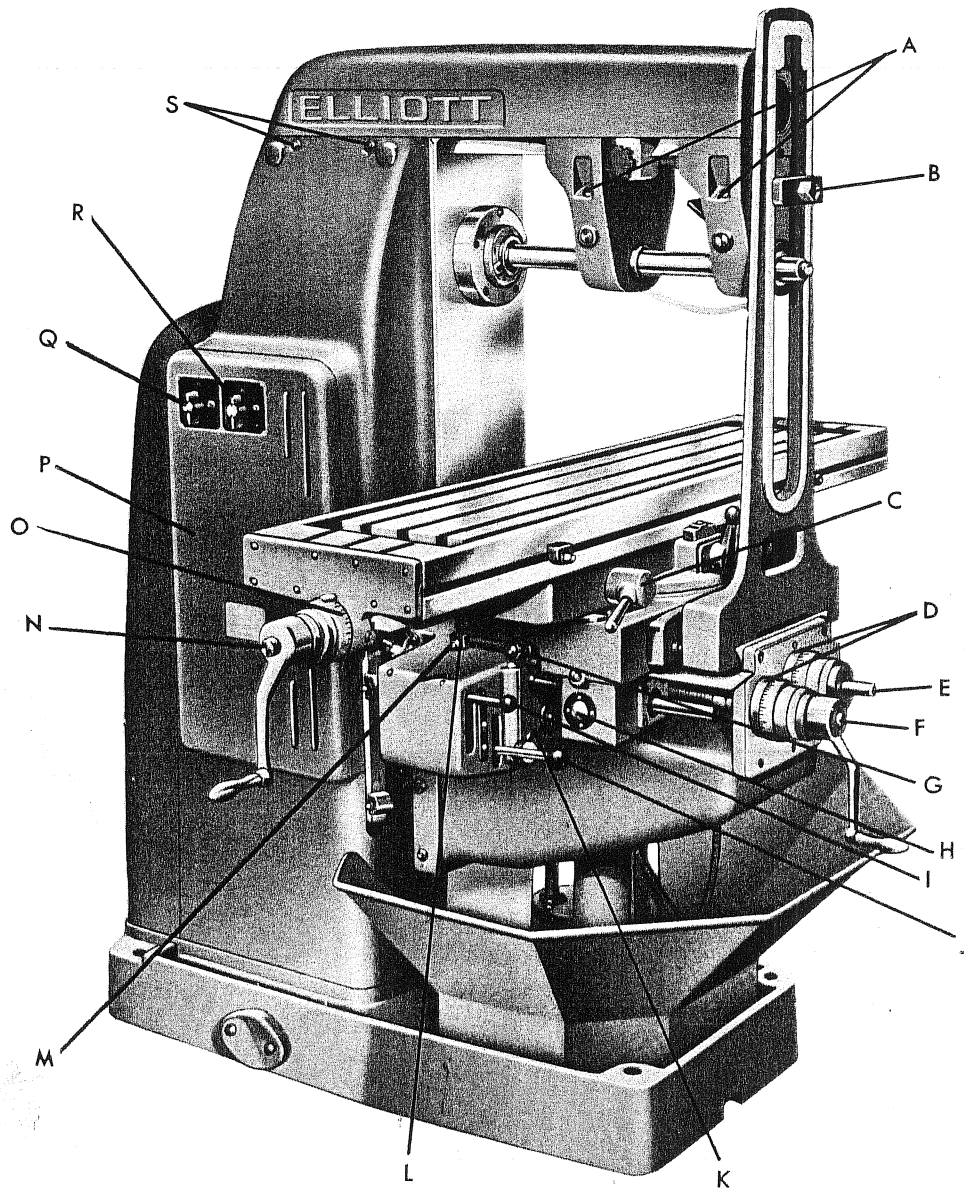


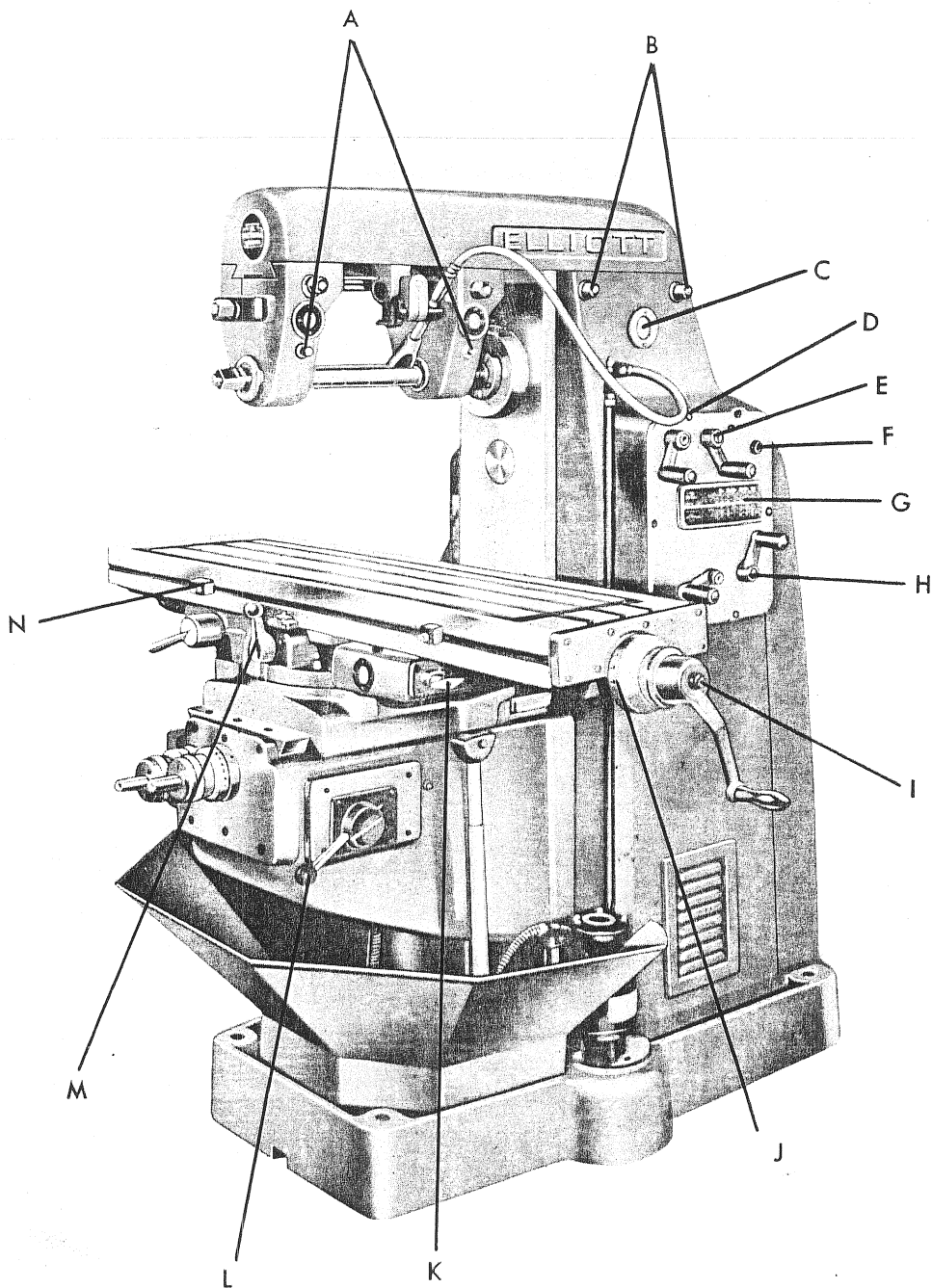
Figure 7

- | | |
|------------------|-------------------|
| 1. Motor plate | 4. Lift pin |
| 2. Swivel collar | 5. Swivel bracket |
| 3. Locking bolt | 6. Swivel shaft |



- | | | | |
|---|------------------------------------|---|---|
| A | Oil filler plugs | K | Oil sight glass |
| B | Brace clamp | L | Cross feed trip |
| C | Table lock | M | Oil nipples |
| D | Graduated dials | N | Table hand traverse |
| E | Vertical traverse (.001" - .02 mm) | O | Graduated dial dividing head drive cover (.001" - .02 mm) |
| F | Cross traverse (.001" - .02 mm) | P | Electrical panel |
| G | Cross traverse lock | Q | Spindle direction switch |
| H | Worm box oil level | R | Coolant switch |
| I | Feed direction selector | S | Overarm gib adjustment screws |
| J | Feed engagement lever | | |

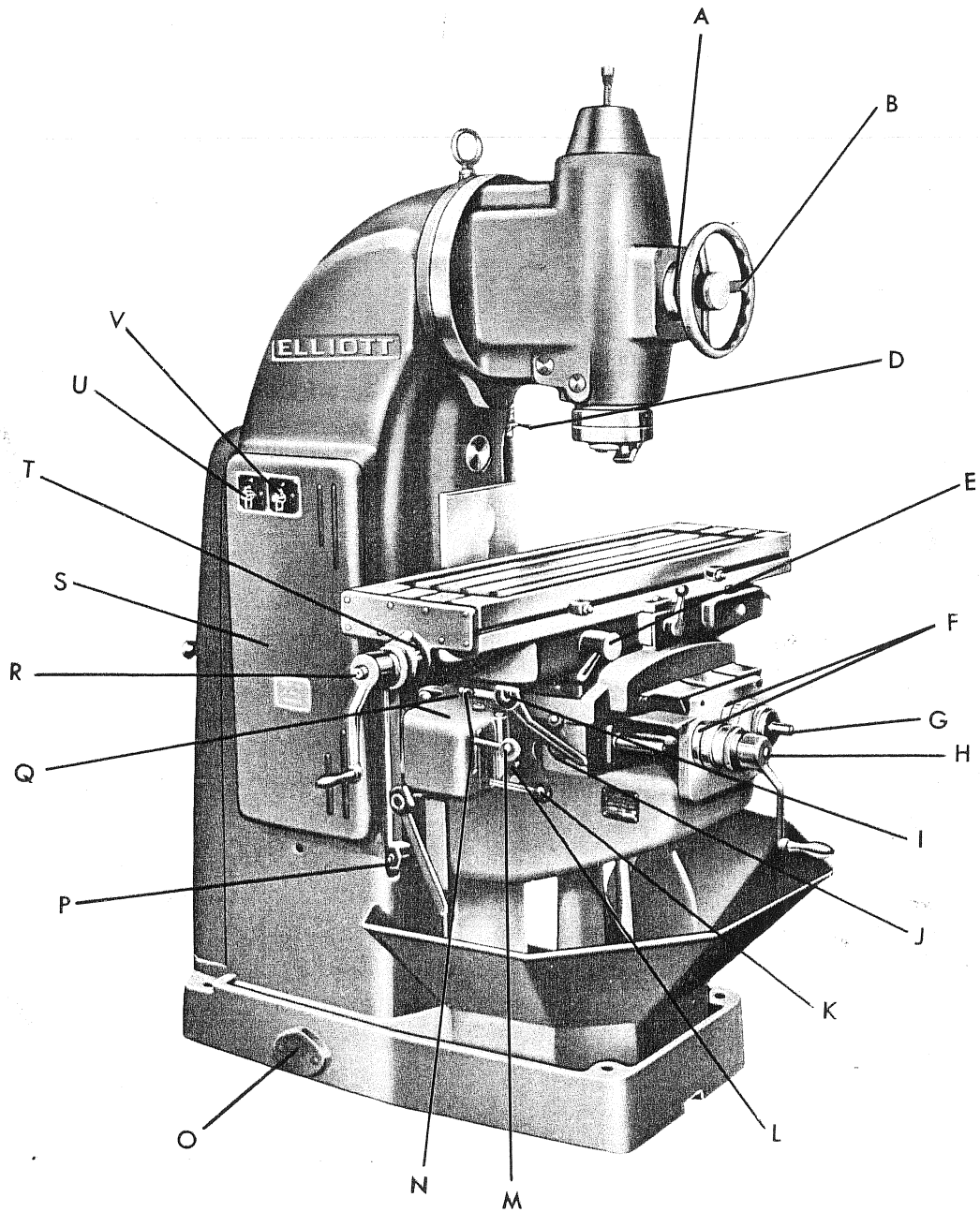
Figure 8



- A Push button oilers
- B Overarm locks
- C Oil pump indicator
- D Oil filler plug
- E Speed change levers
- F "Inching" button
- G Speed and feed plate

- H Feed change levers
- J Graduated dial
- K "One shot" lubricator
- L Stop and start lever
- M Table auto-feed lever
- N Feed trip dogs

Figure 9



- | | |
|--------------------------------------|----------------------------------|
| A Graduated dial (.001" - .02 mm) | L Oil sight glass |
| B Quill vertical traverse hand wheel | M Feed direction selector |
| D Coolant tap | N Cross feed trip |
| E Table lock | O Drain cover |
| F Graduated dials (.001" increments) | P Knee lock |
| G Vertical traverse (.001" - .02mm) | Q Oil nipples |
| H Cross traverse (.001" - .92mm) | R Table hand traverse |
| I Cross traverse lock | S Electric panel |
| J Worm box oil level | T Graduated dial (.001" - .02mm) |
| K Feed engagement lever | U Spindle direction switch |
| | V Coolant switch |

Figure 10

WIRING,

The wiring diagram for the machine is shown in Fig. 11.

The electrical panel comprising of motor contactor, spindle reversing switch, and coolant switch is housed in the column (Figs. 8, 9 & 10).

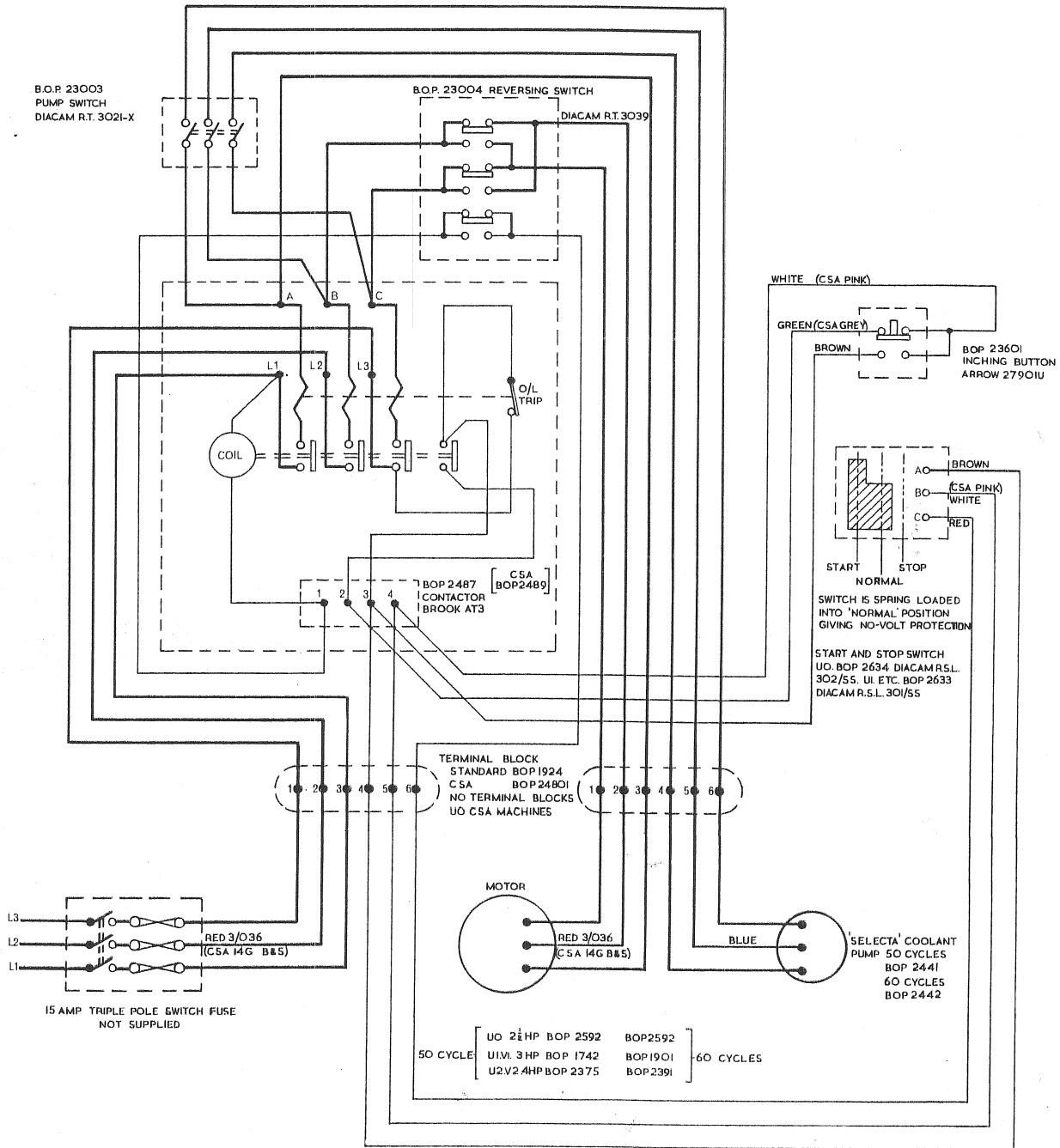


Figure 11

MAINTENANCE

MAIN SPINDLE,

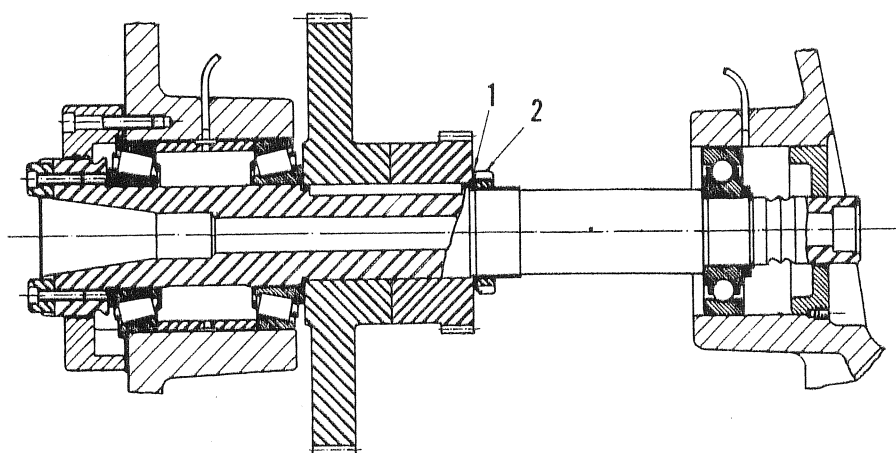
HORIZONTAL MACHINES

The front bearings on the main spindle may be adjusted by means of a locknut, after the tab of the lock washer has been pushed clear (Fig. 12).

The locknut will be made accessible on removal of the overarm and the sheet metal cover underneath. Great care must be exercised when adjusting these bearings lest they be too heavily pre-loaded. After adjustment the machine should be run and a check made to see that the temperature rise of the bearings is not excessive.

The front Arbor Steady is fitted with a tapered bronze bush which may be adjusted to take up wear by loosening the back locknut and tightening the front nut a corresponding amount.

MAIN SPINDLE,



1. Tab Washer 2. Bearing Adjustment Locknut

Figure 12

MAINTENANCE (cont.),

MAIN SPINDLE,
(VERTICAL MACHINE),

The main spindle bearings may be adjusted should the need arise, after the quill has been removed. Procedure is as follows :-

1. Release the grub screw securing the quill positioning plug and remove plug.
2. Release quill lock and lower spindle quill unit out of head.
3. Release tension on upper lock nut (Refer Fig. 13.), remove lock nut and oil retaining cover.
4. Release tension on radial grub screw in inner lock nut, and adjust tension on bearings as required, retension grub screw.
5. Re-assemble in reverse order.

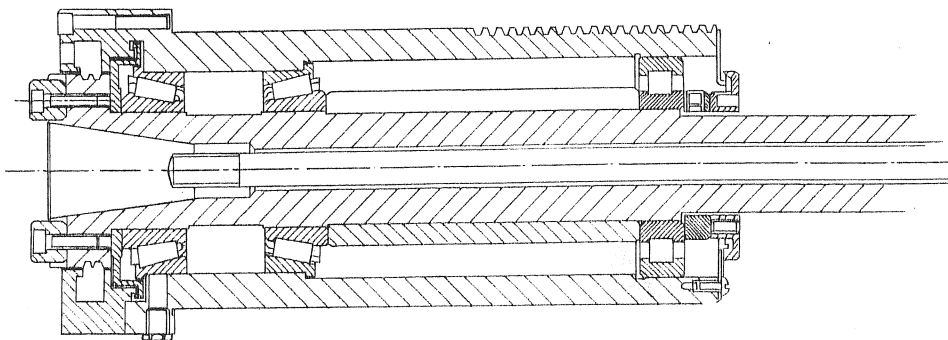


Figure 13

MAINTENANCE (cont.),

AUTO FEED DRIVE MECHANISM, OIL PUMP, SLIDES

The auto-feed drive mechanism is protected from over load by a $5/32$ " dia. brass shear pin fitted on the universal joint nearest the drive from the knee. This pin becomes accessible when the hinged electrical panel (Fig. 14) is opened after removal of the two $3/8$ " socket head cap screws.

Fig. 14 also shows the mounting for the plunger type oil pump and priming pump, should it be necessary to inspect this unit.

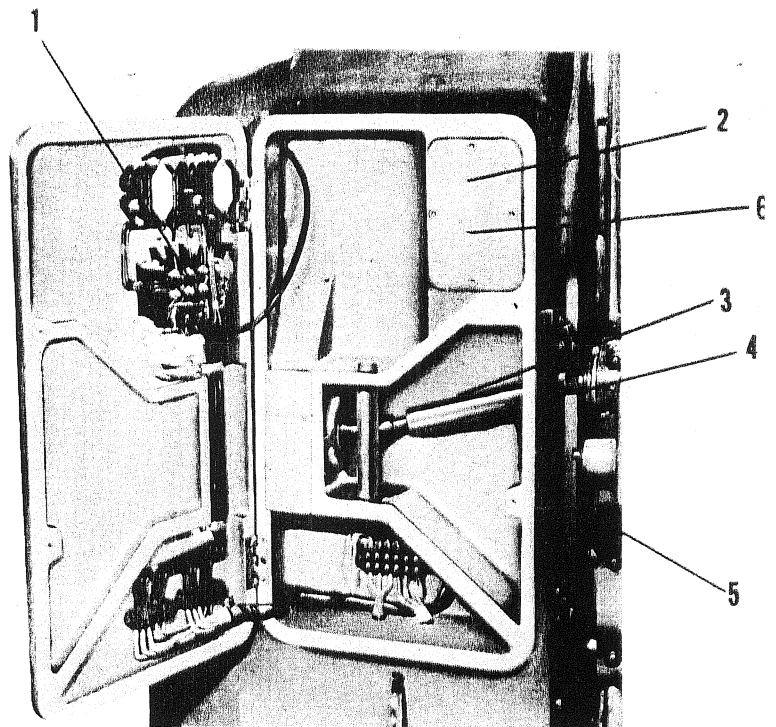
Taper gibs control the running clearance of the table and saddle guides and adjustment for wear is effected by means of screws located at the end of the gibs.

Adjustment of the knee gib is made by backing off the hexagon bolts slightly and adjusting the grub screws so as to set the strip closer to the column dovetails, after which the hexagon bolts must be clamped securely.

ELECTRIC PANEL

Figure 14

1. Spindle contactor
2. Oil pump
3. Oil
4. Brass shear pin
5. Knee lock
6. Grub screw.
Remove to prime.



MAINTENANCE (cont.),

THE COLUMN GEARING

The column gearing may be partially inspected without the necessity of withdrawing the gear change panel, by removing the speed and feed plate and the inspection cover on which it is mounted.

TABLE LEADSCREW AND NUT

Excessive backlash in the table lead screw nut may be eliminated as follows:-

Remove the left-hand table end bracket and push the table to the extreme right. This will make the nut accessible.

Reference to Fig. 15. makes it clear that the nut is made in two halves and all that is necessary to obtain the correct amount of backlash is to adjust the inner nut to the required tension, and tighten the outer nut.

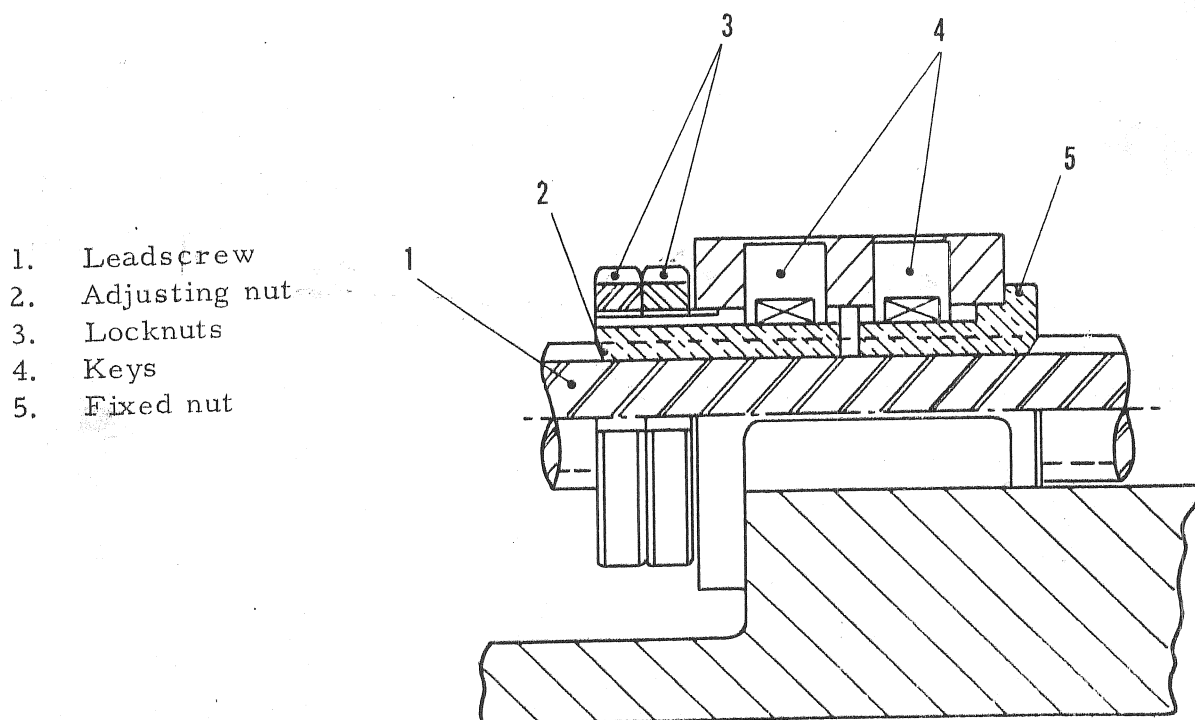


Figure 15

MILLING MACHINE ATTACHMENTS

All attachments when first fitted to the machine should be squared up to the machine table by means of the three adjusting screws at the side of the backplate. Once set and locked this setting will repeat itself.

Great care must be taken to tighten the gib strip evenly as any undue strain side on the bearing housing of the machine's main spindle can cause seizure.

FITTING INSTRUCTIONS FOR SLOTTING ATTACHMENT

1. Withdraw the drive plate and crank from the attachment and fit to machine spindle, with crank at full stroke.
2. Position drive plate with crank pin at top dead centre, and crank link pointing down.
3. Position slide so that the slide crank pin is approximately lined up with the bottom hole in the crank link.
4. It will be found that the slide crank pin will enter the crank link before the back plate spigots itself on the bearing housing of the main spindle.
5. Care should be taken to adjust the gib evenly when on the column, as any undue side pressure can cause a seizure between bearing housing and main spindle.

FITTING INSTRUCTIONS FOR PUNCH SHAPING ATTACHMENT

1. Withdraw the drive plate and crank from the attachment and fit to the machine spindle, with crank at full stroke.
 2. Position drive plate with crank pin at bottom dead centre, and crank link pointing upwards.
 3. Position slide so that the slide crank pin is approximately lined up with the bottom hole in the crank link.
 4. It will be found that the slide crank pin will enter the crank link before the bank plate spigots itself on the bearing housing of the main spindle.
 5. Care should be taken to adjust the gib evenly when on the column, as any side pressure can cause a seizure between bearing housing and main spindle.
-

specification

MODEL U2 & P2

TABLE		
Working surface of table	45" x 11 $\frac{3}{4}$ "	1143 mm. x 289 mm.
Number and size of T slots	3 x $\frac{1}{2}$ "	3 x 17.5 mm.
Swivel of table to each side (Universal machine only)	45°	45°
TRAVERSES		
Longitudinal feed, power—(hand 30")	29 $\frac{1}{2}$ "	750 mm.
Cross feed, power—(hand 8 $\frac{1}{2}$ ")	8"	203 mm.
Vertical feed, power—(hand 15")	14 $\frac{1}{2}$ "	370 mm.
SPINDLE		
Number of spindle speeds	12	12
Range of spindle speeds	31 to 1010 rpm.	31 to 1010 tr/min.
International standard spindle nose taper	No. 40	No. 40
Diameter of cutter arbor	1"	25.4 or 27 mm.
Distance under overarm to spindle centre	6"	150 mm.
FEEDS		
Number of longitudinal feeds	18	18
Range of feeds (longitudinal) standard	0.4 - 12.25 in./min.	8 - 245 mm./min.
Range of feeds, cross	0.4 - 12.25 in./min.	8 - 245 mm./min.
Range of feeds, vertical	0.4 - 12.25 in./min.	8 - 245 mm./min.
GENERAL		
Power of motor	4 hp.	4 ch.
Speed of motor (sync.)	1500 rpm.	1500 tr/min.
Dividing head centre height	5"	127 mm.
Maximum distance dividing head to tailstock	26"	660 mm.
Net weight	3136 lb.	1425 kg.
Gross weight	3584 lb.	1629 kg.
Case dimensions	60" x 61" x 67"	4.0 m ³
Code word (Universal machine)	VITWO	VITWO
Code word (Plain machine)	PLTWO	PLTWO
STANDARD EQUIPMENT. 1" diameter cutter arbor complete with spacing collars, arm brace, complete coolant equipment, operating spanners, grease gun, operator's instruction book and test certificate, etc.		
EXTRA EQUIPMENT. Universal dividing head, dividing plates, chart, tailstock, support block and set of change wheels, vertical milling attachment, universal milling attachment, slotting attachment, circular table, swivelling machine vice, chucks, etc., adaptors, Autolock and Clare collet chucks and collets, rack milling attachment, tool cabinet, base splash guard, cutter guard, etc.		

MODEL V2

TABLE		
Working surface of table	45" x 11"	1145 mm. x 280 mm.
Number and size of T slots	3 x $\frac{1}{2}$ "	3 x 17.5 mm.
TRAVERSES		
Longitudinal feed, power—hand	30"	762 mm.
Cross feed, power—hand	8 $\frac{1}{2}$ "	215 mm.
Vertical feed, power—hand	15"	380 mm.
SPINDLE		
Number of spindle speeds	12	12
Range of spindle speeds	32 to 1050 rpm.	32 to 1050 tr/min.
Spindle nose	No. 40 I.S.T.	No. 40 I.S.T.
Vertical travel of spindle	3"	75 mm.
Maximum distance spindle nose to table	16"	405 mm.
Distance centre spindle to column	12"	305 mm.
FEEDS		
Number of feeds	18	18
Range of feeds longitudinal standard	0.4 - 12.25 in./min.	8 - 245 mm./min.
Range of feeds, cross	0.4 - 12.25 in./min.	8 - 245 mm./min.
Range of feeds, vertical	0.4 - 12.25 in./min.	8 - 245 mm./min.
GENERAL		
Power of motor	4 hp.	4 ch.
Speed of motor (50 c. sync.)	1500 rpm.	1500 tr/min.
Net weight	3248 lb.	1477 kg.
Gross weight	3920 lb.	1782 kg.
Case dimensions	60" x 61" x 75"	4.5 m ³
Code word	TETWO	TETWO
STANDARD EQUIPMENT. Coolant pump and fittings, one set of necessary spanners, operator's handbook.		
EXTRA EQUIPMENT. 10" rotary table, plain or swivel base vice, self-centring shaft vice, Autolock or Clare chucks and collets, high speed attachment (96 to 3150 rpm.), boring head, end measuring troughs and clocks, base splash guard, spindle adaptors, low voltage lighting set, tool cabinet, etc.		

The manufacturers hereby reserve the right to modify the design of the machine and equipment, at any time, without notice and also alter the materials of which it is constructed. Nothing in these particulars should be deemed to form part of any contract for the sale of machine or equipment.

B. ELLIOTT (MACHINERY) LTD.
 VICTORIA ROAD · LONDON · N.W.10

TELEPHONE: ELGAR 4050 (14 LINES)
 TELEGRAMS: ELLIOTTONA, LONDON, NW10

Overseas Subsidiaries: AUSTRALIA · CANADA · SOUTH AFRICA · USA · SOUTH AMERICA



COMPONENT PARTS LIST

OF THE

ELLIOTT

HORIZONTAL AND VERTICAL MILLING MACHINES

MODELS

U2, P2, V2

MADE IN ENGLAND

The Parts shown in this book are finished parts and for identification purposes only.
In some cases it is necessary for the individual part to be correctly fitted to the machine.
Please always supply machine serial number when ordering spare parts.

COLUMN & BASE — PLAIN & UNIVERSAL MACHINES

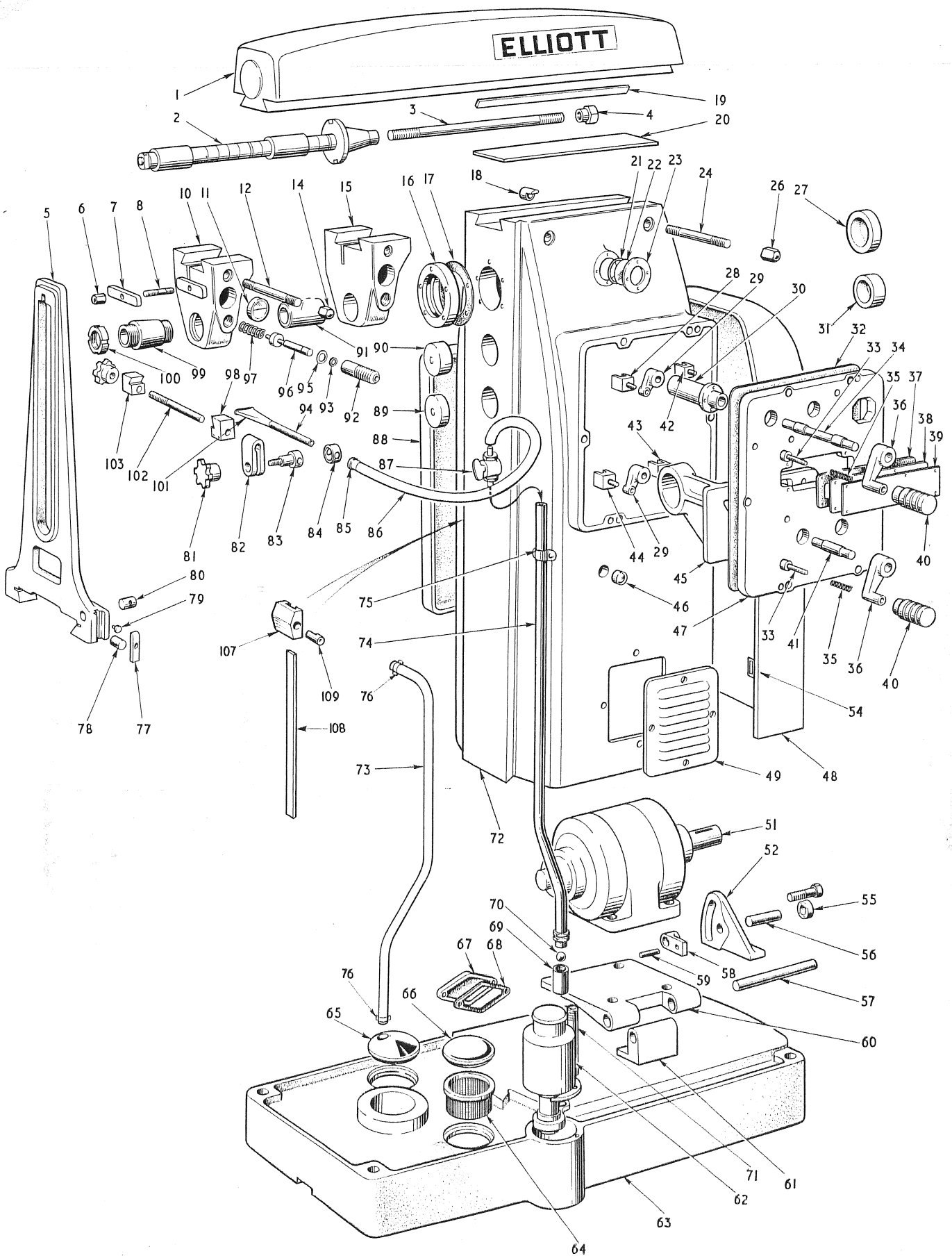
Illus. No.	Part No.	DESCRIPTION
56	171-72-B	Handle boss pin
57	171-71-B	Swivel bracket pin
58	171-69-B	Lifting arm
59	171-73-A	Lifting pin
60	171-66-D	Motor plate
61	171-67-C	Swivel bracket
62	BOP.2441	Suds pump
63	171-2-X	Base
64	BOP.69-B	Filter
65	357-3-C	Drain cover
66	15-4-C	Well cover
67	15-3-B	Drain cover
68	BOP.2045-B	Gasket
69	216-10-B	Valve body
70	BOP.1721	Steel ball
71	BOP.1774-B	3/4" BSP pipe
72	171-1-X	Column
73	BOP.15805	Drain hose
74	176-10-B	Suds pipe
75	BOP.1466	Pipe clip
76	BOP.15804	'0' clip
77	351-80-B	Brace clamp
78	351-78-B	Pivot
79	30-196-A	Heel pin
80	171-91-A	Brace clamp
81	BOP.2623	Handwheel
82	176-13-B	Nozzle clamping block
83	216-6-B	Clamp bolt
84	176-15-A	Clamp collar
85	BOP.15808	'0' clip
86	BOP.15806	Hose
87	BOP.15812	Suds cock
88	171-5-E	Side cover
89	171-35-B	Front plug
90	171-21-B	Front abutment
91	15-87-A	Bearing bush
92	211-85-B	Valve body
93	BOP.1816	'0' ring oil seal
94	266-7-B	Pipe for nozzle
95	BOP.15214	'0' ring oil seal
96	211-82-2	Oil piston
97	BOP.13028	Compression spring
98	176-11-B	Left hand coolant bracket
99	171-112-B	Bearing bush
100	171-113-B	Locknut
101	112-44-B	Nozzle
102	211-84-B	Clamp rod
103	176-12-B	Right hand coolant bracket
107	171-302-B	Trip stop (U2/P2 only)
108	171-301-C	Vee strip (U2/P2 only)
109	201-22-A	Trip clamp (U2/P2 only)

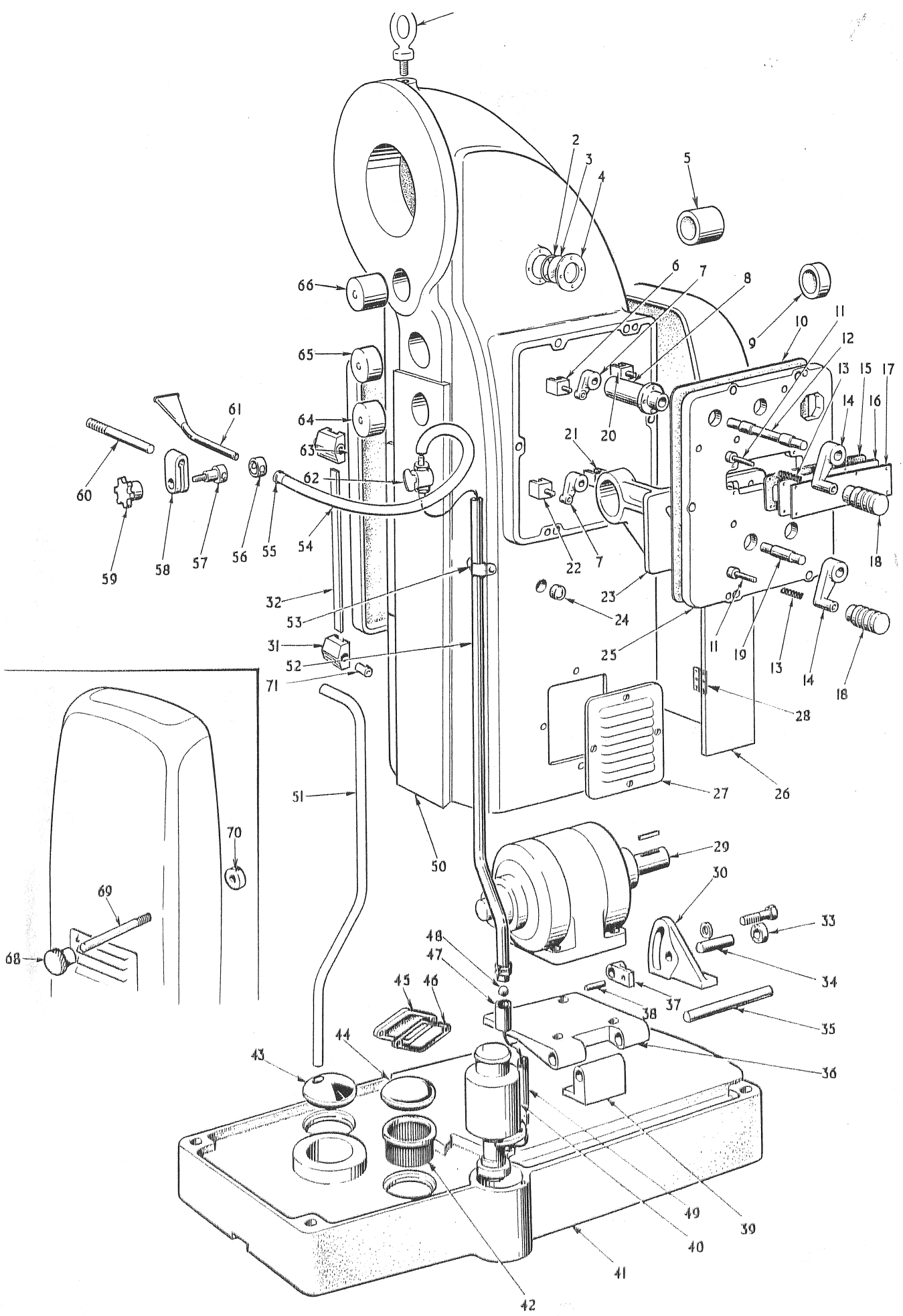
Illus. No.	Part No.	DESCRIPTION
1	171-4-D	Overarm
2	200-11-C	No.40 taper 1" diameter x 18" long arbor
3	171-104-B	Draw bar
4	171-105-A	Draw bar nut
5	171-88-D	Brace strut
6	211-79-B	Brace clamp
7	171-92-B	Support clamp plate
8	171-93-B	Clamp plate stud
10	171-110-E	Outer arbor support
11	BOP.15709	Oil sight
12	211-84-B	Arbor steady clamp stud
14	211-79-B	Clamp nut
15	171-111-E	Inner arbor support
16	171-9-C	Front bearing cover
17	BOP.1756	Bearing cover gasket
18	171-98-B	Overarm clamp
19	171-96-B	Gib strip
20	BOP.1795-C	Top cover for column
21	BOP.974	Oil sight washer
22	BOP.975-A	Oil sight window
23	150-521-B	Oil sight glass retainer
24	171-97-B	Clamp screw
26	211-79-B	Clamp nut
27	171-10-B	Rear plug
28	172-6-B	Glut for back gear
29	172-5-B	Glut operating lever
30	172-4-B	Support bush
31	171-22-B	Rear abutment
32	BOP.16031-B	Gasket
33	15-62-A	Handle plunger
34	172-10-B	Glut operating shaft
35	BOP.65-A	Compression spring
36	15-61-B	Outside change lever
37	BOP.1804-B	Gasket
38	172-5-C	Inspection cover
39	BOP.2758	Speed and feed plate
40	15-63-B	Handle for change lever
41	172-11-A	Glut operating shaft
42	172-7-B	Glut
43	172-8-B	Glut
44	172-7-B	Glut
45	172-2-E	Bracket
46	BOP.2612	Oil sight glass
47	172-1-E	Change gear panel
48	BOP.19604-E	Back cover
49	15-7-D	Side cover
51	BOP.21013	Motor U1/P1
52	BOP.21015	Motor U2/P2
54	171-68-C	Clamp bracket
54	BOP.12519	Latch
55	171-70-B	Handle boss

COLUMN & BASE - VERTICAL MACHINES

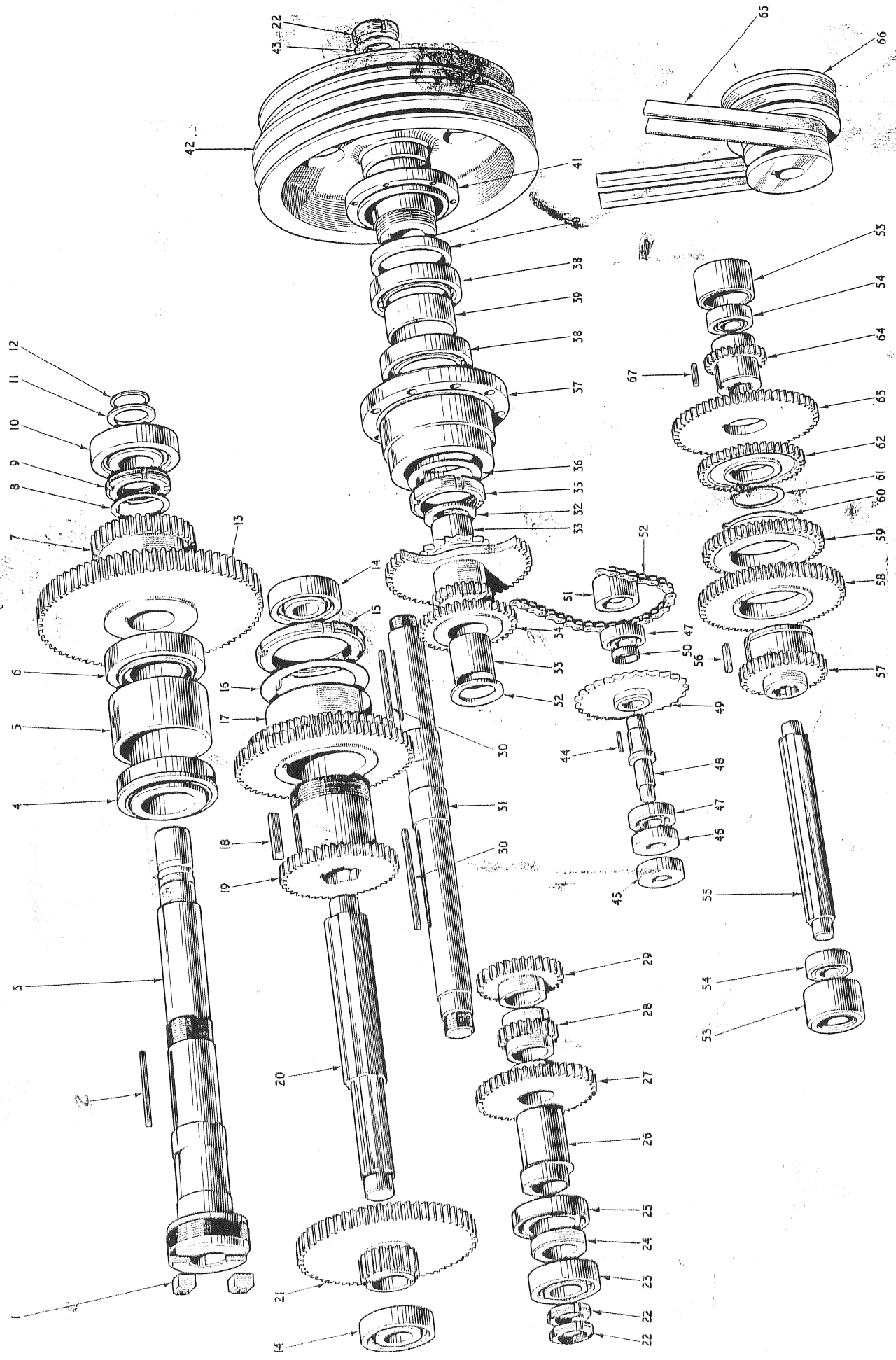
Illus. No.	Part No.	DESCRIPTION
36	171-66-D	Motor plate
37	171-69-B	Lifting arm
38	171-73-A	Lifting pin
39	171-67-C	Swivel bracket
40	BOP.2441	Suds pump
41	171-2-X	Base
42	BOP.68-B	Filter
43	357-3-C	Drain cover
44	13-4-B	Well cover
45	13-3-B	Drain cover
46	BOP.2045-B	Gasket
47	216-10-B	Valve body
48	BOP.1721	Steel ball
49	BOP.1774	1/2" BSP pipe
50	165-1-X	Column
51	BOP.15803	Drain hose
52	176-10-B	Suds pipe
53	BOP.1466	Pipe clip
54	BOP.15806	Hose
55	BOP.15808	10' clip
56	176-15-A	Clamp collar
57	216-6-B	Clamp bolt
58	176-13-B	Nozzle clamping block
59	BOP.2623	Handwheel
60	266-4-B	Clamp rod
61	176-10-B	Suds pipe
62	BOP.15812	Suds cock
63	165-12-E	Side cover
64	171-35-B	Front plug
65	165-14-B	Front abutment
66	165-13-B	Front abutment
67	112-44-B	Coolant nozzle
68	13-116-A	Knob
69	165-50-A	Retaining screw
70	13-117-A	Collar
71	201-22-A	Trip clamp (V2 only)

Illus. No.	Part No.	DESCRIPTION
1	BOP.2074	B.S Eye bolt
2	BOP.974-A	Oil sight washer
3	BOP.975-A	Oil sight window
4	150-321-B	Oil sight glass retainer
5	165-11-B	Shaft abutment
6	172-6-B	Glut for backgear
7	172-5-B	Glut operating lever
8	172-4-B	Support bush
9	171-22-B	Rear abutment
10	BOP.16031-B	Gasket
11	13-62-A	Handle plunger
12	172-10-B	Glut operating shaft
13	BOP.65-A	Compression spring
14	13-61-B	Outside change lever
15	BOP.1804-B	Gasket
16	172-3-C	Inspection cover
17	BOP.2758-C	Speed and feed plate
18	13-63-B	Handle for change lever
19	172-11-A	Glut operating shaft
20	172-7-B	Glut
21	172-8-B	Glut
22	172-7-B	Glut
23	172-2-E	Bracket
24	BOP.2612	Oil sight glass
25	172-1-E	Change gear panel
26	162-3-E	Back cover
27	13-7-D	Side cover
28	BOP.1969	Hinge
29	BOP.21013	Motor (V1 only)
29	BOP.21015	Motor (V2 only)
30	171-68-C	Clamp bracket
31	171-302-B	Trip stop (V2 only)
32	171-301-C	Ve e strip (V2 only)
33	171-70-B	Handle boss
34	171-72-B	Handle boss pin
35	171-71-B	Swivel bracket pin





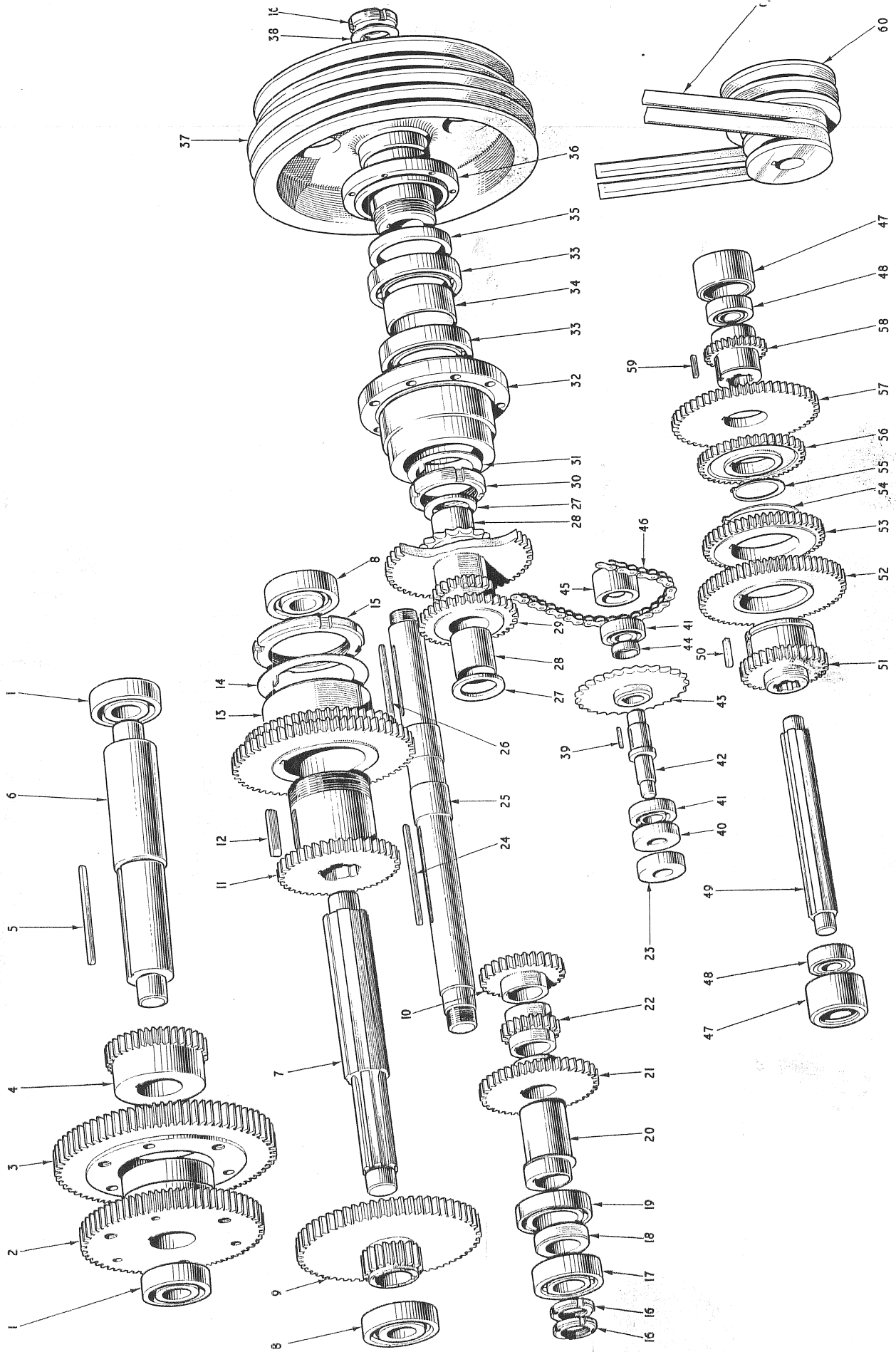
ILLUS. No.	Part No.	Description
1	BOP-1387-A	Drive Dogs
2	KO3-28	Key
3	171-11-D	Main Spindle
4	BOP.11531	Taper Roller Bearing Flanged
5	171-15-B	Bearing Spacer Collar
6	BOP.11632	Taper Roller Bearing
7	171-13-C	43T Gear
8	BOP.1007-B	Tab Washer
9	SN2"	Unified Slotted Nut
10	BOP.223	Ball Bearing
11	171-14-A	Bearing Spacer Washer
12	BOP.155	External Circlip
13	171-12-D	96T Gear
14	BOP.981	Ball Bearing
15	ULN 31/2"	Unified Slotted Locknut
16	BOP.2318	Tab Washer
17	171-30-C	77T Gear
18	KO4-20	Key
19	171-29-C	50T Gear
20	171-31-D	Spline Shaft
21	171-28-D	24T/77T Gear Cluster
22	ULN 11/4"	Unified Slotted Locknut
23	BOP.2149	Self Aligning Ball Bearing
24	171-107-B	Spacing Collar
25	BOP.1838	Ball Bearing
26	171-52-D	Pump Cam
27	171-47-C	51T Gear
28	171-46-B	24T Gear
29	171-45 B	36t Gear
30	KO3-36	Key
31	171-53-D	Main Drive Shaft
32	171-44-A	Gear Spacing Washer
33	171-43-A	Gear Cluster Bearing Bush
34	171-42-D	Gear Cluster
35	USN 2.5"	Unified Slotted Nut
36	BOP.2023-B	Tab Washer
37	171-33-C	Bearing Housing
38	BOP.1729	Ball Bearing
39	171-34-B	Spacing Bush
40	BOP.2258	Oil Seal
41	171-39-C	Oil Seal Housing
42	171-32-D	Drive Pulley
43	BOP.2322-A	Tab Washer
44	KO1-36	Key
45	BOP.1018	Oil Seal
46	171-59-B	Oil Seal Housing
47	BOP.441	Ball Bearing
48	171-58-B	30T Sprocket Shaft
49	171-57-C	30T Sprocket
50	171-60-A	Spacing Washer
51	171-56-B	Rear Abutment
52	BOP.1731	1/2" Pitch Single Roller Chain
53	172-24-B	Bearing Housing
54	BOP.205	Angular Contact Bearing
55	172-16-C	Spline Shaft
56	K.2002-A	Key
57	172-17-C	37T Gear
58	172-18-C	64T Gear
59	172-19-C	52T Gear
60	BOP.1733	Ext. Circlip
61	BOP.1734	Ext. Circlip
62	172-22-C	45T Gear
63	172-21-C	63T Gear
64	172-20-B	25T Gear
65	BOP.14009	V-Belt (U1/P1 only)
	BOP.14016	V-Belt (U2/P2 only)
66	171-65-C	Motor Pulley
67	K.2001-A	Key



SPINDLE DRIVE — VERTICAL MACHINES

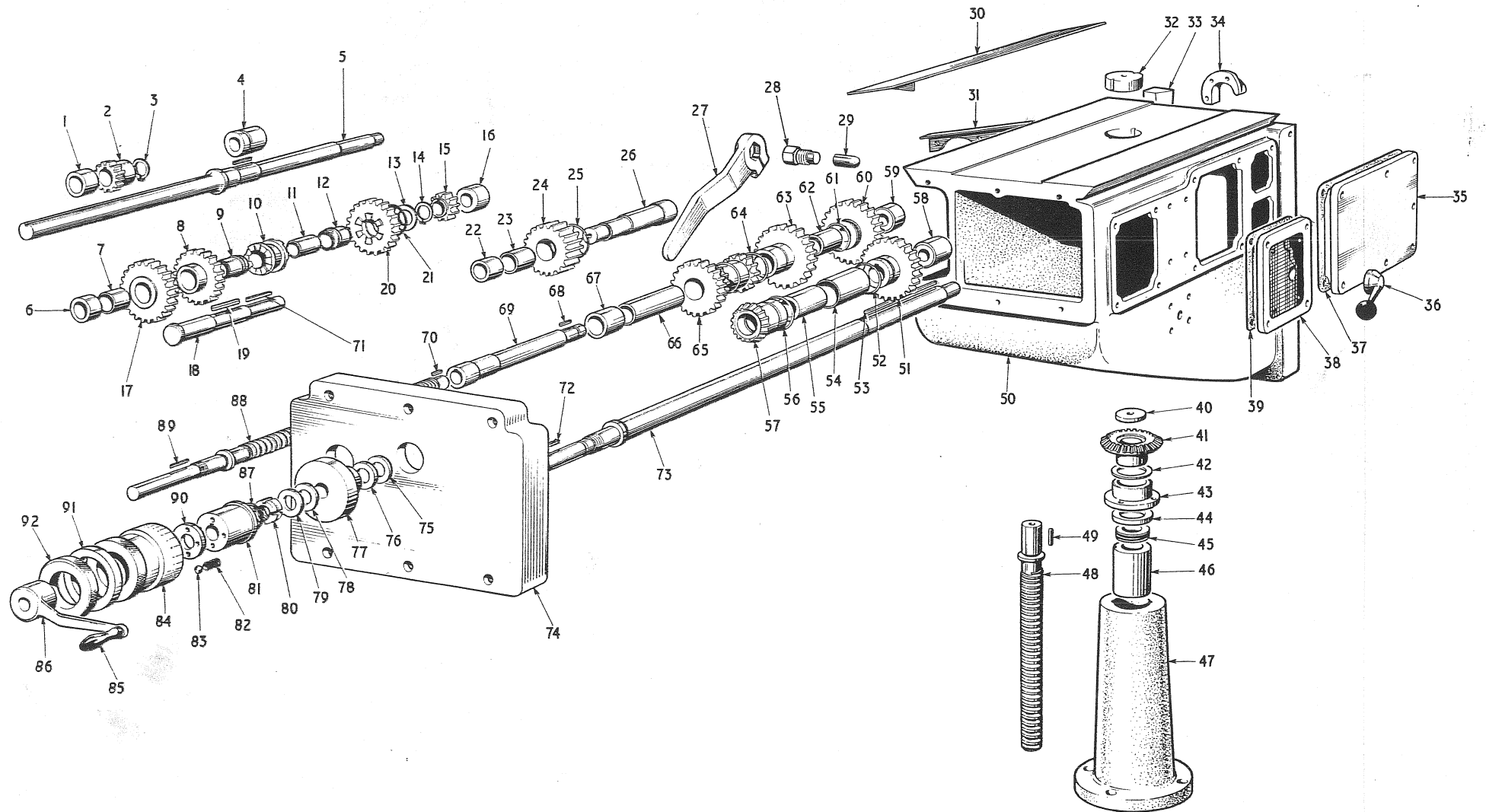
Illus. No.	Part No.	DESCRIPTION
32	171-37-C	Bearing housing
33	BOP.1729	Ball bearing XIJ 2 $\frac{1}{2}$ "
34	171-34-B	Spacing bush
35	BOP.2258	Oil seal
36	171-39-C	Oil seal housing
37	171-32-D	Drive pulley
38	BOP.2322-A	Tab washer
39	K01-36	Key
40	171-59-B	Oil seal housing
41	BOP.441	Ball bearing XIJ $\frac{3}{4}$ "
42	171-58-B	30T sprocket shaft
43	171-57-C	30T sprocket
44	171-60-A	Spacing washer
45	171-56-B	Rear abutment
46	BOP.2022	$\frac{1}{2}$ " pitch chain 80 pitches
47	172-24-B	Bearing housing
48	BOP.205	Ball journal bearings
49	172-16-C	Spline shaft
50	K.2002-A	Key
51	172-17-C	37T gear
52	172-18-C	64T gear
53	172-19-C	52T gear
54	BOP.1733	Circlip
55	BOP.1734	Circlip
56	172-22-C	45T gear
57	172-21-C	63T gear
58	172-20-B	25T gear
59	K.2001-A	Key
60	171-65-C	Motor pulley
61	BOP.14003	V belt (V1 only)
61	BOP.14001	V belt (V2 only)

Illus. No.	Part No.	DESCRIPTION
1	BOP.2654	Ball journal bearing MJ 1 $\frac{1}{2}$ "
2	165-67-D	57T Helical gear
3	165-68-D	96T Spur gear
4	171-13-C	43T Gear
5	K03-28	Key
6	165-21-C	Shaft
7	171-31-C	Spine shaft
8	BOP.981	Ball bearing MJ 1 $\frac{1}{4}$ "
9	171-28-D	24T and 77T gear cluster
10	171-45-B	36T Gear
11	171-29-C	50T Gear
12	K09-20	Key
13	171-30-C	77T Gear
14	BOP.2318	Tab washer
15	ULN.3 $\frac{1}{2}$ "	Unified slotted locknut
16	ULN.1 $\frac{1}{2}$ "	Unified slotted locknut
17	BOP.2149	Self aligning double row ball journal NJJ 1 $\frac{1}{4}$ "
18	171-107-B	Spacing collar
19	BOP.1838	Ball bearing x 1J2"
20	171-52-D	Pump cam
21	171-47-C	51T gear
22	171-46-B	24T gear
23	BOP.1018	Oil seal
24	K03-36	Key
25	171-53-D	Main drive shaft
26	K03-28	Key
27	171-44-A	Gear spacing washer
28	171-43-A	Bearing bush
29	171-42-D	Gear cluster
30	USN.2 $\frac{1}{2}$ "	Unified slotted nut
31	BOP.2023-B	Tab washer



Illus. No.	Part No.	DESCRIPTION
1	243-24-B	Bearing bush (front)
2	243-22-B	16T spur gear
3	BOP.768	External circlip $\frac{7}{8}$ " dia.
4	243-23-B	Bearing bush (rear)
5	243-81-C	Feed drive shaft
6	243-54-B	Bearing bush (front)
7	B 1" x 1"	Bearing bush 1" bore x 1" long
8	243-48-C	34T gear and clutch
9	243-51-A	Bearing bush
10	243-49-B	Dog clutch
11	243-50-B	Splined sleeve
12	243-52-A	Bearing bush
13	BOP.1003	Spring ring
14	BOP.768	External circlip
15	243-53-B	17T spur gear
16	243-34-B	Bearing bush
17	243-47-B	22T and 37T gear cluster
18	243-46-C	Intermediate shaft
19	K00-10	Key
20	243-48-C	34T gear and clutch
21	BOP.1003	Spring ring
22	243-60-A	Locating bush
23	B $\frac{3}{4}$ " x 1 $\frac{1}{2}$ "	Bearing bush $\frac{3}{4}$ " bore x 1 $\frac{1}{2}$ " long
24	243-59-B	29T spur gear
25	BOP.1003	Spring ring
26	243-58-B	Idler shaft
27	BOP.2824-C	Bent locking spanner
28	243-70-A	Locking screw
29	173-8-A	Knee locking pad
30	BOP.2376-B	Drive shaft cover
31	243-9-B	Suds shield
32	243-75-B	Plug
33	243-4-C	Knee gib
34	243-10-B	Suds shield
35	243-78-D	Right hand side cover
36	BOP.2633	Control knob
37	BOP.2790-C	Gasket (oil reservoir cover)
38	217-1-C	Control panel
39	BOP.16022-B	Gasket
40	243-63-A	Retaining washer
41	243-62-C	Elevating bevel gear
42	243-64-A	Fitting washer
43	243-6-B	Bearing
44	243-65-A	Bearing washer
45	BOP.181	Thrust bearing
46	243-66-B	Knee elevating nut

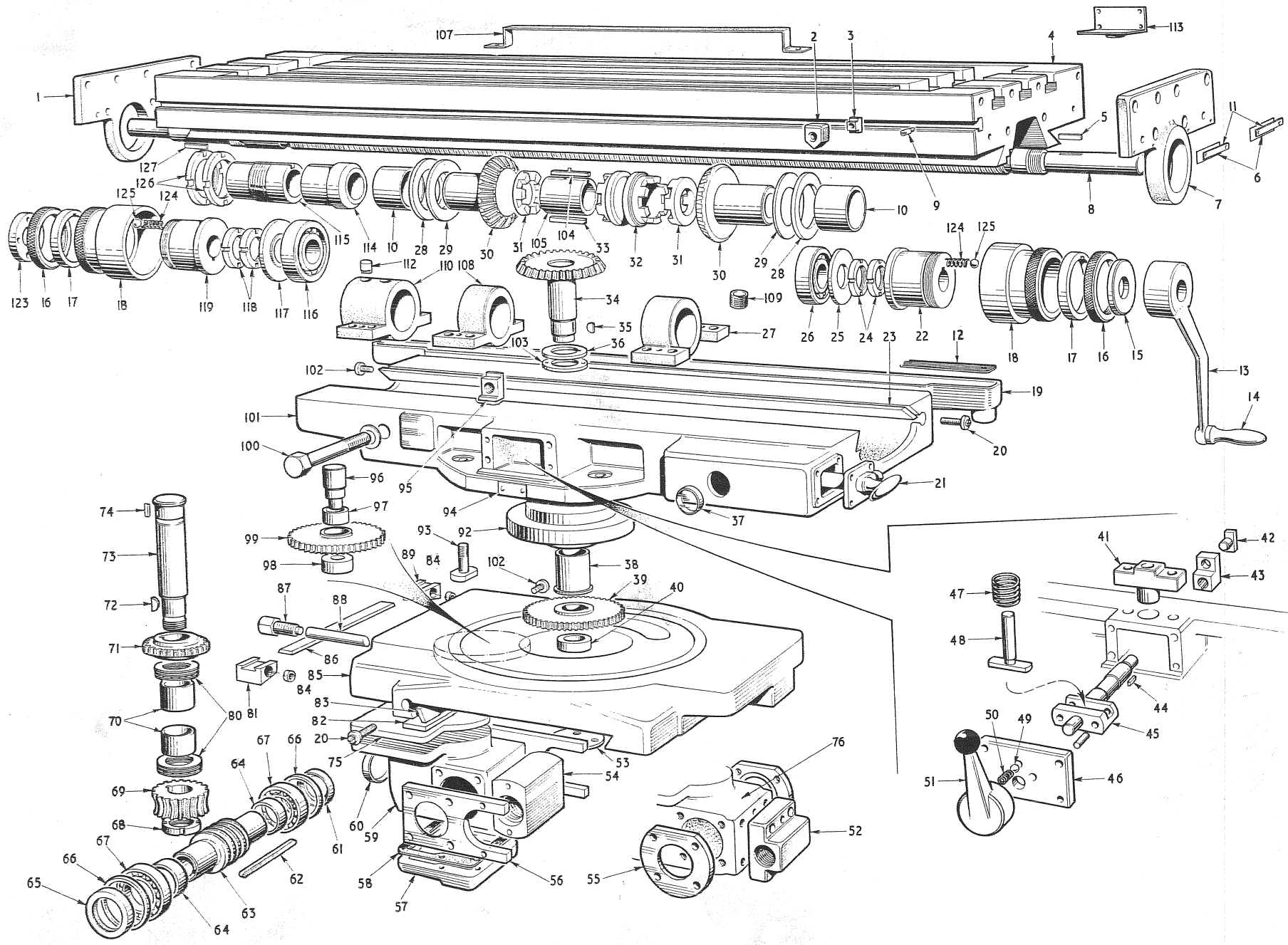
Illus. No.	Part No.	DESCRIPTION
47	243-3-D	Nut support
48	243-61-C	Knee elevating screw
49	K02-08	Key
50	243-1-X	Knee
51	243-39-B	37T spur gear
52	BOP.1003	Spring ring
53	K01-36	Key
54	B1 $\frac{1}{4}$ " X 1 $\frac{7}{8}$ "	Bearing bush 1 $\frac{1}{4}$ " bore x 1 $\frac{7}{8}$ " long
55	243-41-A	Bearing sleeve
56	BOP.1003	Spring ring
57	243-40-C	Elevating pinion
58	243-42-B	Bearing bush (rear)
59	243-34-B	Bearing bush
60	243-32-B	37T Driver gear
61	BOP.1003	Spring ring
62	B $\frac{1}{8}$ " x 1 $\frac{7}{8}$ "	Bearing bush $\frac{1}{8}$ " bore x 1 $\frac{7}{8}$ " long
63	243-31-B	37T Idler gear
64	BOP.1003	Spring ring
65	243-30-C	Gear cluster
66	B $\frac{1}{8}$ " x 3"	Bearing bush $\frac{1}{8}$ " bore x 3" long
67	243-33-B	Bearing bush
68	K00-07	Key
69	243-28-C	Cross traverse shaft
70	K00-48	Key
71	k00-10	Key
72	K00-08	Key
73	243-83-C	Vertical drive shaft
74	243-80-E	Front cover
75	KW $\frac{7}{8}$ "	Keyed thrust washer
76	TW $\frac{1}{8}$ "Y	Thrust washer
77	243-7-B	Bearing bush
78	TW $\frac{1}{8}$ "Z	Thrust washer
79	KW $\frac{1}{8}$ "	Keyed thrust washer
80	USN $\frac{1}{8}$ "	Unified slotted nut
81	153-428-C	Bush
82	BOP-100-A	Compression spring
83	BOP.2305	Steel ball
84	173-28-B	Graduated collar
85	265-23-B	Handle
86	174-9-C	Handle stem
87	BOP.1002	Spring ring
88	243-82-C	Cross traverse screw
89	K00-08	Key
90	153-427-B	End plate
91	173-29-B	Plain collar
92	213-32-A	Locking nut



SADDLE AND TABLE—UNIVERSAL MACHINES

Illus. No.	Part No.	DESCRIPTION
1	174-88-D	Left hand table bracket
2	174-90-B	Trip dog
3	174-91-A	Tee nut
4	174-72-E	Table (U1 only)
4	244-11-E	Table (U2 only)
5	K.13-10	Key
6	BOP.2922-A	Table wiper
7	174-87-D	Right hand table bracket
8	174-76-D	Table lead screw (U1 only)
8	174-76-D	Table lead screw (U2 only)
9	32-14-A	Stop pin for trips
10	174-38-B	Bush bearing
11	BOP.2925-B	Plate for table wiper
12	BOP.2099-B	Filter and cover
13	174-9-C	Handle stem
14	265-23-B	Handle
15	153-427-B	End plate-right hand
16	213-32-A	Locking nut (2 off)
17	175-29-B	Plain collar
18	174-77-B	Graduated collar
19	174-86-D	Suds trough
20	355-40-B	Gib adjusting screw
21	BOP.1719	Lubrication pump
22	153-428-C	Bush for knee dial
23	174-75-C	Table gib
24	ULN. $\frac{1}{8}$ "	Unified slotted locknut (2 off)
25	174-78-A	Right hand bearing cover
26	BOP.530	Angular contact bearing(MJT $\frac{7}{8}$ "
27	174-33-C	Right hand bevel gear bracket
28	174-36-A	Thrust washer
29	174-37-A	Thrust washer
30	174-35-C	23T bevel gear
31	174-59-B	Dog plate
32	174-52-B	Clutch
33	K01-16	Key
34	174-85-C	28T bevel gear
35	No. 61	Woodruff key
36	KW1"	Keyed washer
37	BOP.15708	Oil window unit
38	174-84-B	Bush bearing
39	244-3-B	49T gear
40	175-22-B	Bush bearing
41	174-48-B	Plunger guide
42	174-51-A	Clutch shifter
43	174-50-B	Clutch shifter arm
44	K12-04	Key
45	174-53-C	Clutch operating shaft
46	174-55-B	Plunger box cover
47	BOP.1847-A	Compression spring
48	174-55-B	Plunger
49	BOP.59	Steel ball
50	BOP.1158-A	Compression spring
51	214-52-B	Clutch operating handle
52	175-29-B	Traverse nut (U1 only)
53	214-54-A	Cover
54	245-7-B	Traverse nut (U2 only)
55	175-30-B	Bearing abutment (U1 only)
56	245-6-B	Bearing abutment (U2 only)
57	175-28-C	Cover plate
58	BOP.1781-B	Gasket

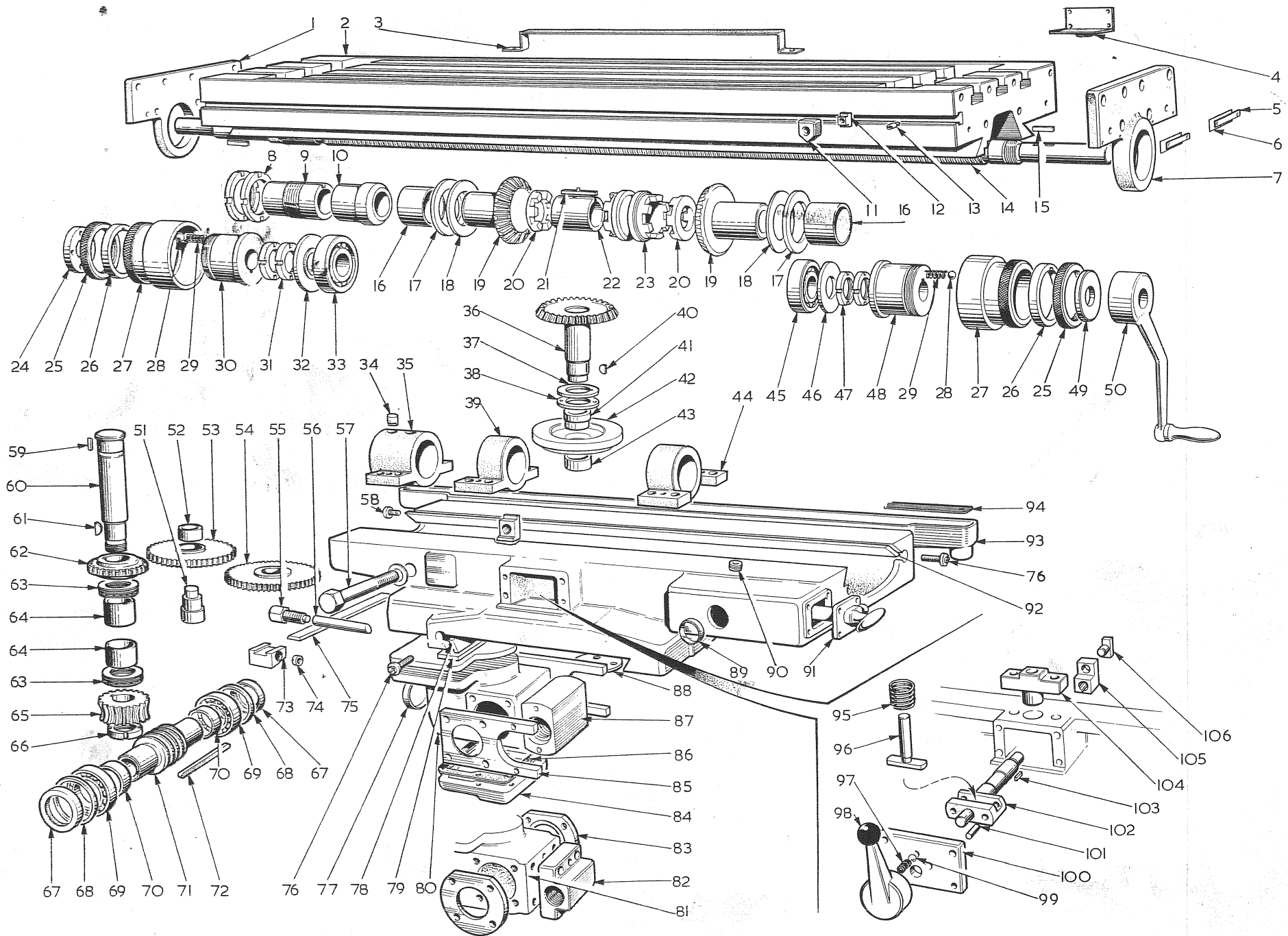
Illus. No.	Part No.	DESCRIPTION
59	245-2-E	Worm box (U2 only)
60	BOP.2612	Oil sight glass
61	BOP.1736	Internal oil seal
62	K01-20	Key
63	175-9-B	Worm
64	175-12-A	Spacing washer (2 off)
65	BOP.1736	Internal oil seal
66	245-25-B	Spigot
67	BOP.1735	Light narrow ball bearings KLNJ 1
68	SN. $\frac{3}{4}$ "	Slotted nut
69	175-8-B	Worm wheel
70	B1" x 1"	Bush bearing, 1" bore x 1" long
71	245-11-B	26T gear
72	No. 61	Woodruff key
73	175-10-B	Wormwheel shaft
74	K01-08	Key
75	245-3-B	Fitting plate
76	175-31-E	Worm box (U1 only)
80	BOP.879	Flat track thrust bearing (2 off)
81	245-17-B	Right hand trip stop (U2 only)
82	175-25-B	Gib retaining strip
83	175-24-B	Saddle gib
84	201-22-A	Locking pad (U2 only)
85	245-1-X	Saddle
86	245-27-B	Vee strip (U2 only)
87	175-27-A	Locking screw
88	245-23-A	Clamp pin
89	245-16-B	Left hand trip stop (U2 only)
92	174-83-C	Spigot
93	174-62-A	Tee bolt
94	BOP.17808-B	Zero plate
95	174-6-B	Table clamp
96	245-13-B	Idler spigot
97	B $\frac{3}{4}$ " x $\frac{5}{8}$ "	Bush bearing $\frac{3}{4}$ " bore x $\frac{5}{8}$ " long
98	175-17-A	Idler shaft bush
99	175-18-B	50T idler gear
100	174-82-A	Table clamp bolt
101	174-71-X	Swivel table
102	355-9-B	Gib screw
103	TWY	Tab washer
104	174-65-A	Clutch peg key
105	174-58-B	Clutch bush
107	BOP.2518-B	Coolant strainer (table)
108	174-34-C	Left hand bevel gear bracket
109	BOP.1942	1" conduit nipple
110	174-27-C	Traverse nut bracket
112	174-30-A	Traverse nut location plug
113	BOP.2894-B	Suds outlet cover
114	174-81-B	Traverse nut (shouldered half)
115	174-80-B	Traverse nut (threaded half)
116	BOP.948	Angular contact bearing LJT $1\frac{1}{8}$ "
117	174-79-A	Left hand bearint cover
118	ULN. $1\frac{1}{8}$ "	Unified slotted locknut
119	265-30-C	Bush for table dial
120	174-23-B	Driving ring
123	265-31-B	End plate
124	BOP.100-A	Compression spring
125	BOP.2305	Steel ball
126	ULN. $1\frac{1}{8}$ "	Unified slotted locknut
127	K14-01	Key



SADDLE & TABLE—PLAIN AND VERTICAL MACHINES

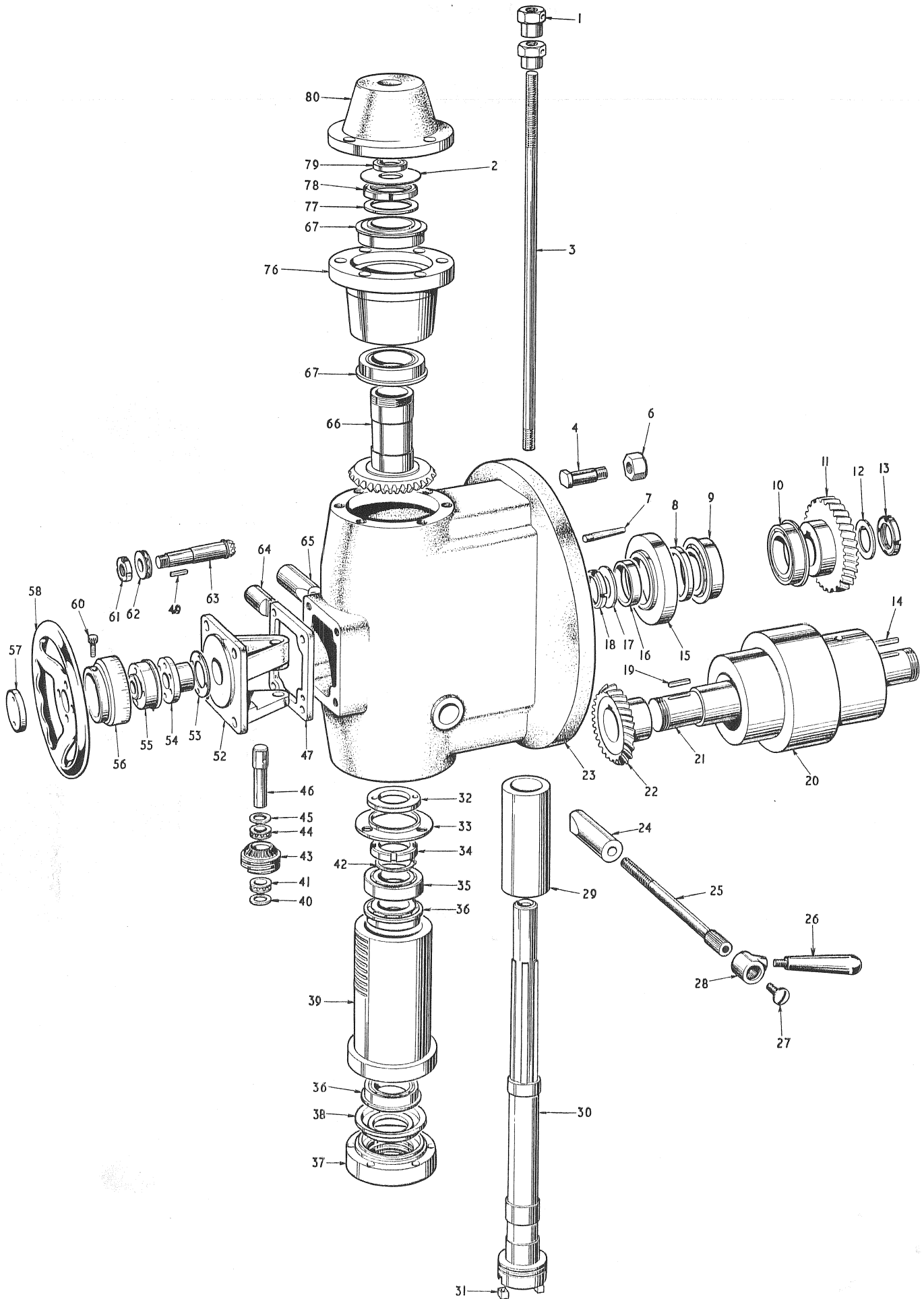
Illus. No.	Part No.	DESCRIPTION
54	244-5-B	49T gear
55	355-38-B	Saddle locking screw
56	245-25-A	Clamp pin
57	174-82-A	Table locking screw
	174-6-B	Table clamp
58	337-55-B	Gib screw
59	K01-08	Key
60	175-10-B	Shaft
61	No. 61	Woodruff key
62	245-11-B	26T gear
63	BOP.879	Thrust race
64	1 1/2" x 1"	Brush bearing
65	166-8-B	Worm wheel (V1 & V2)
66	175-9-B	Worm wheel (P1 & P2)
67	USN 3/4"	Slotted nut
68	BOP.1756	Oil seal
69	245-25-B	Spigot
70	BOP.1755	Bearing
71	175-12-A	Spacing washer
	166-7-B	Worm (V1/V2)
72	175-8-B	Worm (P1/P2)
73	K01-20	Key
74	245-17-B	R.H trip stop (V2/P2)
75	245-16-B	L.H trip stop (V2/P2)
76	526-32-B	Locking pad
77	245-27-B	Vee strip (V2/P2)
78	537-54-B	Gib adjusting screw
79	BOP.15709	Oil sight window
80	175-24-B	Saddle gib
81	214-55-B	Gib retaining strip
82	245-2-E	Worm box
83	175-29-B	Traverse nut (V1/P1 only)
84	175-50-B	Bearing abutment (V1/P1)
85	175-28-C	Cover plate
86	245-6-B	Bearing abutment (V2/P2 only)
87	BOP.1781-B	Gasket
88	245-7-B	Traverse nut (V2/P2)
89	214-54-A	Cover
90	BOP.15709	Oil sight glass
91	1/4" BSP	Plug
92	BOP.1719	Lubrication pump
93	174-75-D	Table gib
94	246-12-J	Suds trough
95	BOP.2099-B	Suds strainer
96	BOP.1847-A	Compression spring
97	174-54-B	Plunger
98	BOP.1158-A	Compression spring
99	214-52-B	Clutch operating handle
100	BOP.59	Steel ball
101	174-55-B	Plunger box cover
102	1 1/4" x 1 1/4"	Dowel pin
103	174-53-C	Clutch operating shaft
104	K12-04	Key
105	174-48-B	Plunger guide
106	174-50-C	Clutch shifter arm
	174-51-A	Clutch shifter

Illus. No.	Part No.	DESCRIPTION
1	174-87-D	L.H table bracket
2	244-11-E	Table (V2 & P2)
3	174-72-E	Table (V1 & P1)
4	BOP.2518-B	Table coolant strainer
5	BOP.2894-B	Suds outlet cover
6	BOP.2925	Plate for table wiper
7	BOP.19979	Table wiper
8	174-88-D	R.H Table bracket
9	ULN. 1 1/2"	Unified locknut (2 off)
10	174-80-B	Traverse nut (threaded)
11	174-90-B	Traverse nut (shoulder)
12	174-91-A	Tee nut
13	32-144-A	Stop pin
14	174-76-D	Table lead screw (V1 & P1)
	244-12-D	Table lead screw (V2 & P2)
15	K13-10	L.H lead screw key
	K14-10	R.H lead screw key
16	174-58-B	Brush bearing
17	174-56-A	Thrust washer
18	174-57-A	Keyed washer
19	174-55-C	23T bevel gear
20	174-59-B	Dog plate
21	174-65-B	Clutch peg key
22	174-58-B	Clutch bush
23	174-52-B	Clutch
24	265-51-B	End plate
25	213-52-A	Locking nut
26	173-29-A	Plain collar
27	174-77-B	Graduated collar
28	BOP.2305	Steel ball
29	BOP.100-A	Compression spring
30	265-50-C	Dial bush
31	ULN. 1 1/2"	Unified locknut (2 off)
32	174-79-A	L.H bearing cover
33	BOP.448	1 1/2" Angular contact bearing
34	505-50	Location plug
35	174-27-C	Traverse nut bracket
36	166-5-C	28T bevel gear
37	KW 1 1/2"	Keyed washer
38	TW 1 1/2"	Thrust washer
39	174-54-C	L.H Bevel gear bracket
40	No. 61	Woodruff key
41	166-6-B	Bearing bush for bevel gear
42	166-2-C	Housing for bevel gear
43	175-22-B	Bevel gear bush
44	174-53-C	R.H bevel gear bracket
45	BOP.550	1 1/2" medium angular contact bearing
46	174-78-A	R.H bearing cover
47	ULN 1 1/2"	Unified locknut
48	153-428-B	Dial bush
49	213-51-B	End plate
50	174-9-B	Handle stem
	265-25-A	Handle
51	246-2-B	Idler spigot
52	2 1/2" x 3/8"	Bearing bush
53	175-18-B	50T idler gear



VERTICAL MACHINES ONLY

Illus. No.	Part No.	DESCRIPTION
1	211-74-A	Draw bar nut
2	BOP.2156-A	Oil seal cover plate
3	165-47-B	Draw bar
4	165-71-B	Tee bolt
6	211-79-A	Clamp nut
7	165-46-A	Locating pin
8	BOP.2516	Oil seal
9	BOP.11539	Taper roller bearing
10	BOP.147	Taper roller bearing
11	165-19-C	39T Helical gear
12	BOP.2135-A	Tab washer
13	ULN.1 $\frac{5}{8}$ "	Unified slotted locknut
14	K04-12	Key
15	165-70-C	Oilseal housing
16	165-33-A	Spacing washer
17	BOP.1944-A	Tab washer
18	ULN 1 $\frac{1}{2}$ "	Unified slotted locknut
19	K03-16	Key
20	165-7-D	Bearing housing
21	165-18-D	Shaft
22	165-17-C	30T Spiral gear
23	165-2-X	Vertical head
24	165-28-B	Quill clamp
25	165-34-B	Quill clamp bolt
26	32-130-B	Handle
27	165-36-A	Retaining screw
28	165-35-B	Boss for quill clamp
29	165-31-B	Spacing bush
30	165-15-D	Main spindle
31	BOP.1387-A	Driving dog
32	165-32-B	Oil flinger
33	BOP.2025-B	Quill cover
34	USN 1 $\frac{7}{8}$ "	Unified slotted nut
35	BOP.1509	Roller bearing
36	BOP.1968	Taper roller bearing
37	165-10-C	Main spindle cover
38	165-52-C	Flinger
39	165-4-D	Main spindle quill
40	165-65-A	Fitting washer
41	BOP.2198	Flat track thrust bearing
42	BOP.1238-A	Circlip
43	165-53-C	Worm & 25T bevel gear
44	BOP.2198	Flat track thrust bearing
45	165-65-A	Fitting washers
46	165-56-B	Spigot for worm
47	165-64-C	Adjusting plate
49	K00-10	Key
52	202-32-D	Front cover
53	165-66-A	Fitting washer
54	362-13-B	Pinion bush
55	362-42-B	Dial body
56	362-43-B	Graduated collar
57	362-44-B	Cover plate
58	362-12-D	Handwheel
60	362-45-B	Locking screw
61	USN. $\frac{3}{4}$ "	Unified nut slotted
62	BOP.1125	Flat track thrust bearing
63	362-46-C	12T Bevel pinion
64	165-30-A	Quill stop
65	165-27-B	Quill clamp
66	165-16-D	42T Spiral bevel gear
67	BOP.1495	Taper roller bearing
70	165-66-A	Fitting washer
76	165-5-D	Bearing housing
77	BOP.2023-B	Tab washer
78	ULN.2 $\frac{1}{4}$ "	Unified slotted locknut
79	BOP.763	Oil seal
80	165-6-D	Top cover



FEED CONTROL BOX - ALL MODELS

Illus. No.	Part No.	DESCRIPTION	Illus. No.	Part No.	DESCRIPTION
1	242-3-C	Lever gate	26	242-16-A	Shift lever
2	242-2-0	Lever cover	27	BOP.2320-A	Tension spring
3	B $\frac{3}{8}$ " x 1 $\frac{1}{8}$ "	Bush bearing	28	158-29-A	Spring anchor pin
4	242-4-C	Index arm	29	158-25-B	Cam roller arm
5	242-12-A	Index plate	30	158-28-A	Cam roller
6	242-22-A	Plunger roller	31	158-27-A	Roller pin
7	242-21-A	Plunger bearing	32	242-15-B	Indexing cam
8	BOP.1432	10' ring	33	BOP.2371-C	Control box gasket
9	BOP.13030-A	Compression spring	34	BOP.2612	Oil sight glass
10	242-20-B	Cross traverse plunger	35	242-32-B	Oil sight adaptor
11	242-29-A	Plunger bearing (vertical)	36	242-19-B	Plunger push rod
12	242-18-B	Vertical traverse plunger	37	BOP.2394-B	Gasket
13	242-28-A	Peg screw	38	BOP.2402-B	Inspection cover
14	242-1-E	Control box	39	242-25-A	18T gear
15	BOP.341	External circlip	40	K00-05	Key
16	242-11-B	Operating shaft	41	242-30-A	Idler shaft bearing
17	242-5-B	Shift lever	42	BOP.1343	External circlip
18	K00-05	Key	43	P 5/16" x 1 $\frac{1}{8}$ "	Dowel (2 off)
20	BOP.490	Steel ball	44	242-13-B	Operating shaft
21	242-26-A	Idler shaft	45	242-23-B	Plunger shoe
22	BOP.649	Compression spring	46	242-14-B	Operating boss
23	242-6-A	Gear shifter	47	242-17-B	Operating lever
24	242-7-A	Gear shifter	48	BOP.2608-A	Bakelite knob
25	158-26-A	Swivel pin	49	242-31-B	Operating lever

