

Instructions

for operating and maintaining the

JONES-SHIPMAN

Model 310 Cutter & Tool Grinder



INSTALLATION AND OPERATING INSTRUCTIONS

Jones - Shipman

MODEL 310 CUTTER AND TOOL GRINDING MACHINE

This manual is issued to give the operator a general outline of the methods and functions of the machine also to ensure that the maximum service and most efficient results be obtained. We therefore recommend that the book be thoroughly read and understood before attempting any grinding operations.

The machine has been designed specifically for cutter grinding and we have given all the necessary operating instructions, but the various methods of setting up the machine for grinding a range of cutters which will normally be dealt with in every day use are covered in our booklet, P.G. 5 on Precision Grinding Techniques. Particular attention should be given to lubrication and the directions given should be fully adhered to.

To avoid any possible future misunderstandings, reference to this machine should always bear the following identification numbers which correspond with those stamped on the nameplate on the front of the machine.

Machine Erection No.

Machine Allocation No. B.O.

Model Type

Capacity

Date Machine Supplied

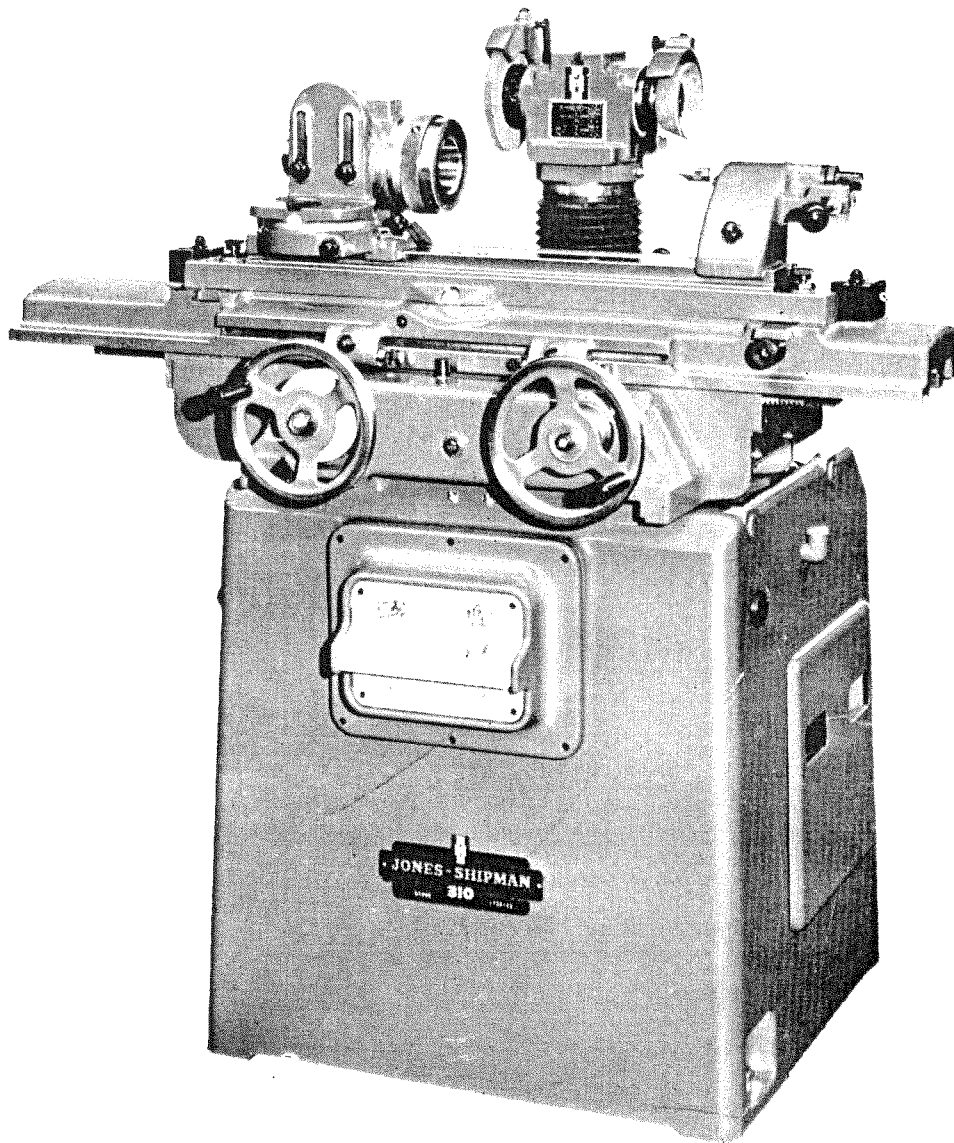
Jones & Shipman International



MODEL 310

CUTTER AND TOOL GRINDING MACHINE

8" × 16" CAPACITY
(203 × 406 mm)



Our endeavour is to supply machines that embody the latest developments in grinding machine design and therefore whilst the details given in this booklet were correct at the time of printing, modifications and improvements may have been made subsequently.

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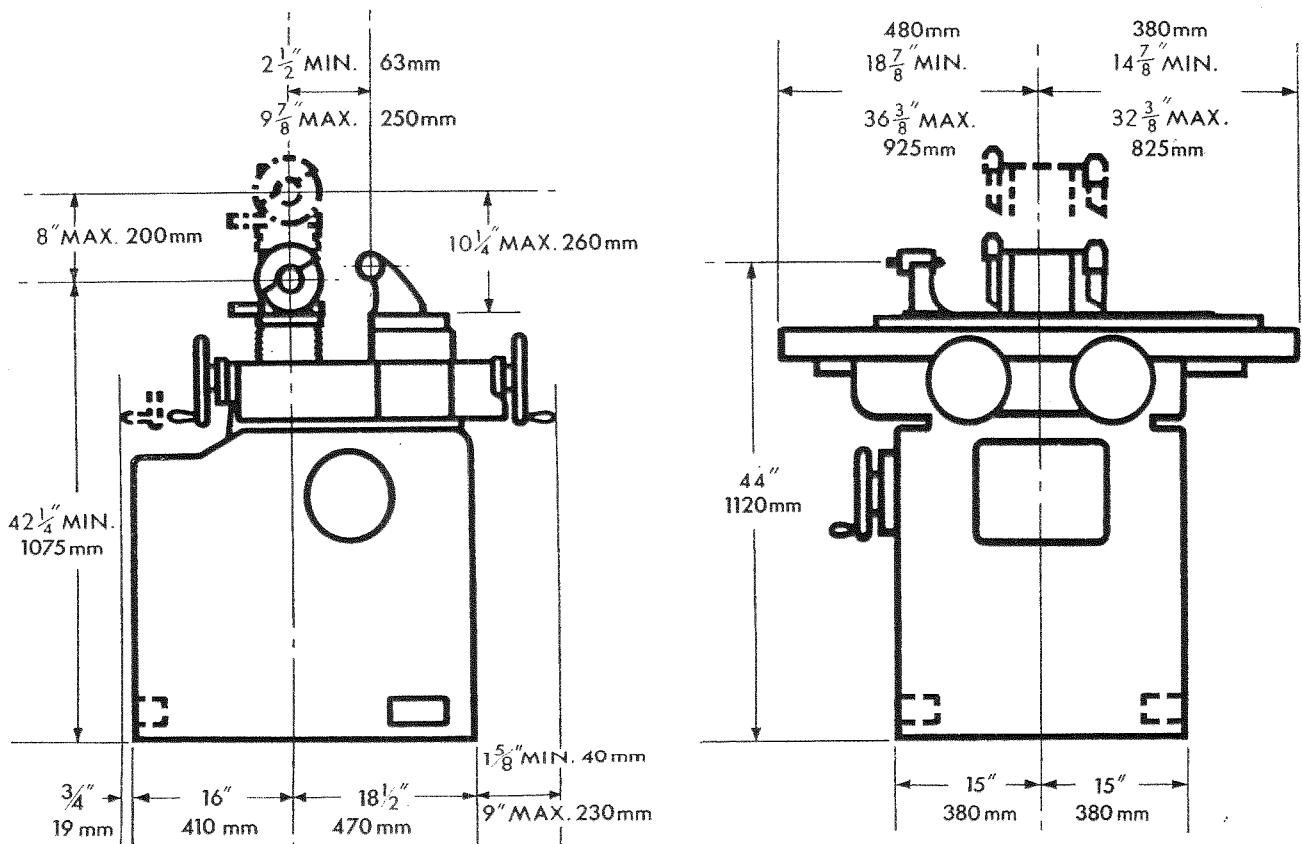
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Further information on general grinding practice which may be of help to users is given in our booklet No. P.G.5 titled "*Precision Grinding Techniques*" available on request.

SPECIFICATION

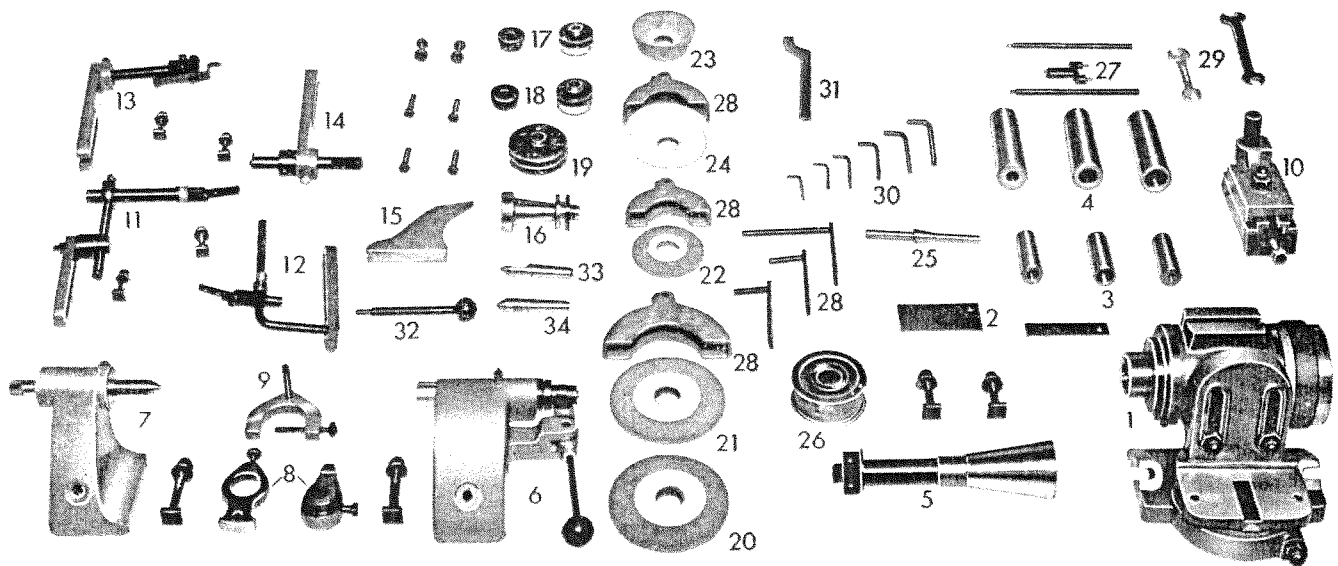
CAPACITY	Length between cutterhead and right hand tailstock	14"	356 mm
	Length between tailstock centres	19"	483 mm
	Maximum swing diameter on standard centres (Larger swing to order)	8"	203 mm
	Maximum swing diameter on cutterhead	12"	305 mm
TABLE	Longitudinal traverse	17 $\frac{1}{2}$ "	455 mm
	Cross traverse	7 $\frac{3}{8}$ "	187 mm
	Working surface	29 $\frac{1}{2}$ " \times 4 $\frac{1}{4}$ "	749 \times 108 mm
	Swivel either side of zero with end locking	8°	8°
	Swivel left hand side of column with centre locking	90°	90°
	Swivel right hand side of column with centre locking	45°	45°
WHEELHEAD	Vertical adjustment	8"	203 mm
	Centre of wheel above table (max).	10 $\frac{1}{4}$ "	260 mm
	Centre of wheel above table (min.)	2 $\frac{1}{4}$ "	57 mm
	Circular adjustment	338°	338°
	Wheel speeds (two) r.p.m.	3,600-5,000	3,600-5,000
	H.P. of motor	1	1 cv
MACHINE DIMENSIONS	Height from floor to standard tailstock centres ..	44"	1,118 mm
	Size of base	30" \times 34 $\frac{1}{2}$ "	762 \times 876 mm
	Overall working area of machine	68 $\frac{3}{4}$ " \times 44 $\frac{3}{4}$ "	1,746 \times 1,140 mm
SHIPPING DETAILS	Net weight, approximately	2460 lb.	1,116 kg.
	Gross weight approximately,	3250 lb.	1,474 kg.
	Shipping dimensions, approximately	95 cu. ft.	2,7 m ₃

CAPACITY CHART



3" x 16" SURFACE GRINDING CAPACITY

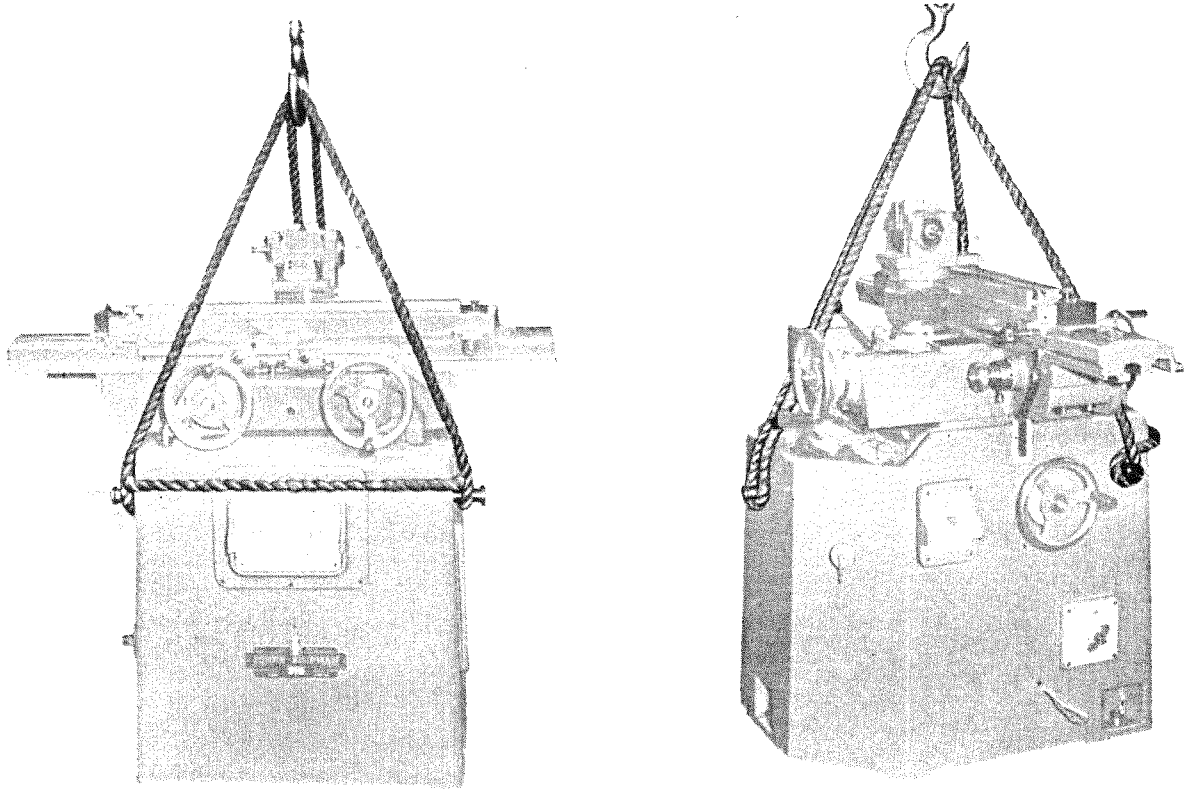
STANDARD EQUIPMENT



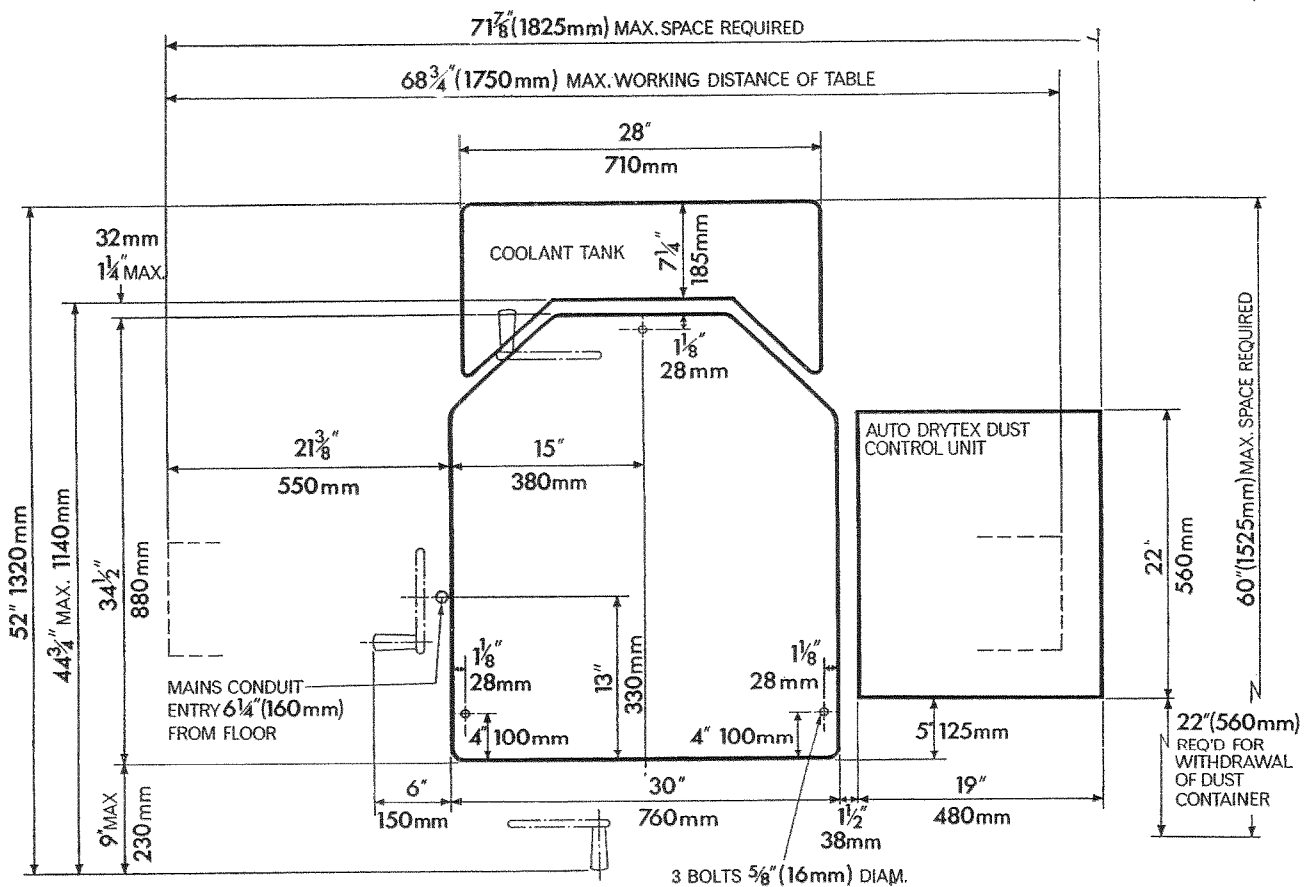
1. Universal Cutter Head, UJ8215/17, adjustable for 8", 10" and 12" (203, 254 and 305 mm) swing diameter
2. Setting strips for Universal Cutter Head to give 10" (254 mm) and 12" (305 mm) swing
3. Reducing sockets, 8815 304, 204 and 104, Nos. 4 to 3, 4 to 2, 4 to 1 Morse Tapers
4. Reducing sockets, 8817 012, 912 and 712, Nos. 12 to 10, 12 to 9, 12 to 7 Brown and Sharpe Tapers
5. Reducing arbor No. 50 International Taper to No. 4 Morse Taper with drawbar, nut, and washer 31762 102
6. Right hand centre tailstock, No. 2 M.T. bore UK8205
7. Left hand centre tailstock, 8" (203 mm) dia. swing UK8204
8. Clearance angle setting for left hand tailstock
9. Carrier for clearance angle setting gauge
10. Diamond holder (exclusive of diamond) UW1305
11. Universal tooth test, with extensions and micro adjustments to blade UX8214
12. Universal tooth rest and extension with one blade UX8215
13. Plain tooth rest and extensions (heavy type) UX8216
14. Centre height gauge and holder for wheelhead UX8217
15. Centre height gauge for table UX8054
16. Wheel spindle extension flange UC8206
17. Right hand 4" (102 mm) wheel flange UC8109
18. Left hand 4" (102 mm) wheel flange UC8205
19. Left hand 6" (152 mm) wheel flange UC8207
20. 6" \times $\frac{1}{2}$ " \times $1\frac{1}{4}$ " (152 \times 13 \times 32 mm) bore disc wheel, coarse grade
21. 6" \times $\frac{1}{2}$ " \times $1\frac{1}{4}$ " (152 \times 13 \times 32 mm) bore disc wheel, medium grade
22. 4" \times $\frac{3}{8}$ " \times $1\frac{1}{4}$ " (102 \times 10 \times 32 mm) bore disc wheel
23. 4" \times $1\frac{1}{2}$ " \times $1\frac{1}{4}$ " (102 \times 38 \times 32 mm) bore taper cup wheel
24. 4 $\frac{1}{2}$ " \times $\frac{1}{2}$ " \times $1\frac{1}{4}$ " (114 \times 13 \times 32 mm) bore saucer wheel
25. Wheel balancing mandrel
26. Extra pulley for wheelhead motor to give alternative speed
27. Wheelhead flange key and two tommy bars
28. Three wheel guards and three clamping brackets
29. Two spanners, $\frac{3}{8}$ " (10 mm) B.S.W. \times $\frac{7}{16}$ " (11 mm) B.S.W. and $\frac{5}{16}$ " \times $\frac{3}{8}$ " (8 \times 10 mm) B.S.F. D/E
30. Six wrenches for socket head screws $\frac{3}{32}$ " (2,3 mm) $\frac{1}{8}$ " (3 mm) $\frac{5}{32}$ " (4 mm) $\frac{3}{16}$ " (4,7 mm) $\frac{7}{32}$ " (5,5 mm) $\frac{5}{16}$ " (8 mm)
31. One adjustable locknut spanner, Type 3152 2" to 4 $\frac{3}{4}$ " (51 to 121 mm)
32. Removable lever for rear table traverse control
33. No. 2 M.T. half-centre
34. No. 2 M.T. style 'A' Centre

Arranged for self-contained motor-drive to wheelhead, including 1 h.p. motor and control gear suitable for operation on any standard 3 phase, A. C. supply.

LIFTING



FOUNDATION



LIFTING

The machine should only be lifted in the manner illustrated with the cross saddle as near as possible to the wheelhead. The table stops should be locked up to the dead stop before lifting.

No responsibility will be accepted by us for damage or mis-alignment should any other lifting method be adopted.

Note: Whenever the machine is moved the cross saddle should be as near as possible to the wheelhead and the table stops locked up to the dead stop, as for lifting.

FOUNDATION

For maximum stability and accuracy a suitable bed of concrete or a stone-floor is recommended for the reception of this machine. The machine should be levelled in both longitudinal and transverse directions by means of a sensitive spirit level placed on the table. Levelling is accomplished by adjusting the jack bolts which give a three-point bedding.

INSTALLATION

Every effort is made to ensure that the machine is delivered in first class condition. Precautions are taken for transit purposes and on receipt the following points should be attend to:

1. Protective Coating

All exposed, unpainted surfaces receive a protective coating before despatch, and this should be removed before attempting to run the machine. Rub the surfaces with a solvent or conventional degreasing agent, e.g. white spirits.

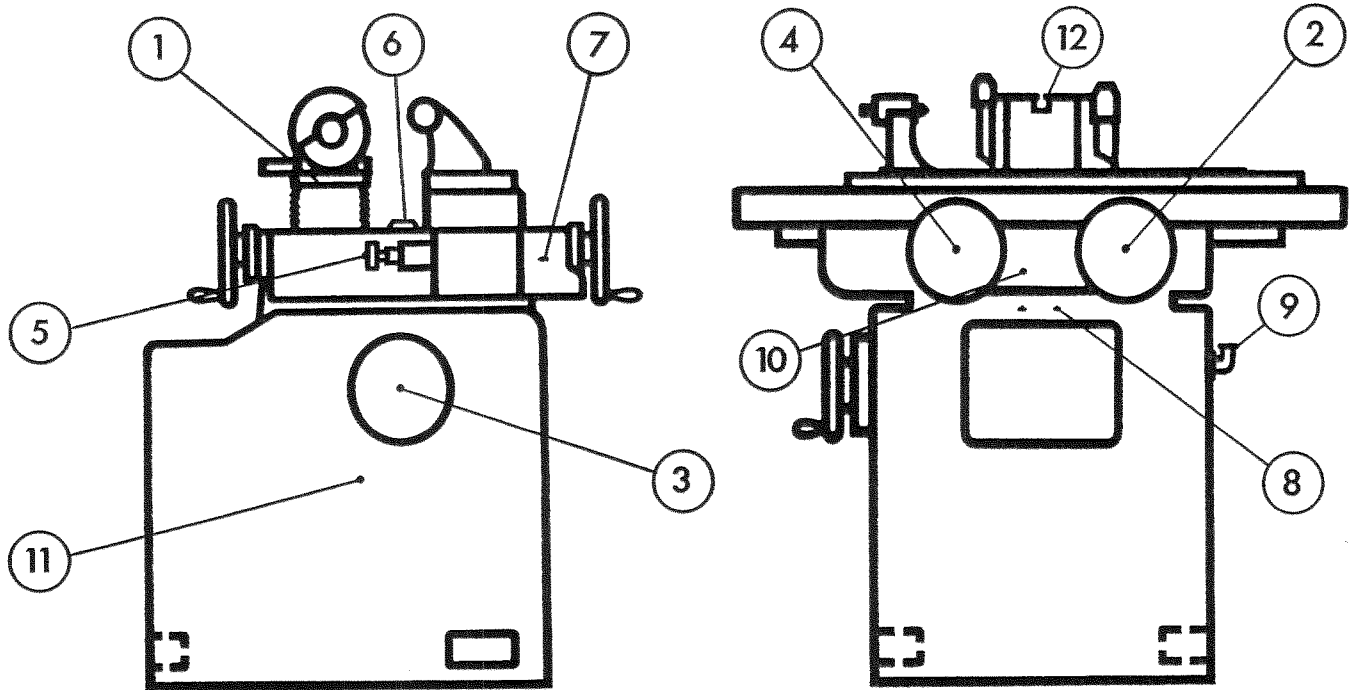
2. Coolant Supply (Optional Feature)

Fill the external coolant tank to the full capacity and couple up hoses. The capacity of the tank is approximately 4 gallons. (18 litres).

3. Electrical Connections

Connect the mains to the isolator switch. All motors and starters have been connected at our works. Check the rotation of the wheel spindle, which should be in a clockwise direction when looking at the wheel [6" (152 mm)] from the left hand side of the machine. If the rotation is anti-clockwise, two of the mains input lines should be interchanged.

LUBRICATION



It is essential that lubrication of this machine be systematically carried out at regular intervals as indicated below and on opposite page.

Note: Ensure that the area adjacent to all lubricating points is free from abrasive before oiling or filling up with oil.

Daily

1. Two oil nipples for column

Weekly

2. Oil nipple for hand traverse bearings
3. Oil nipple for elevating handwheel shaft bearings
4. Two oil nipples (front and back) for cross screw bearings
5. Oil nipple for rear hand traverse bearing
6. Remove cover to lubricate cross feed screw
7. Three oil nipples for cross slide
8. Two oil nipples to elevating mechanism
9. Oil reservoir for cross traverse chain. Maintain oil level at bottom of the cap thread
10. Maintain oil level to the centre of the glass indicator. See also page 14

LUBRICATION

Grease packed for life

11. Idler pulley
12. Wheelhead and cutter head spindle bearings

Note: When cutter head is motor driven it is essential that the oil nipple should be lubricated with Vacra Heavy Medium Oil

Electric Motors

All electric motors whether fitted with grease nipples or not should be re-lubricated with a good quality lithium based grease such as Mobil Oil Co. Mobilux No. 2 or equivalent every three years or every 9,000 running hours whichever is the more frequent.

LUBRICANTS

These machines are run in our works on the following types of lubricant:

	Supplier	Grade
Oil nipples	Mobil Oil Co. Ltd.	Vactra heavy medium oil
Cross feed screw	Mobil Oil Co. Ltd.	Vactra heavy medium oil
Chain reservoir	Mobil Oil Co. Ltd.	Vactra oil extra heavy

Other suppliers will recommend equivalent oils on application to them.

STARTING UP THE MACHINE

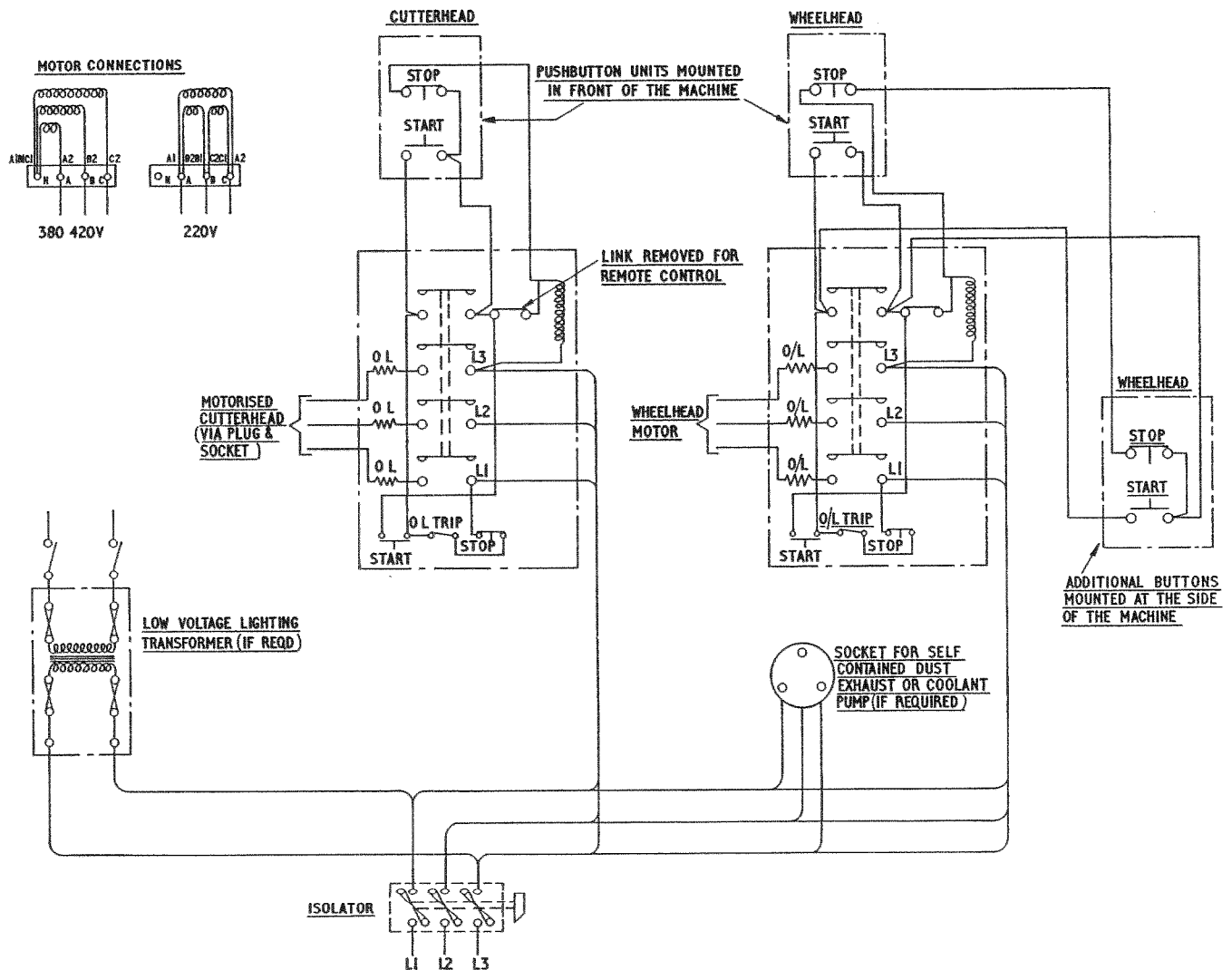
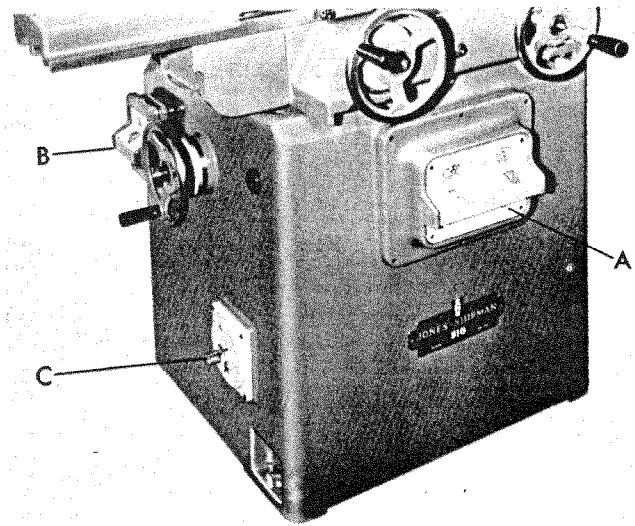
Before starting up the machine after installation, see that the following points have been attended to, and that the appropriate pages appertaining thereto have been understood.

1. Motors rotate in correct direction Page 7, item 3
2. Machine lubricated in general Pages 8, 9
3. Wheelhead flat belt drive correctly tensioned Page 17
4. Coolant tank filled (if supplied) Page 7, item 2
5. Wheelhead is raised clear of table equipment Page 17

Note: During all grinding operations both wheel flanges must be kept in position on the wheel spindle, otherwise serious damage will be caused to the bearings due to ingress of abrasives.

ELECTRICAL SYSTEM

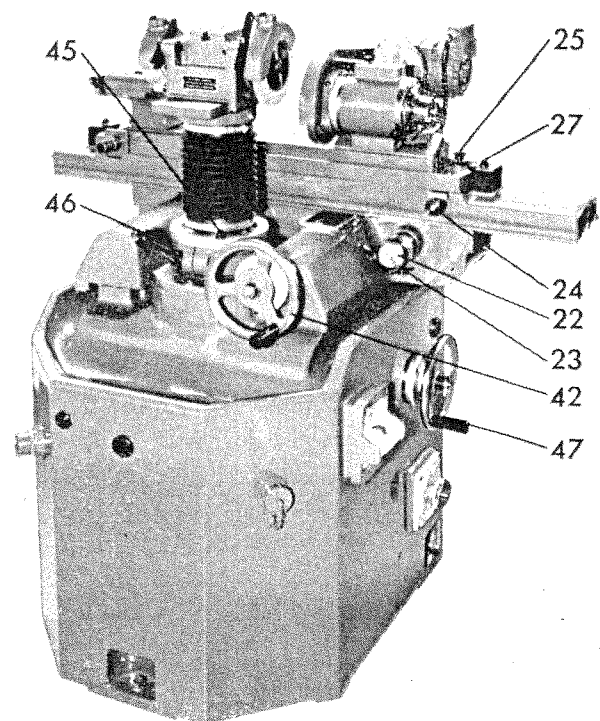
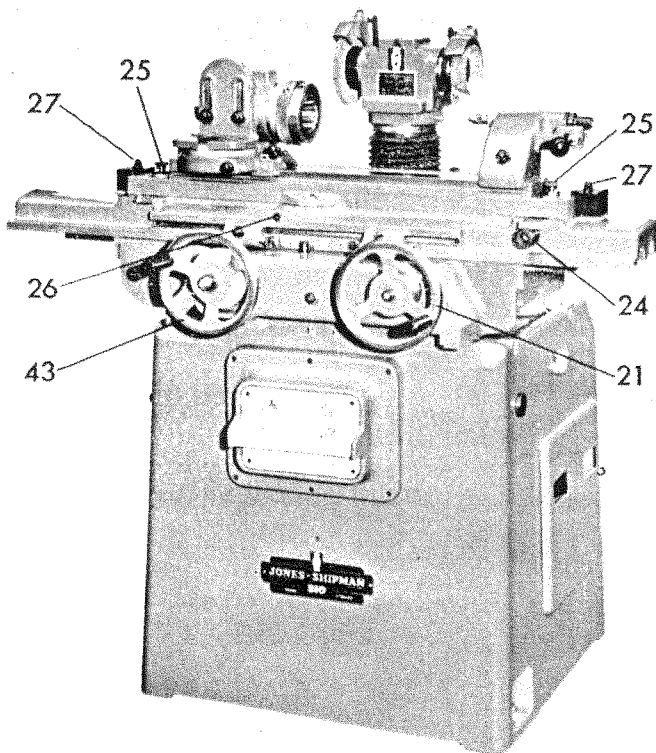
The main electrical switchgear is housed in a compartment (A) at the front of the machine. An additional control (B) is provided at the rear of the machine. The isolator (C) is mounted on the left hand side of the machine and must be switched to the OFF position before attempting to remove the switchgear cover.



CONTROL CHART

The dual front and rear controls provide universal operating positions. They are within comfortable reach of the operator for ease of control in every position. A complete description of all the controls is given on the following pages.

Note: This machine is fitted with start/stop keys of special safety design which must be **pressed upwards** to start.



- | | |
|--|--|
| 21. Front table control handwheel | 27. Table swivel lock nuts |
| 22. Rear table control knob | 42. Rear cross feed control handwheel |
| 23. Locking screw for table traverse | 43. Front cross feed control handwheel |
| 24. Fine feed table swivel adjustment knob (two) | 45. Swivel locking nut |
| 25. Table swivel plungers (two) | 46. Locking handle for vertical wheel-head adjustment. |
| 26. Central locking screw | 47. Handwheel for vertical wheelhead adjustment |

TABLE

The table is arranged to swivel on its slide, being mounted on a central spigot and bush. It has a locking clamp at each end and can be swivelled 8 degrees each side of the zero mark for long taper work. In addition, for shorter jobs, the table is capable of being swivelled 90 degrees in left hand direction and 45 degrees in right hand direction of the central zero mark and locked by a bolt on the front facing. The front is a true straight edge to which the cutter head and attachments are pulled up in perfect alignment by bolts in the angular tee slot in the table top. The angular adjustment is graduated in degrees.

TABLE SLIDE

The table slide is of sufficient length to cover the slideways in all stages of the longitudinal traverse; the movement is extremely sensitive, the weight of the table slide and equipment being carried on suitably mounted bush roller chains having an accuracy of 0.0003" (0,0075 mm) concentricity and immersed in an oil bath with visible oil level. A touch of the finger moves the table without any effort. The stop dogs on the table may be set to limit the stroke of the table, either as positive dead stops for grinding close to a shoulder, or as shock absorbing stops with spring loaded ends.

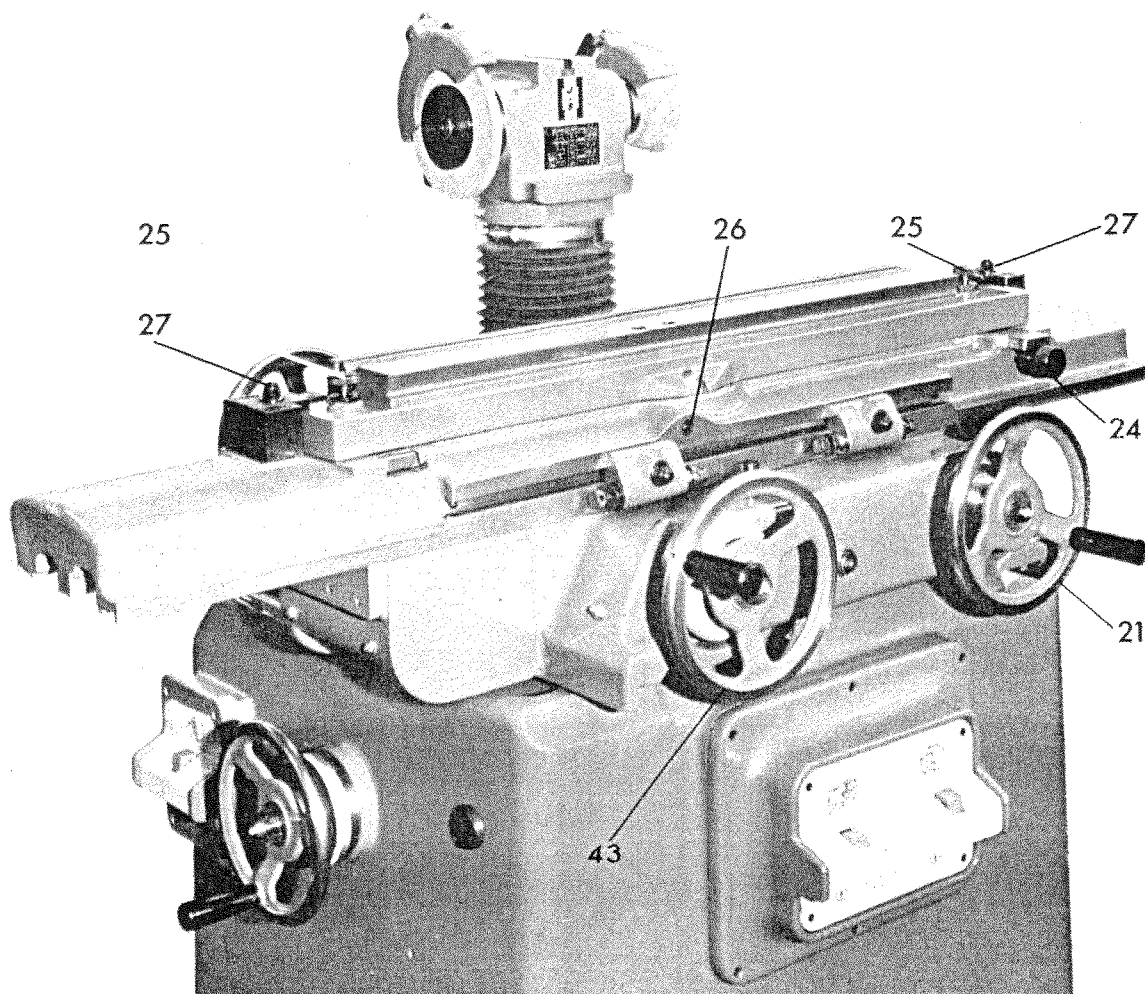


TABLE CONTROLS

21. Front control handwheel

This handwheel is used for traversing the table. To disengage pull the handwheel out approximately $\frac{3}{4}$ " (19 mm). The table traverses 4.75" (121 mm) for each revolution of the handwheel.

22. Rear control knob

This knob is used for table traversing and is normally only used when front handwheel (21) is disengaged. Pull out to disengage. A detachable lever is supplied for short stroke work.

23. Locking screw for table traverse

This lock can only be used when rear knob (22) is in gear, and prevents any movement of the table.

TABLE SWIVEL

24. Fine feed table swivel adjustment knob (two)

25. Table swivel plungers (two)

The table can be swivelled in both directions up to 8° . To swivel, unlock nuts (27) at each end of the table, pull plungers (25) upward and turn until pins are held out of the holes. Push table to approximate angle and re-insert one plunger (25). Final and accurate setting can then be accomplished by the fine feed adjusting knob (24). Turn knob (24) clockwise to move the right hand end of table towards the wheelhead. Procedure is exactly the same if left hand end plunger is the one engaged. Finally lock clamp nuts (27).

26. Central locking screw

When table is swivelled outside the limits of the table swivel locknuts (27) the central locking screw can be used to lock table when set. Table can be swivelled up to 90° in the left hand direction and 45° in the right hand direction of the central zero mark.

27. Table swivel locknuts

These securely clamp the table.

TABLE STOP DOGS

These are dual purpose as they can either be arranged as dead stops or alternatively with spring loaded cushions to prevent shocks. When using as dead stops the outside screw (37) is screwed up until the plunger (38) is locked solid against its shoulder. The knurled screw (39) on the inside of the stop is for fine adjustment when face or shoulder grinding. When set, locknut (40) should be locked rigid.

When cushioning is desired, release the outside screw (37) and the amount this is screwed out determines the amount of cushioning.

Two socket head screws (41) are screwed into the ends of the underslide to prevent it from being wound too far should the stop dogs not be locked in position.

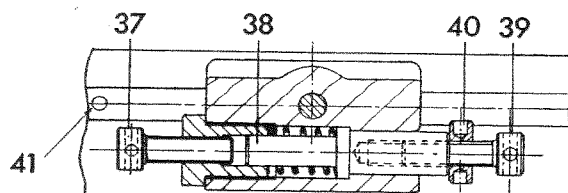
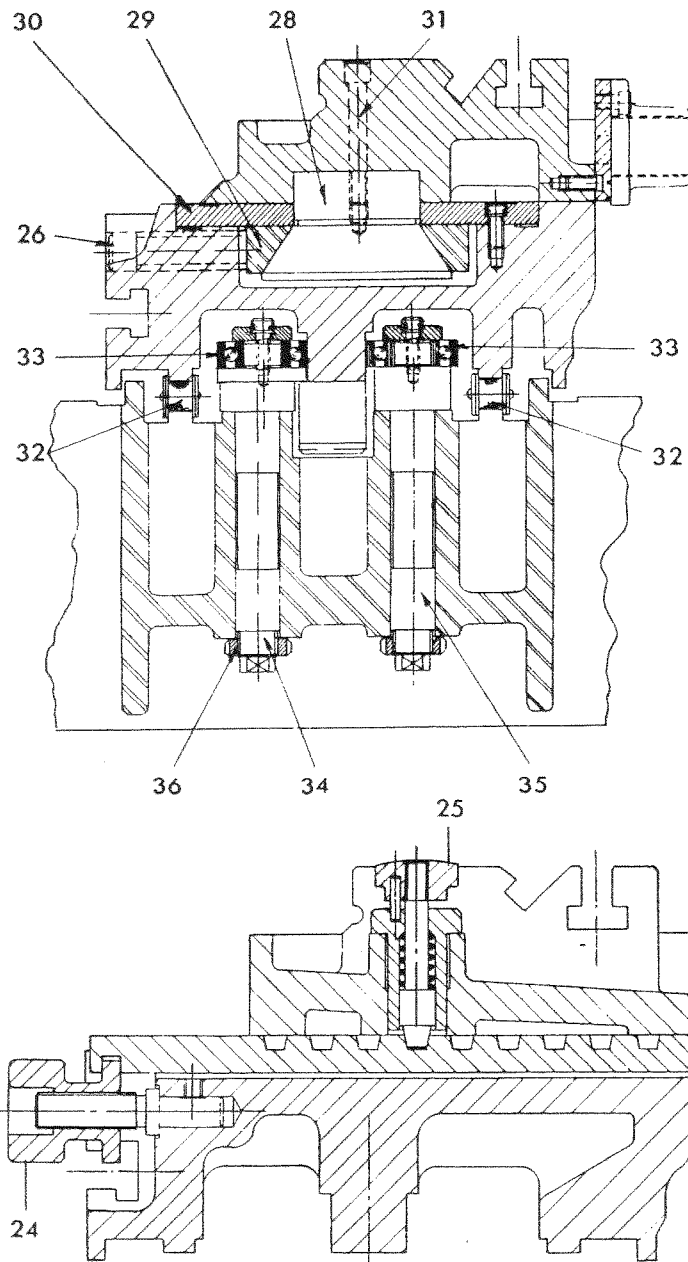


TABLE MOUNTINGS

The table has a hardened spigot (28) and vee clamp (29) and the faces are ground to ensure perfect seating. Screw adjustment (24) with quick release plungers (25), at the right hand and left hand of the table provide fine setting for grinding tapers. The angular graduations (30) are plainly visible on the front of the table and can be used for large angular settings in conjunction with the central clamp screw (26).

The table slide is mounted on accurately ground roller chains (32) and is guided by four ball bearings (33). These bearings are carried on eccentric shafts (34 and 35), which protrude through the bottom of the cross-slide for ease of adjustment. To adjust for side play, release the locknuts (36) right hand and left hand ends and turn eccentric shafts (34) by means of a spanner until all the play is eliminated. Finally lock up nuts (36) in position.

Note: When adjusting for side play do NOT alter setting of rear eccentric shaft (35) as this will affect the squareness of the underslide to the cross-slide.



MAINTENANCE AND OIL FILLING INSTRUCTIONS

The table seating face should be cleaned at least every twelve months. To remove the table, lift the two plungers (25) at both ends of the table, remove the two $\frac{3}{8}$ " (9,5 mm) socket head screws (31). Unlock the two end clamps (27) and swing the table clear and lift bodily off the table slide.

The table slide chain reservoir should be cleaned out at least every twelve months. To remove the table slide, remove one of the table stop dogs and slide the whole assembly off the cross saddle. Care should be taken, when sliding the table slide back on to the cross saddle, that the guide ways are lined up with the rollers (33).

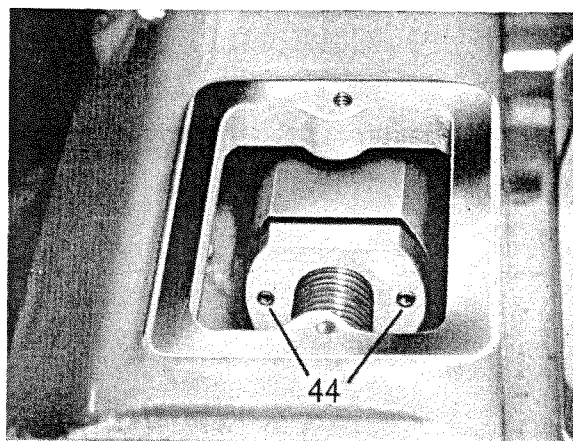
To fill the chain reservoir, remove the left hand table stop dog, push the under slide to the extreme right of traverse and pour oil into reservoir (see pages 8 and 9, item 10).

CROSS SLIDE

The cross slide which carries the table slide is mounted on wide spread slides, one vee slide and the other a roller chain slide of similar design to the table ways. The cross screw is located immediately above the vee slide to ensure accurate movement.

CROSS SCREW

A removable cover, fitted at the rear of the cross slide, gives access to the cross feed nut, which is provided with adjustment to compensate for wear, and to remove any resulting backlash. To remove backlash tighten up the two grub screws (44). When completed replace cover.



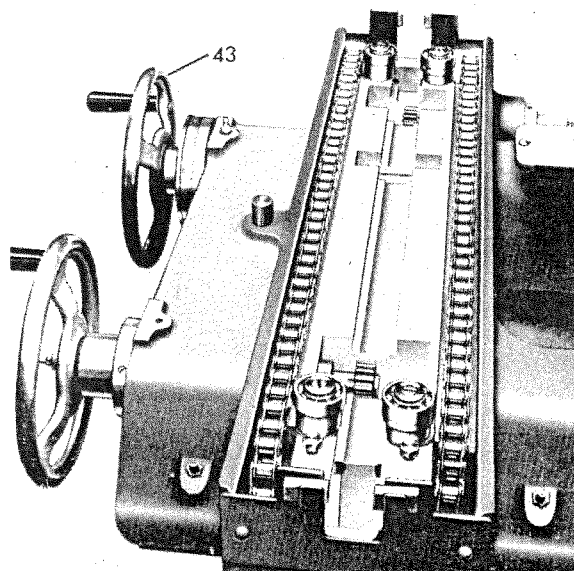
CROSS FEED CONTROLS

42. Rear control handwheel - see p. 16

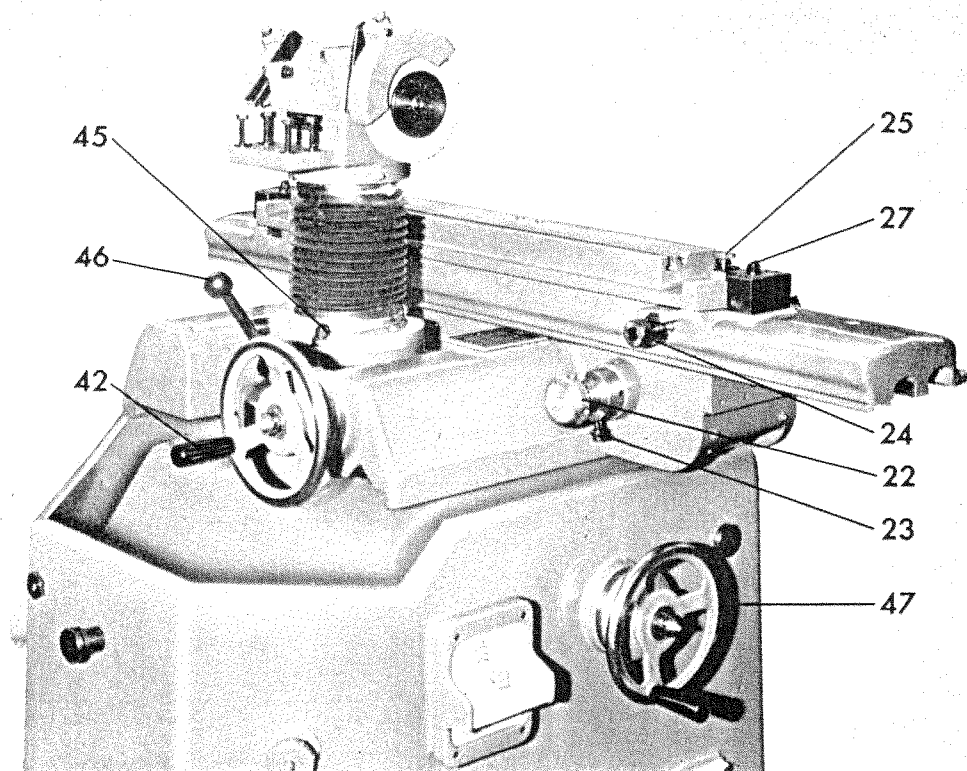
This is used for the rear control of the cross feed. It is fitted with an adjustable graduated dial that can be set to zero to save the operator calculating his final reading. The dial has 100 (250 metric) divisions, each division equalling 0.001" (0,01 mm), hence one revolution of the handwheel equals 0.1" (2,5 mm) movement of the saddle. Turning the handwheel in a clockwise direction moves the saddle towards the grinding wheel.

43. Front control handwheel

This handwheel is for the front control of the cross feed. It is also fitted with an adjustable graduated dial as for (42). Turning the handwheel in a clockwise direction, moves the saddle away from the grinding wheel.



WHEELHEAD



The spindle is of larger diameter, mounted on specially selected pre-loaded combined journal and thrust bearings, mounted in dust proof housings. The ball bearings are packed with grease, and require no further lubrication attention. The ends of the spindle are tapered to ensure perfect fitting and concentricity of the wheel flanges and extension spindle.

During all grinding operations both wheel flanges must be kept in position on wheel spindle otherwise serious damage will be caused to bearings due to ingress of abrasives.

The spindle has a central drive and the head is so designed that the driving belt can be readily changed without dismantling the spindle (see page 17).

WHEELHEAD PILLAR

The wheelhead can be swivelled to any desired angle, a graduated ring providing accurate setting. Graduations are in degrees. The exposed portion of the column is protected from grit by a telescopic bellows guard.

WHEELHEAD CONTROLS

45 Swivel locking nut

This is used for locking the swivelling movement of the wheelhead pillar.

46. Locking handle for vertical adjustment

This is used for locking the vertical adjustment of the wheelhead pillar.

Note: Nut (45) and handle (46) should be locked before commencing to grind.

47. Handwheel for vertical adjustment

This handwheel controls the vertical adjustment of the wheelhead. The handwheel is fitted with an adjustable graduated dial which can be set to zero in any position. The dial has 100 (254 metric) divisions, each division equalling 0.001" (0,1 mm), hence one revolution of the handwheel equals 0.1" (2,54 mm) of movement.

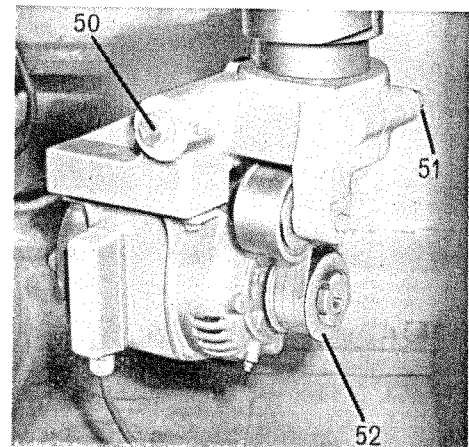
WHEELHEAD DRIVE

The drive is obtained from a 1 H.P. motor, mounted on a bracket at the bottom of the pillar and an endless flat belt is the driving medium, with provision for belt tensioning. The whole drive is encased in the machine bed and a removable cover in the side of the bed gives access to the motor and driving belt. Two pick-off pulleys interchangeable on the motor spindle, give wheel speeds of 3,600 and 5,000 r.p.m.

BELT TENSION

This is obtained by lowering the motor bracket by means of the rack pinion (50). To adjust, remove the inspection cover in the side of the bed. Swivel wheelhead pillar round until the locking nut (51) and rack pinion shaft (50) are most readily accessible. Release nut (51) and with a spanner adjust pinion (50) until required tension is obtained; relock nut (51).

Note: Always keep the belt taut to prevent the belt rubbing and fraying on the inside wall of the pillar.

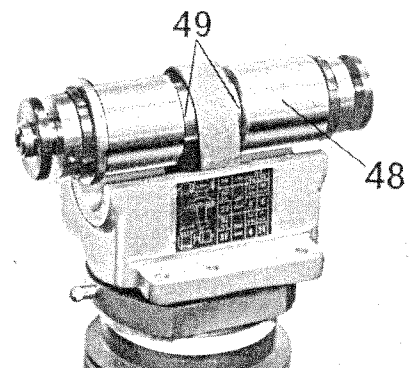


FITTING NEW BELT TO WHEELHEAD

1. Take belt off motor pulley (52)
2. Remove the four socket head screws and take off the top cover from wheelhead
3. Lift off spindle unit (48) and withdraw old belt
4. Replace new belt and lower spindle unit

Note: Spindle unit must be replaced with arrows marked on inner flanges at (49), directly opposite each other

5. Check to see that belt is not twisted or crossed
6. Refit top cover
7. Fit belt on to motor pulley (52) and obtain correct tension as described above



SPINDLE SPEEDS

Two interchangeable pulleys are supplied for the motor shaft, giving speeds of 3,600 and 5,000 r.p.m. with the motor running at 2,800 r.p.m.

Always keep as near to the standard speed as possible by using the correct diameter wheels in conjunction with the spindle speeds.

The surface speed of the grinding wheel should be between 4,000 and 6,000 feet per minute (1200 and 1800 metres/minute) to obtain the longest life and best cutting action of the wheel.

If the wheelhead motor is changed to one with a different speed, the pulley diameter must be increased or decreased to keep the correct wheel speed.

Surface speeds are calculated from the following formulae:

$$\begin{array}{lcl} \text{Revolutions per minute} & & \\ \text{of spindle} & = & \frac{R \times P}{W} \end{array}$$

$$\begin{array}{lcl} \text{Surface speed} & & \\ \text{(feet per minute)} & = & \frac{S \times \pi \times D}{1000} \end{array}$$

where: R = R.P.M. of wheelhead motor

P = Motor pulley diameter

W = Wheelhead pulley diameter

(P and W should have the same units, *i.e.*, both in inches)

S = R.P.M. of wheelhead spindle

$$\pi = \frac{\text{circumference}}{\text{diameter}} = 3.142$$

D = Wheel diameter (in inches)

$$\begin{array}{lcl} \text{Surface speed} & & \\ \text{(m per minute)} & = & \frac{S \times \pi \times D}{1000} \end{array}$$

SERVICE REPLACEMENT SCHEME WHEELHEAD SPINDLE CARTRIDGE UNIT

This scheme enables customers to exchange their existing cartridge unit for an (as new) works reconditioned unit from our Service Pool.

Before ordering a replacement unit please quote the Machine Allocation/Serial Number, which is stamped on either the right or left hand rear paws of the carriage, or on the name plate on the front of the machine *e.g.* B.O.63291.

We reserve the right to refuse any unit returned under this scheme should it be of the wrong type stated or too damaged or worn to warrant exchange. If the unit is acceptable for exchange the customer will be credited with the appropriate amount.

It should also be noted that the cartridge unit **ONLY** should be returned for exchange, *i.e.* existing guards, flanges (which are interchangeable) must be retained, as these are not supplied with the replacement unit.

This service is available to users in Great Britain only.

UNIVERSAL CUTTER HEAD

The Universal Cutter Head UJ8215/17 is adjustable in centre height to allow between 8" (203 mm) and 12" (305 mm) swing. It can also be swivelled in two directions, each provided with fully graduated scales marked in degrees. Clearance angles are obtained by rolling the cutter head to the required angle as indicated on the fully graduated dial. The spindle is mounted on ball bearings (grease packed for life) and is bored No. 12 Brown and Sharpe taper one end and No. 50 International Taper the other. Reducing sleeves are provided to give Nos. 10, 9 and 7 Brown and Sharpe Taper. Reducing sleeves from No. 50 International Taper to Nos. 4, 3, 2 and 1 Morse Tapers are also supplied. The spindle is arranged to take an indexing drum for accurate spacing and the head can be arranged for motor drive, if required (see extra equipment).

Note: *If specifically required the spindle of UJ8215/17 cutter head may be supplied bored No. 5 Morse Taper instead of No. 12 B & S taper without extra charge. A set of sleeves Nos. 5-4, 5-3 5-2 Morse Taper would then be supplied in lieu of the standard B & S sleeves.*

TAILSTOCKS

The right hand centre tailstock is designed for the speedy loading of mandrels. It has a long hardened steel sleeve carrying a No. 2 Morse Taper Centre. The lever operated sleeve is spring loaded; adjustment being provided to vary the load applied. The left hand tailstock, with setting dial, is used in conjunction with the right hand tailstock, for cutters mounted on arbors, enabling the clearance and rake angles to be readily obtained in the same way as the circular reading on the cutter head

CENTRE HEIGHT GAUGES

Two centre height gauges are provided, one for clamping to the wheelhead and the other for mounting on the table, both giving a definite setting on the centre line.

TOOTH RESTS

Tooth rests are provided with universal movements and micrometer adjustments to facilitate the setting up of different jobs in conjunction with the centre height gauge. The rest brackets may be attached either to the table, the wheelhead, or at the top or bottom of the cutter head.

ADDITIONAL EQUIPMENT

(Supplied to order only)

Note: This machine is designed specifically for cutter grinding, the wheelhead spindle being mounted on pre-loaded ball bearings and the table mounted on a roller chain cradle to give the sensitive table movement required for this purpose.

A motorised cutterhead can be supplied for Cylindrical Grinding, also an Internal Grinding Attachment, but users should note carefully that even with these additional items **it is not** a precision cylindrical and internal grinder, and its scope in this respect is limited.

This machine is not suitable for precision surface grinding, although the extension spindle supplied with the standard equipment does enable flat surfaces to be ground within limitation.

Motor drive arrangement UJ8219 for Universal Cutter Head UJ8215/17

Single speed 360 r.p.m. with motor, pulleys, guards, starter, etc., standard voltage; also one No. 1 Morse Taper centre.

4" Three-Jaw Self Centring-Chuck with two sets of jaws.

Collet Attachment UX 8206 using "Schaublin" type W.25 collets 0- $\frac{3}{4}$ " (0 to 19 mm) capacity, with one collet $\frac{3}{4}$ " (19 mm) bore, for use with UJ8215/17 cutter head having spindle bored No. 12 B. & S. taper.

Collet Attachment UX 8208

Collet attachment exactly as UX8206, but for use with UJ8215/17 cutter head having spindle bored No. 5 Morse Taper.

Collet Attachment UX 8207 using "Brown & Sharpe" sleeve type collets $\frac{1}{2}$ " to $1\frac{1}{4}$ " (13 to 32 mm) capacity, with one collet $1\frac{1}{4}$ " (32 mm) bore for use with UJ8215/17 cutter head having spindle bored No. 12 B. & S. taper.

Collet Attachment UX 8209

Collet attachment exactly as UX8207, but for use with UJ8215/17 cutter head having spindle bored No. 5 Morse Taper.

Positive Indexing Attachment X127

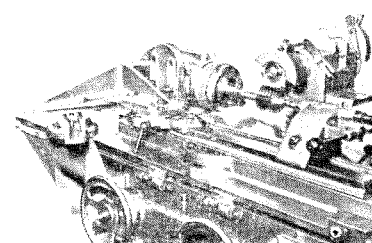
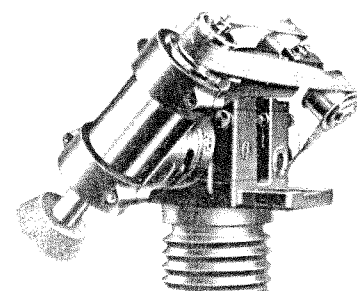
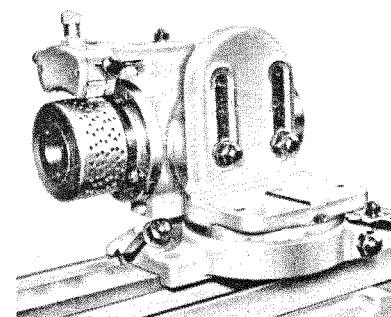
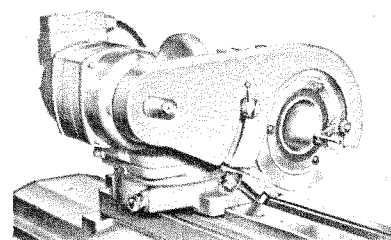
This attachment is arranged to be fixed on to the Universal Cutter Head UJ8215/17 and is complete with a drum having seven rows of holes; 20, 30, 28, 24, 22, 32 and 18 per row. The indexing drum fits on to the taper nose of spindle on the cutter head. The plunger bracket bolts on top of the cutter head by means of a tee bolt and is adjusted to suit the row of holes giving the required number of divisions. The plunger is provided with radial adjustment for variations of setting.

Vertical and Swivelling Die-grinding Attachment X42

Arranged to fit on the wheelhead and carries a No. 1660 R.H. internal grinding spindle driven from a pulley on the wheelhead spindle. It is arranged to swivel in either direction and is suitable for numerous grinding operations, particularly die-grinding. (Guard removed for illustration purposes.) Equipment includes belt, driving pulley and $2\frac{1}{4}$ " (57 mm) diameter cup wheel.

Sine Bar Hob Grinding Attachment UX8213

This attachment is designed to grind in the flutes of a comprehensive range of Spiral Hobs, also Spiral Fluted Reamers, Taps and Milling Cutters. It consists, briefly, of a transverse rack which engages with a gear on the work spindle, the rack being actuated by a slider carried in a swivelling sine bar attached to the machine saddle. Work can be ground up to 10" (254 mm) long by 8" (203 mm) max. diameter, and an infinitely variable lead range is possible for 4" (102 mm) lead minimum up to infinity (i.e., straight flutes). Any number of flutes up to 20 can be ground, both R.H. and L.H. cutters.



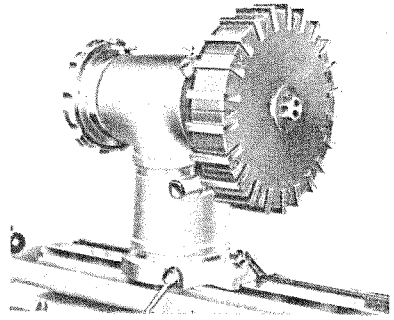
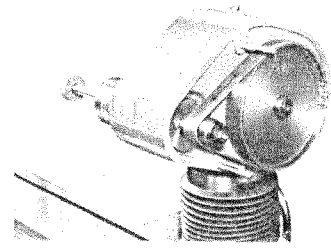
ADDITIONAL EQUIPMENT (cont.)

Internal Grinding Attachment UC8219

This attachment bolts on top of the wheelhead and carries the internal grinding spindle, either the No. 1656 or No. 1660 model. The drive to the internal grinding spindle is by an endless flat belt from a pulley which fits on to the wheelhead spindle in place of the grinding wheel. (Guard removed for illustration purposes.)

The standard Jones-Shipman Internal Grinding Spindles can be supplied for this attachment. They are designed to run continuously at high speeds. 1656LH for grinding holes $\frac{3}{8}$ " to $\frac{3}{4}$ " (9,5 to 19 mm) dia. $\times 2$ " (51 mm) deep, 25,200 r.p.m. [A collet adaptor can be supplied for grinding holes $\frac{1}{4}$ " to $\frac{3}{8}$ " (6,4 to 9,5 mm) dia.] 1660 LH for grinding holes $\frac{3}{4}$ " to 2" (19 to 51 mm) dia. $\times 3\frac{1}{4}$ " (83mm) deep, 17,500 r.p.m.

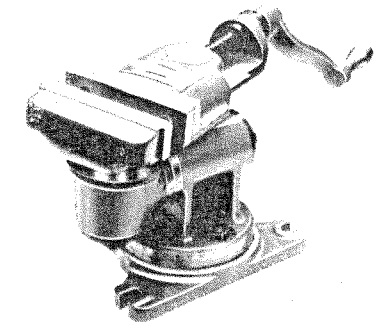
(N.B.—The full grinding capacities stated being obtained by auxiliary adaptor spindles).



Face Mill Grinding Attachment UJ8209

This attachment is for grinding face mills up to 16" (406 mm) dia. By means of the inclined face and dual swivels, the cutter can be tipped to any combined clearance angle desired, both from the cutting edge and also inwards to centre of cutter. It can also be swivelled to grind a bevelled edge or the periphery of the cutter. The spindle is bored to suit $2\frac{3}{4}$ " (70 mm) international taper of $3\frac{1}{2}$ " (89 mm) per ft. or alternatively the $5\frac{1}{16}$ " (129 mm) dia. nose can be used as a spigot.

A $1\frac{1}{4}$ " (32 mm) dia. adaptor is provided for the smaller dia. mills.

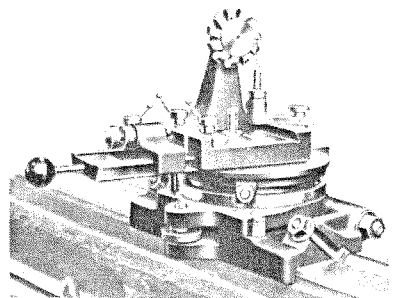


Universal Vice Type 4613 013

Designed specially for holding work to any desired compound angle. Three separate swivelling movements are provided, fully graduated. The jaws are 1" (25 mm) deep, 4" (102 mm) wide and admit work $2\frac{3}{8}$ " (65 mm). Height overall is $6\frac{1}{2}$ " (165 mm.)

Tool Rest Type 4613 014

For use in conjunction with the Universal Vice Type 4613 013, and consists of an accurately ground table, 6" \times 5" (152 \times 127 mm) having a stump which is interchangeable with the top section of the machine vice.



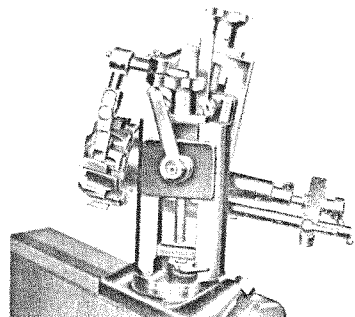
Radius Grinding Attachment X9

For grinding radii on all forms of milling cutters, including side and face, 180 degrees convex, small face mills, end mills, etc., and concave cutters up to 90 degrees. The setting is effected by inserting gauge blocks to the radius required. The cutter heads are provided with interchangeable buttons for varying size bores, and will also accommodate a diamond stick for forming a radius on the grinding wheel. A tilting head is also provided with a No. 8 "Brown & Sharpe" taper adaptor or No. 3 M.T. adaptor for holding end mills, etc. The equipment includes tooth rests (for both forms of grinding) and gauge plugs.

Universal Vee Clamp X2

Cutters having No. 1 to No. 5 Morse Taper and $\frac{1}{2}$ " to $1\frac{3}{4}$ " (13 to 44 mm) parallel or irregular shaped shanks, can be held while grinding the face, peripheral or angular edges. At maximum height it will swing 8" (203 mm) diameter cutters and the whole attachment can be rotated on its own base.

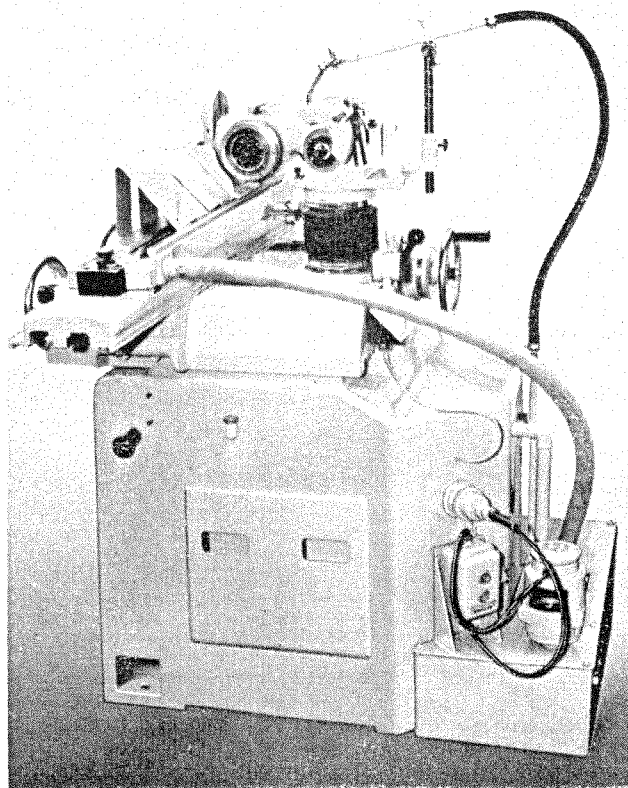
An adjustable stop is provided for shank-end location of cutters having blank ends. A "floating" centre is provided for cutters having centres.



COOLANT SUPPLY

(Optional Feature)

The standard machine is arranged so that coolant service can be incorporated. The coolant tank, complete with electric pump, weirs and filters is arranged to fit at the rear of the machine. The flexible nozzle is clipped to the wheelhead and suitable piping returns the coolant to the tank through troughs in the table and machine bed. The capacity of the tank is approximately 4 gallons (18 litres).



TILTING WHEELHEAD MODEL

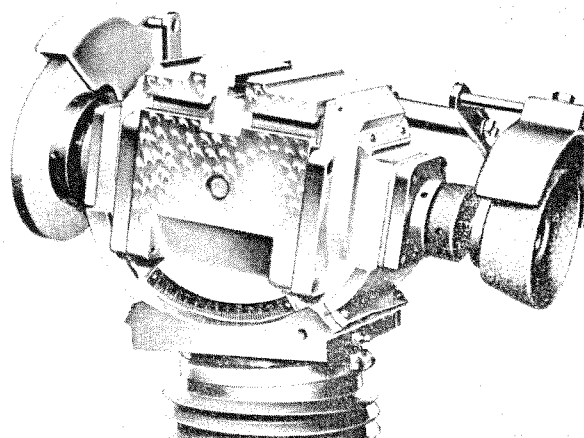
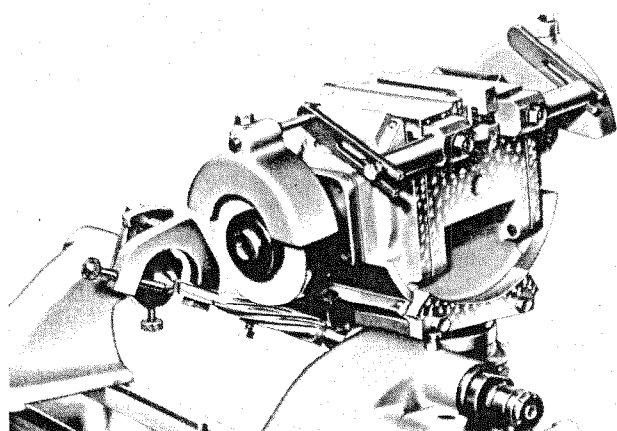
(To order only)

This is a standard Model 310, but fitted with a wheelhead arranged to tilt 30° each way above and below the horizontal axis in addition to the standard horizontal circular swivel of 338° .

The spindle is driven by a Rotor and Stator unit with grease packed bearings and runs at one speed of 2,850 r.p.m. It is cooled by air blown upwards through the head column from a blower mounted inside the bed.

Standard wheels can be carried at each end of the spindle; one end being fitted with a Collet for the rapid interchange or positioning of extending wheel arbors.

Tee slots are provided on the head to carry wheel guards and tooth rest equipment, etc.



WHEEL BALANCING

The external grinding wheels are mounted on flanges which can be readily withdrawn from the wheel spindle. Balance weights or wedges are fitted to the wheel flange, and it is essential that the wheel is properly balanced by means of these wedges before the flange carrying the wheel is fitted the wheel spindle.

To fit a new wheel on to the flange, unscrew locknut which has a left hand thread and withdraw flange. Remove existing wheel and fit new wheel on to the fixed flange. Refit flange and screw locknut tightly. The ensemble should then be fitted on the taper of the balancing mandrel supplied and placed upon a balancing tool for preference or parallel blocks. The wedges should then be loosened and moved until the wheel is perfectly balanced.

To Balance the Wheel

Proceed in the following manner

1. Securely lock wheel on to flanges—fix balance weights diametrically opposite

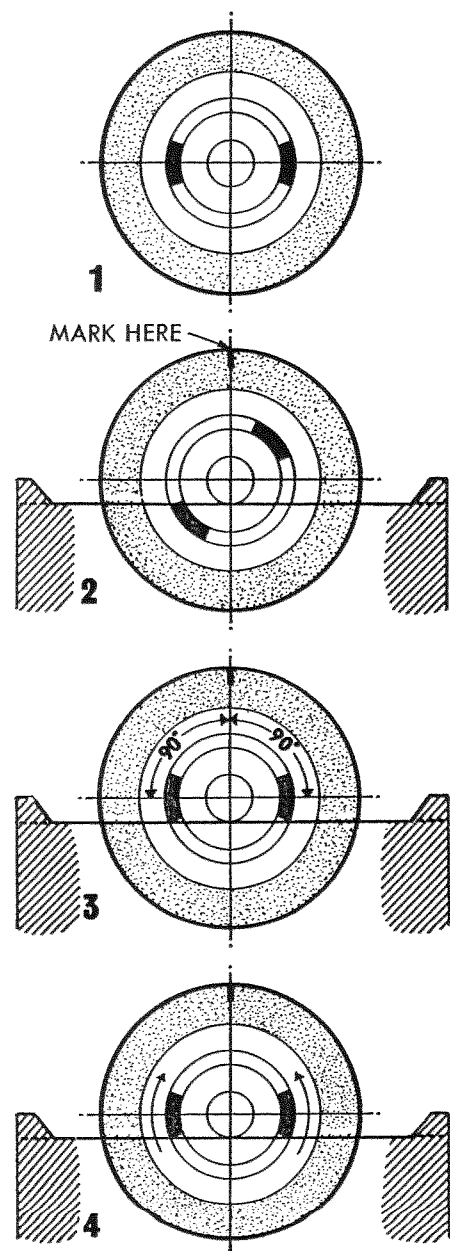
Dress wheel

2. Remove assembly from wheelhead and mount on Balancing Mandrel—place on Balancing Unit, and allow to turn until it stops, then mark top centre of wheel.

3. Move balance weights to 90° from mark and diametrically opposite.

4. Move weights equally towards mark approx. $\frac{1}{8}$ in. (3 mm) at a time until assembly remains static in any position.

Remount assembly on to wheelhead and redress wheel before putting into operation.



REPLACEMENT SPARES

Wheelhead and column assembly

31651 104 bellows guard	1 off
2000 mm — 1980 mm \times 15 mm Hevaflex belt	1 off
34561 510 spindle nut	1 off
34561 511 spindle nut	1 off
34142 106 coupling plate	2 off

Cutter head unit

XLS $2\frac{3}{4}$ " J & T bearing A.C.D.E.P.	1 off
F021 $2\frac{3}{4}$ " + 0.005" bore J & T bearing	1 off

Cross feed assembly

32512 514 cross screw	1 off
32531 404 fixed cross feed nut	1 off
32531 405 adjustable cross feed nut	1 off
35711 101 feed dial leaf spring	3 off

Tailstock unit

31731 701 L.H. tailstock centre	1 off
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Extra flanges

UC8244 L.H. extension spindle flanges UC8206, UC8207
UC8109, UC8205 and UC8244 can be supplied (to order) with 1" bore in lieu of $1\frac{1}{4}$ " bore.

Grinding wheels standard sizes and grades

$6" \times \frac{1}{2}" \times 1\frac{1}{4}"$ bore disc wheel A46 K5 V30 to suit flange UC8207
 $6" \times \frac{1}{2}" \times 1\frac{1}{4}"$ bore disc wheel A60 K5 V30 to suit flange UC8207
 $4" \times \frac{3}{8}" \times 1\frac{1}{4}"$ bore disc wheel A60 K5 V30 to suit flanges UC8205 and UC8206
 $4" \times 1\frac{1}{2}" \times 1\frac{1}{4}"$ bore taper cup wheel BA60 K5 VFBLU to suit flanges UC8109 and UC8206
 $4\frac{1}{2}" \times \frac{1}{2}" \times 1\frac{1}{4}"$ bore saucer wheel AA60 J5 VF8 to suit flanges UC8109 and UC8206

Important: Always quote Machine Allocation No. B.O. shown on page 1 when ordering replacement spares.

A complete Spare Parts Catalogue is available on request