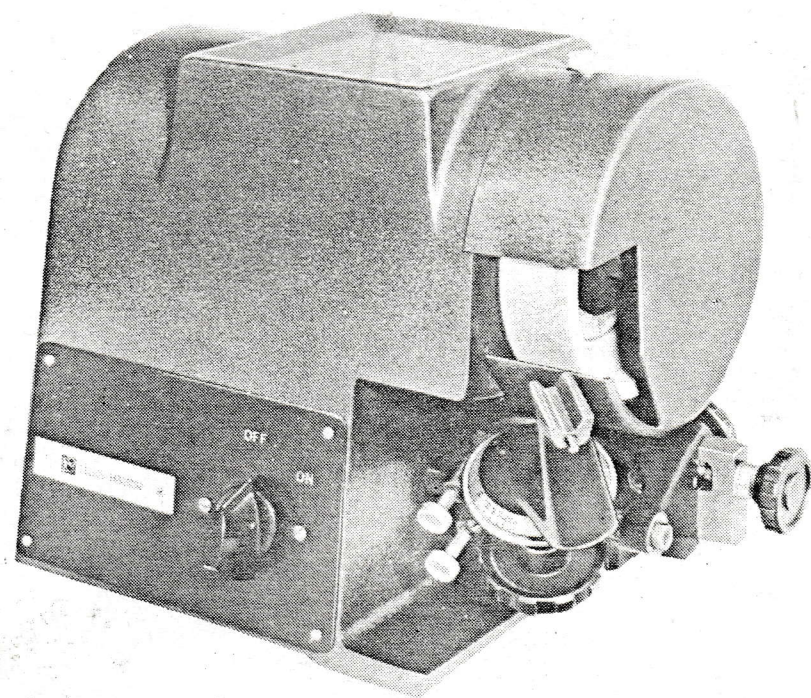


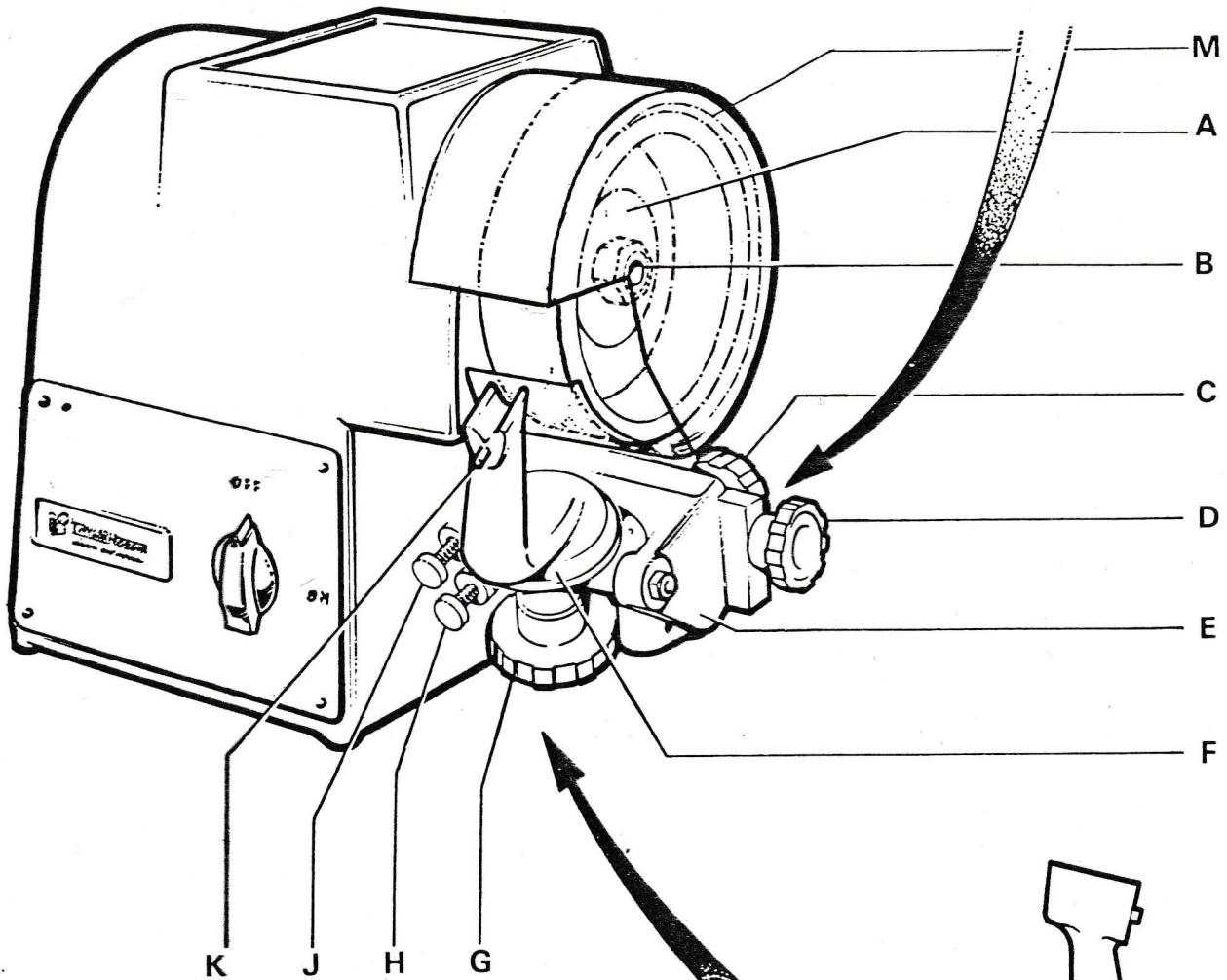
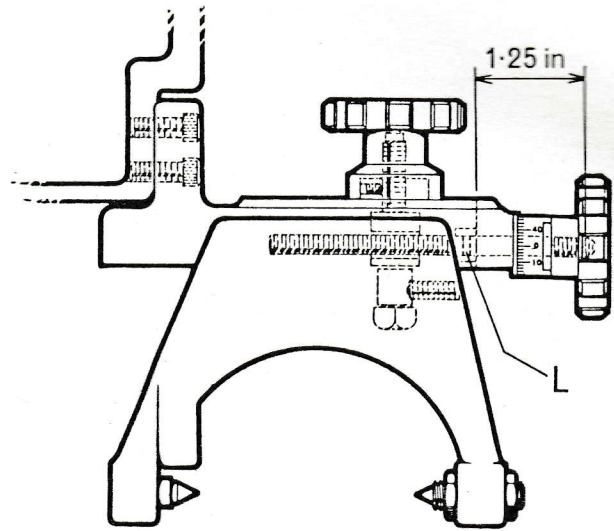
At Home

MODEL G CUTTER GRINDER

OPERATOR'S HANDBOOK



- A Wheel Flange
- B Wheel Nut
- C Feed Clamp Screw
- D Feed Screw
- E Mounting Bracket
- F Crutch



- G Crutch Clamp Screw
- H Bottom Stop Screw
- J Stop Screw
- K Crutch Stop Pin
- L Sel-Lok Pin
- M Guard

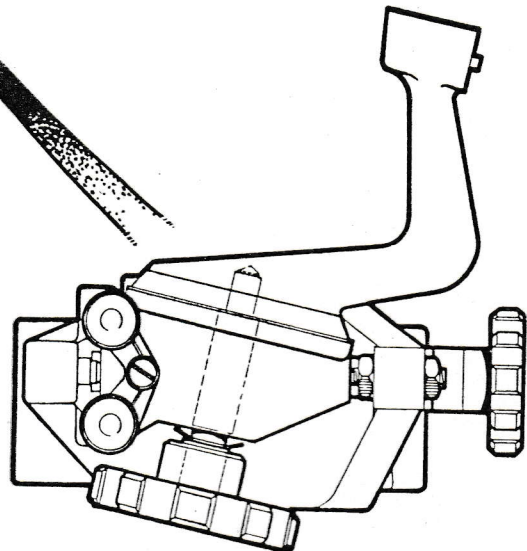


FIGURE 1
GENERAL ARRANGEMENT OF CUTTER GRINDER

SECTION 1

GENERAL DESCRIPTION

The first essential of good and precise engraving is the use of correctly ground cutting tools.

The Model 'G' cutter grinder for use with RTH engraving machines, produces accurately the correct cutting edge, clearance angle and cutting shapes required for most types of engraving.

The setting gauge and stop cams provided with the machine, ensure precise grinding of the clearance angle, whilst an in-feed screw graduated in steps of 0.002 inch (0.05 mm), permits specified cutter sizes to be readily achieved.

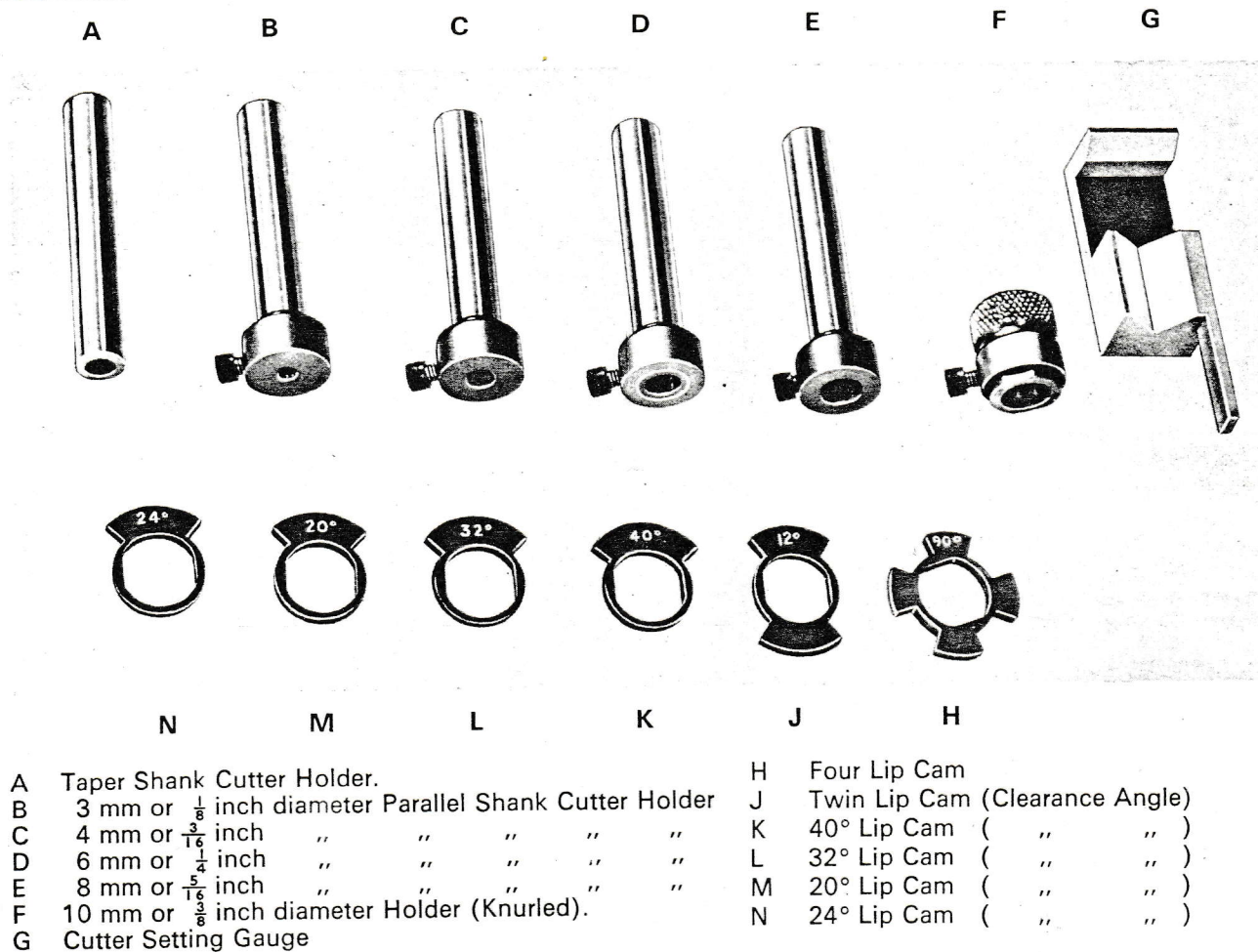


FIGURE 2

Sturdily built as a free standing bench model, the machine (Figure 1) enables the cutters to be frequently re-ground to maintain the cutting edge without disturbing the engraving machine settings.

The machine consists basically of a polyurethane painted aluminium casting on which is mounted a 1/6 hp induction motor suitable for operation from the supplies shown below.

The motor has synchronous speed of 3600 rev/min and a starting current of approximately 15A. The shaft protrudes through the casting and is countersunk in one position to facilitate the locking of the shaft flange which is a press fit on the shaft and locked with a set screw.

A white oxide grinding wheel fits over the shaft flange and is held in position with a wheel flange and lock nut.

UK and Other Countries	Hz	50	50	60	60
	Phase	1	3	1	3
	Voltage	240	380/440	110	220

The motor is switched on and off by a rotary type switch located on the side of the casting.

Control gear for mounting and grinding cutting tools is fixed to the wheel end of the machine. This comprises an adjustable crutch having a 'Vee' section for locating the cutter holder. The crutch is pivoted about the two centres of a mounting bracket which is fixed to a slider mechanism. Angular setting of the crutch from 0° to 180° is achieved by aligning the required angle on the crutch graduated scale with the scribed line on the crutch support, the crutch

can then be locked with a clamp screw. Movement of the crutch across the face of the grinding wheel is limited by two adjustable stop screws; whilst movement of the crutch towards or away from the grinding face of the wheel is controlled by a hand operated feed screw graduated in increments of 0.002 inch (0.05 mm) operating the slider which can be locked by the feed control clamp screw.

The following is a list of standard accessories and spares used with the machine.

Code No.	Item	Code No.	Item
110/15	Magnifier	* 110/912-S	Set of cutter holders including setting gauge, clearance cams
110/19	Oilstone	or 110/952-S	
110/463	Style collar for engraving machines (not model 'K')	116/38	$\frac{3}{32}$ inch A/F Allen Key
110/886	Grinding wheel—White Oxide	110/920	Wheel truing Diamond and Holder
110/888	Style collar for 'K' Type engraving machines	01453	Eccentric pin for crutch
110/909	Grinding wheel—Diamond Impregnated	116/83	Wheel Spanner— $\frac{3}{4}$ inch UNF
		K02816	Feed screw block complete with helicoil insert.

* Note: 110/952-S Supply with 110/948-S Metric version
 110/912-S " " 110/883-S inches "

SECTION 2

OPERATING INSTRUCTIONS

WARNING. When not in the actual process of grinding cutters or dressing the wheel for balance, the machine should be switched 'OFF'.

Before grinding cutting tools the operator should refer to the general guidance table below to obtain the clearance angle.

For general letter engraving 'Trutaper' Axiflat cutters are recommended. For letter punches and die work 'Trutaper' Rigiflat cutters should be used.

GENERAL GUIDANCE TABLE

Material	Cutter material	Width of cut up to		Clearance angle	Speed of cutter rev/min
Free cutting brass	Talyspeed	0.10 in	2.5 mm	32°	18,000
Sheet zinc	Talyspeed	0.10 in	2.5 mm	32°-40°	18,000
Tough cartridge Brass	Talyspeed	0.01 in	0.25 mm	24°-32°	18,000
		0.10 in	2.5 mm	32°-40°	12,000
Aluminium	Talyspeed	0.10 in	2.5 mm	32°-40°	18,000
Mild steel	Talyspeed or	0.01 in	0.25 mm	20°-32°	18,000
	Speedicut	0.10 in	2.5 mm	32°-40°	12,000
Copper	Talyspeed	0.01 in	0.25 mm	24°-32°	18,000
		0.10 in	2.5 mm	32°-40°	12,000
Staybrite steel	Talyspeed or	0.05 in	1.25 mm	20°-24°	18,000
	Speedicut	0.10 in	2.5 mm	24°-32°	15,000
Tool and die steel	Talyspeed or	0.05 in	1.25 mm	20°-24°	8,000
	Speedicut	0.10 in	2.5 mm	24°-32°	5,000
Vybak	Speedicut	0.06 in	1.5 mm	40°	5,000
Cobex	Speedicut	0.06 in	1.5 mm	40°	5,000
Perspex	Talyspeed	0.10 in	2.5 mm	40°	18,000
Formica engraving material	Carbide	0.06 in	1.5 mm	32°-40°	18,000

USE OF THE CUTTER SETTING GAUGE
(Figure 3)

The setting gauge is supplied for use with RTH 'Trutaper' Axiflat and Rigiflat type cutters, it can also be used for setting-up Parallel Shank 'D' Bits, Slot Drill—Twin Flute Type and End mill—Four Flute type cutters. Details for setting-up the various types of cutter in readiness for grinding are as follows.

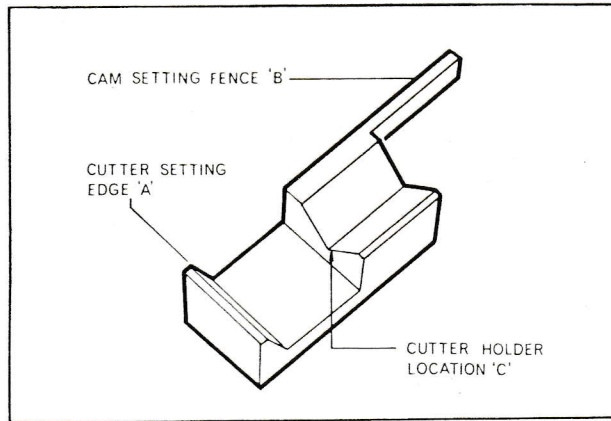


FIGURE 3 CUTTER SETTING GAUGE

Tapered Shank 'D' Bits (Figure 4)

It is important that the cutter taper and the holder are clean and free from grease. A piece of tissue paper approximately one inch (25 mm) square, wrapped around the wooden cleaning plug provided is ideal for cleaning the tapered holes in the cutter holders. To set up the tapered shank 'D' bit:

- (1) Select the appropriate stop-cam as suggested by the general guidance table.
- (2) Locate the cam on a $\frac{3}{8}$ inch diameter cutter holder (Knurled) and assemble this onto the taper shank cutter holder.
- (3) Place the cutter into the holder so that there is freedom of rotation between the holder and the cutter.
- (4) Locate the assembly on the setting gauge, with the flat of the cutter aligned with the setting edge (A Figure 3) and the stop cam as shown in Figure 4C.
- (5) Rotate the cutter holder in a clockwise direction until the stop cam abuts against the setting fence (B Figure 3) as shown in Figure 4D.
- (6) Carefully remove the complete assembly from the setting gauge, taking care not to disturb the setting of the holder relative to the cutter.
- (7) Retain the holder and cutter between the fingers and thumb, and give the knurled end of the cutter holder a sharp blow on a solid flat surface to lock the cutter in the holder. The cutter is now ready for grinding.

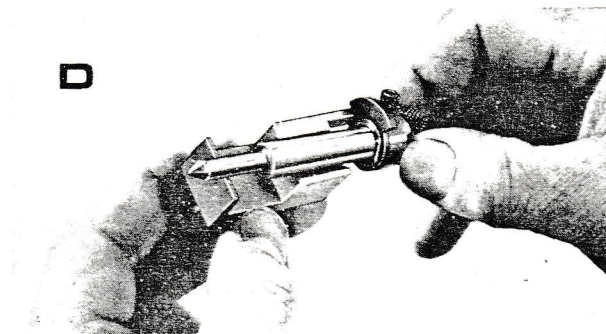
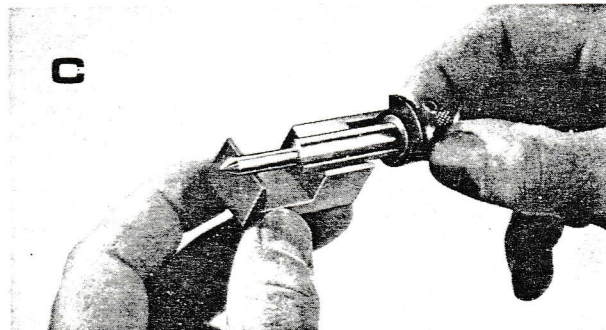
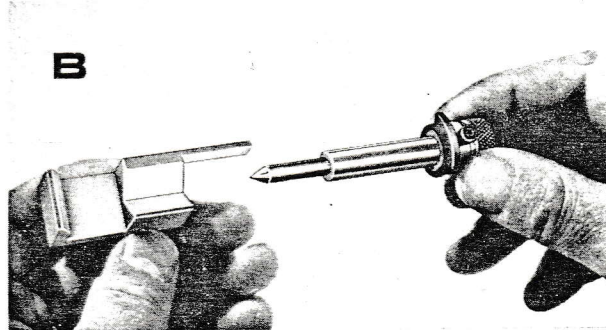
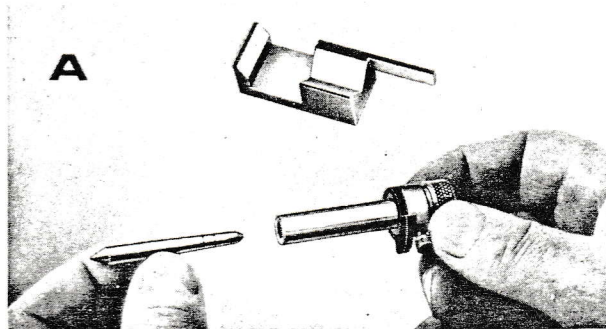


FIGURE 4

Parallel Shank 'D' Bits

This procedure is similar to that given for the taper Shank 'D' bits with the exception that the cutter is locked in the holder with a socket head screw after it has been set-up in the gauge.

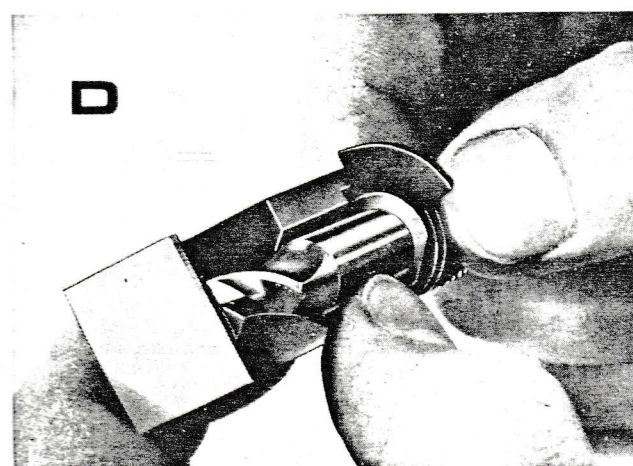
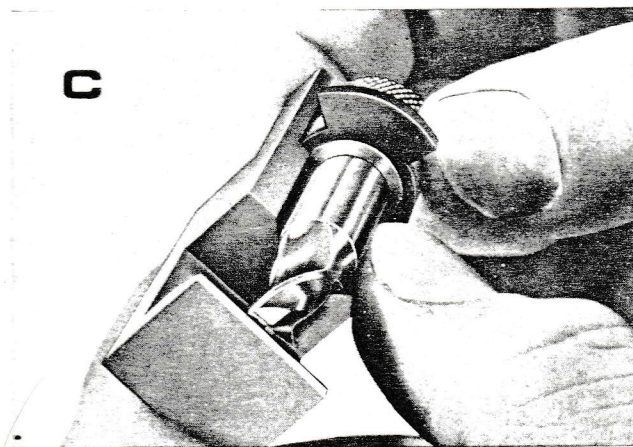
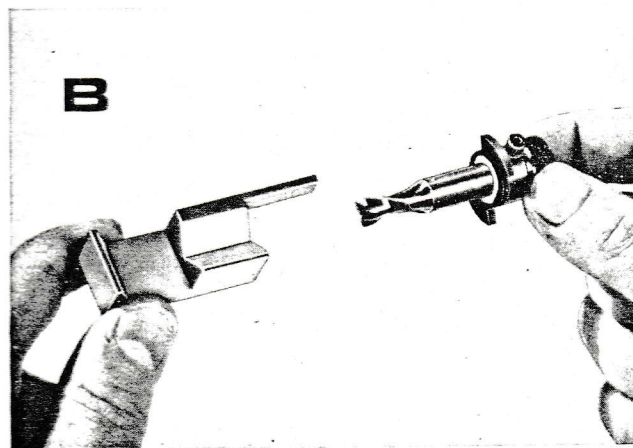
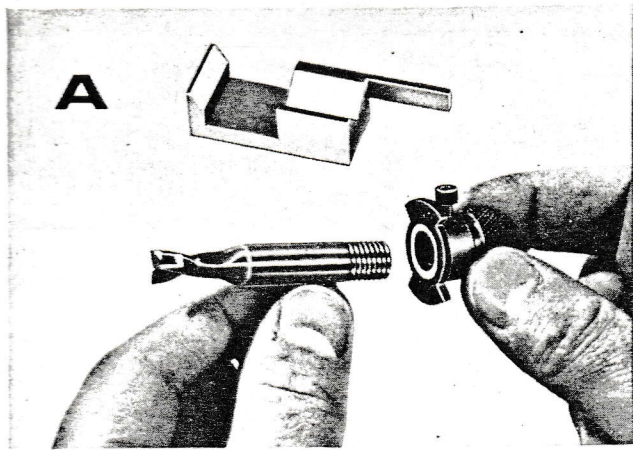


FIGURE 5

Slot Drill—Twin Flute Type (Figure 5)

- (1) Select the correct diameter cutter holder and locate a twin-lip cam on a $\frac{3}{8}$ inch diameter holder (Knurled). If the cutter is smaller than $\frac{3}{8}$ inch diameter, locate this holder on the appropriate size cutter holder and lock it in position with the socket head screw (Figure 6).
- (2) Load the cutter into the holder so that the cutter can freely rotate.
- (3) Locate the cutter and holder correctly on the setting gauge by locating the cutter so that one flute is aligned with the setting gauge edge (A Figure 3) as shown in Figure 5C.
- (4) Holding the cutter holder in the setting gauge, adjust it so that one lip of the stop cam is abutting against the setting fence (B Figure 3) as shown in Figure 5D.
- (5) Lock the cutter in position with the socket head screw.

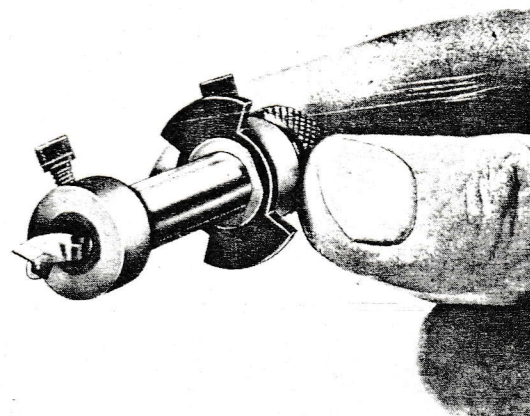


FIGURE 6

End Mill—Four Flute Type (Figure 7)

The setting-up procedure is similar to that given for the slot drill cutter with the exception that a four lip cam stop is used.

Note: Only the cutting end of spiral fluted cutters up to a maximum of $\frac{3}{8}$ inch diameter can be reground.

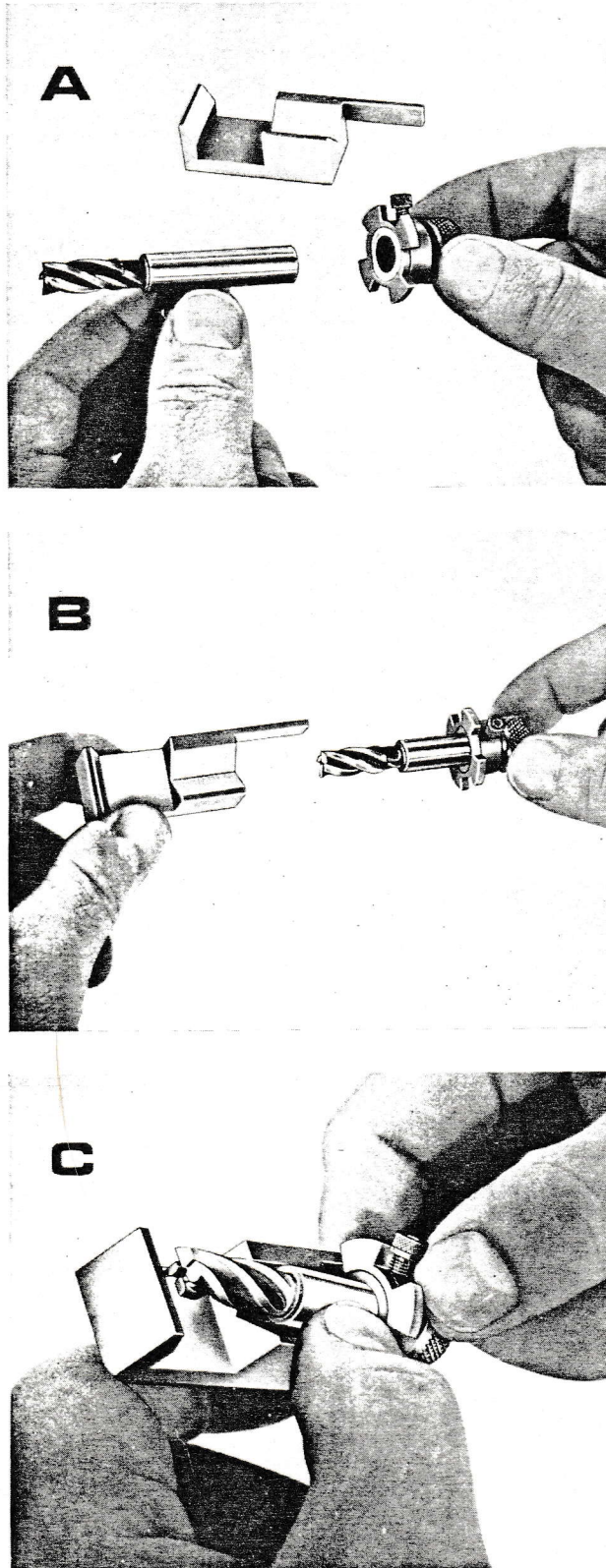


FIGURE 7

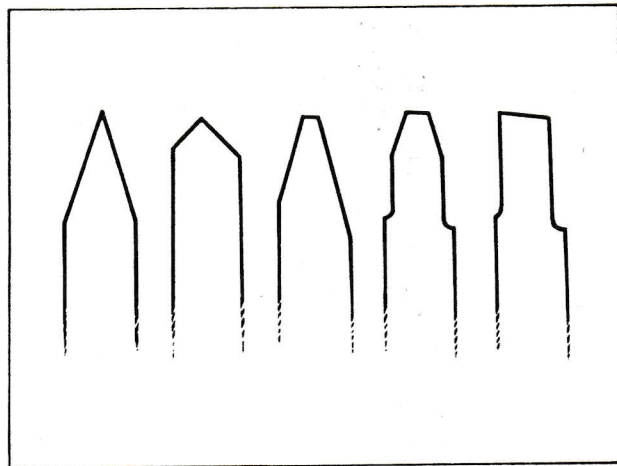


FIGURE 8

CUTTER SHAPES

METHOD OF GRINDING CUTTERS

A selection of engraving cutter shapes is shown on Figure 8 and the following features are common to all.

- (1) The cutting edge is on the left-hand side of the cutter axis as shown in Figure 8.
- (2) All parts of the cutter behind the cutting edge are ground away so that as the cutter revolves in a clockwise direction viewed from above, no part of the cutter other than the cutting edge makes contact with the work. To ensure this, use the cams marked 20, 24, 32 or 40 which are provided to give four angles of clearance. For grinding slot-drill or end-mill type cutters, twin-lip and four-lip cams are provided.
- (3) The point is truncated, this may be as small as 0.001-0.002 inch but it is essential even in the case of a 'pointed' cutter.
- (4) The flat of the cutter is on the axis as on the Axiflat cutter, or the point of the cutter is on the axis as on the Rigiflat cutter.

Grinding Pointed Cutters (Figures 9, 10 and 11)

- (1) Unlock the crutch clamp screw and adjust the crutch to the required cutting angle on the graduated scale then re-lock the clamp screw.
- (2) Locate the cutter holder in the 'Vee' section of the crutch (Figure 9) and rotate it anti-clockwise until the cam abuts against the stop pin (Figure 11).
- (3) Hold the assembly with the left-hand as shown in Figure 10, keeping the cutter holder firmly held in the 'Vee' section with the cam resting against the stop pin.

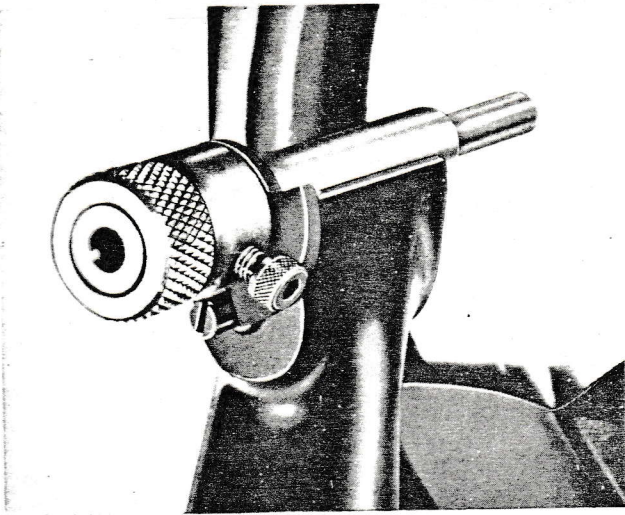


FIGURE 9

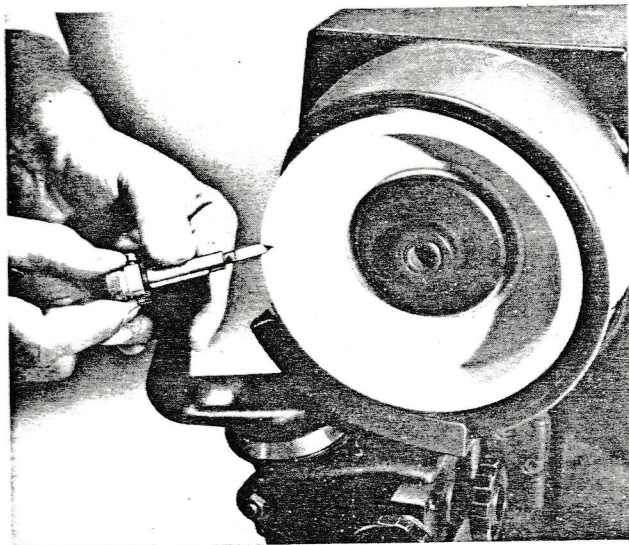


FIGURE 10

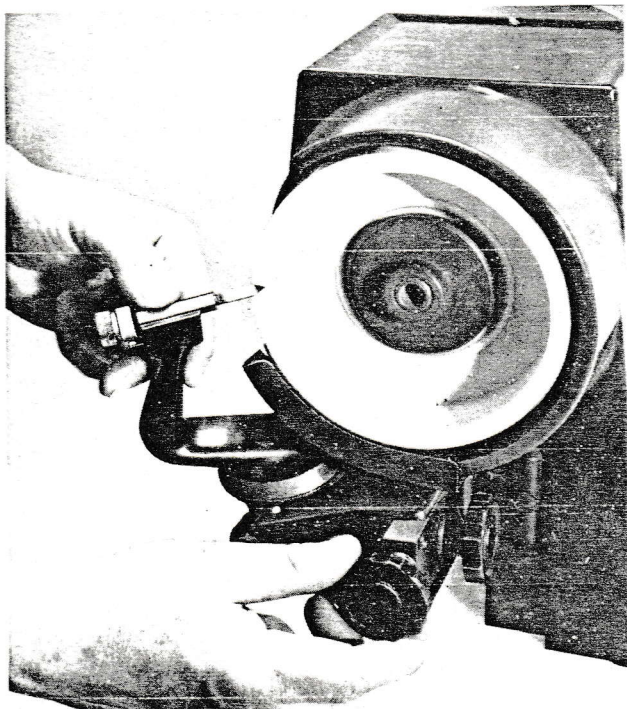


FIGURE 11

- (4) Rock the crutch forward with the left-hand and ensure that the cutter point passes clearly over the grinding face of the wheel. Adjustment of the two top screws may be necessary.
- (5) Holding the cutter holder as shown in Figure 11, switch on the machine and turning the feed screw with the right-hand feed the cutter in towards the grinding face.
- (6) Produce a series of flats on the curved surface of the cutter by rotating the cutter holder a little at a time in a clockwise direction whilst clear of the wheel and after each return movement of the crutch.
- (7) Continue grinding in this manner, returning the cam-stop to the stop pin before applying more feed, until the required dimension is reached.
- (8) Finally produce a smooth cone by rotating the cutter against the face of the wheel and applying sufficient feed to just take out the flats formed by previous grinding.

To Truncate Pointed Cutters

For broad lettering of shallow depth:

- (1) Unlock the crutch and set the graduated scale to position 'T' then re-lock the crutch clamp screw.
- (2) Keep the cutter holder pushed forward to the shoulder of the crutch and turn the holder anti-clockwise on to the stop pin.
- (3) Rock the crutch forward with the left hand about the face of the grinding wheel and operate the feed screw with the right hand. Grind the cutter to the required amount of truncation.
- (4) Remove the cutter from the holder.

Note: With a pointed cutter where the truncation is only a few thousandths of an inch, it may be more convenient to touch this off obliquely with an oilstone, maintaining clearance in two directions as given by the grinder.

To Grind a Parallel Cutter

- (1) Unlock the crutch clamp screw and set the crutch to the 'O' graduation or slightly beyond to give a back clearance, then lock the crutch with the clamp screw.
- (2) Hold the cutter as shown in Figure 11.
- (3) Proceed as instructed for pointed cutters until the required diameter is reached.
- (4) Unclamp the crutch, reset the angle to position 'T' and reclamp the crutch.
- (5) Grind off the end of the cutter obliquely.

To Grind a Two-Lip Cutter

Note: When setting up the cutter in the holder use a twin-lip cam.

- (1) Unlock the crutch clamp screw and set the crutch to the 0° or required angle on the graduated scale.
- (2) Set the cutter in the holder so that when one of the previously ground flat faces of the twin face cutter blank is aligned with the gauge setting face (A), Figure 3, one lip of the twin-lip cam abuts against the setting fence (B), Figure 3.
- (3) Hold the cutter firmly in the 'Vee' section of the crutch and rotate the holder anti-clockwise until the cam lip abuts against the crutch pin. Using the screw feed to feed-in, grind one side first and then the other until the required diameter is obtained.
- (4) Set the crutch angle to position 'T' and grind the end 'fish tail' as shown in Figure 12. Careful adjustment of the lower stop screw will prevent grinding beyond the cutter axis.

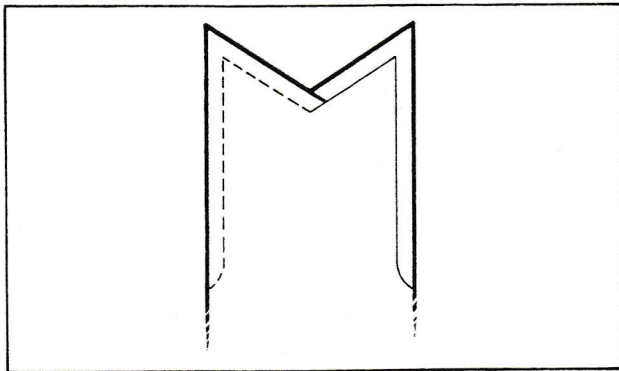


FIGURE 12 FISH TAIL CUTTER

To Restore the Point on a Rigiflat Cutter

- (1) Set the crutch at the special Rigiflat angle between '0°' and '10°' on the graduated scale.
- (2) Place the cutter holder assembly in the 'Vee' section of the crutch and rotate it clockwise until the cam abuts against the stop pin. The cutter flat should now be parallel to the wheel face.
- (3) Grind as before, rocking the crutch with the left hand and operating the feed screw with the right hand until the point or tip of the cutter coincides with the axis.

To Grind a Slot-Drill Cutter

Note: Setting operation can be varied slightly if so desired, depending on the clearance angle required.

- (1) Set the crutch to the midway position between 180° and 'T' on the graduated scale.
- (2) Locate the preset cutter and holder in the 'Vee' section of the crutch.
- (3) Rotate the cutter holder anti-clockwise until one lip of the cam engages the stop pin.
- (4) Adjust the top stop screw (Figure 1) to allow the crutch to pivot towards the centre line of the grinding wheel and adjust the bottom stop screw (Figure 1) limiting the outward movement of the crutch to suit the width of the tooth at the end of the individual flutes.
- (5) Switch on the machine and, using the feed screw to feed in, grind the end of the flute to the required amount.
- (6) Withdraw the cutter and holder from the 'Vee' of the crutch and re-locate it so that a different cam lip engages the stop pin.
- (7) Feed in and grind the second flute of the cutter to the required amount.

To Grind an End Mill Cutter

Note: Setting operation can be varied slightly if so desired, depending on the clearance angle required.

- (1) Set the crutch to position 'T' on the graduated scale.
- (2) Locate the preset cutter and holder in the 'Vee' section of the crutch.
- (3) Rotate the cutter holder in a clockwise direction until one lip of the cam engages the stop pin.
- (4) Adjust the top stop screw (Figure 1) to allow the crutch to pivot towards the centre line of the grinding wheel and adjust the bottom stop screw (Figure 1) limiting the outward movement of the crutch to suit the width of the tooth at the end of the individual flutes.
- (5) Switch on the machine and using the feed screw to feed in, grind the end of the flute to the required amount.
- (6) Withdraw the cutter and holder from the 'Vee' of the crutch and re-locate it so that a different cam lip engages the stop pin.
- (7) Feed in and grind the second flute of the cutter to the required amount.
- (8) The third and fourth flutes are to be ground in the same manner as the first and second.

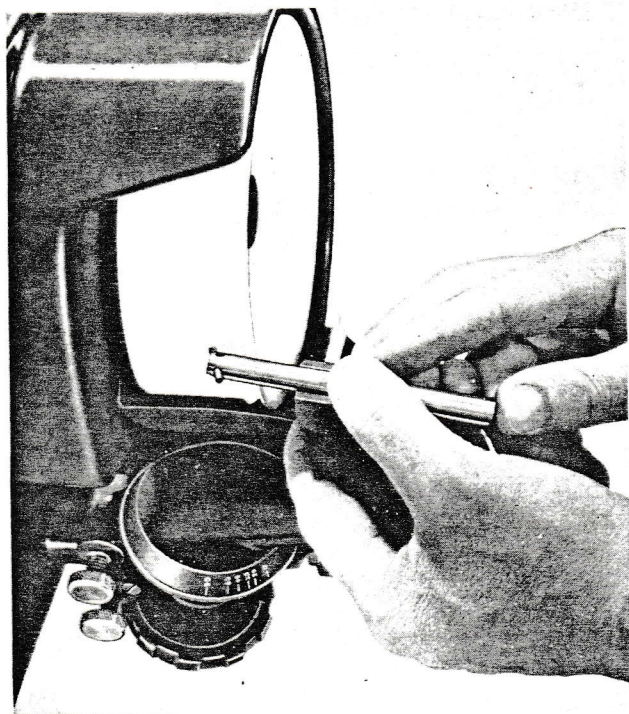


FIGURE 13



FIGURE 14

To Balance a New Grinding Wheel (Figures 13 and 14)

After a new grinding wheel has been fitted there may be slight vibration on the machine caused by the wheel being out of balance. This can be almost eliminated by dressing the inner and outer faces of the wheel with a diamond tipped tool provided with the machine, and is achieved as follows:

- (1) Set the crutch to the 180° position on the graduated scale.
- (2) Locate and hold the diamond tool in the 'Vee' section of the crutch set to dress the outer face of the wheel and feed the crutch in to within one inch of the wheel face.
- (3) Check that the diamond tool is aligned with the wheel surface by sliding it forward in the 'Vee' Section. Using the top stop screw (Figure 1) adjust the tip until it is within $\frac{1}{32}$ inch clearance of the wheel surface.
- (4) Switch on the machine and feed in by adjustment of the top stop screw. Only light cuts are to be made and on no account is the feed screw to be used for this operation.
- (5) Stop the machine and reverse the diamond in the holder.
- (6) Using the stop screw adjust the diamond tip to within $\frac{1}{32}$ inch of the inner face of the grinding wheel.
- (7) Switch on the machine and dress the inner face of the wheel using the bottom stop screw as a feed screw.

Note: Previous experience has shown that an alternative method of wheel balancing can be achieved by the use of a small amount of Plasticine approximately the size of a $\frac{1}{4}$ inch diameter sphere, being placed in a selected position on the inner periphery of the wheel until vibration is eliminated.

SECTION 3

MAINTENANCE

Only a limited amount of general maintenance is required to keep the machine in efficient working order.

GENERAL CLEANLINESS

After each operation of grinding cutting or milling tools, the machine should be brushed down with a soft bristle brush to ensure that no dust from the ground cutting tools builds up on the machine or penetrates onto the feed screw and slider arrangement.

LUBRICATION

This should be confined to a limited application of a suitable mineral base grease to various movable parts, which are as follows:

- (a) Upper and Lower Stop Screws.
- (b) Feed screw and slider.
- (c) Crutch and slider clamping screws.

Note: Care must be taken not to allow any lubricant to come into contact with the grinding wheel.

SECTION 4

SERVICING

This section details the servicing which can be done by the operator and that which should be done by an RTH Service engineer or an appointed agent.

OPERATOR

To Change a Grinding Wheel

- (1) Ensure that the main supply switch for the machine is off.
- (2) Hold the wheel to prevent rotation and, using the spanner provided, remove the wheel locking nut and the wheel flange.
- (3) Withdraw the wheel from the shaft flange.
- (4) Check that the set-screw in the shaft flange is fully tightened, clean any dust off the flange and fit the new wheel.
- (5) Replace the wheel flange with the recessed side facing inwards towards the wheel.
- (6) Replace and fully tighten the locking nut, holding the wheel against rotation.
- (7) Switch on the main supply and run the machine to check for wheel balance. If vibration is apparent, dress the inner and outer faces of the wheel as detailed in the operator's instructions.

To Change the Crutch

- (1) Remove the crutch clamp-screw handwheel and the $\frac{1}{2}$ inch diameter spring washer.
- (2) Remove the 'Truarc' retaining clip from the bottom end of the locking shaft.
- (3) Lift the crutch from its support.

- (4) Remove the locking shaft from the crutch, this may be stiff due to the stud being set in 'Loctite'.
- (5) Fit the stud of the locking shaft into the new crutch with 'Loctite' Grade 'C' and apply grease to the thread of the shaft and the mating faces of the crutch and its support.
- (6) Place the crutch assembly into its support and fit the retaining clip.
- (7) Replace the $\frac{1}{2}$ inch diameter spring washer and clamp screw handwheel.
- (8) Adjust the cam stop pin before grinding cutters.

To Adjust the Cam Stop Pin

Prepare a 'Trutaper' Shank 'D' bit for grinding as detailed in the operator instructions, then proceed as follows:

- (1) Unclamp the crutch locking screw and set the crutch to the 0° graduation on the scale.
- (2) Locate the holder in the 'Vee' section of the crutch with the cam turned fully clockwise and the cam lip resting against the stop pin.
- (3) Rock the crutch forwards towards the grinding wheel and at the same time feed in on the feed screw until the flat of the cutter passes over the grinding face of the wheel.
- (4) Adjust the cam stop pin so that the flat of the cutter is parallel with the grinding face of the wheel. Give the stop pin a sharp tap to ensure locking.

To Change the Slider Feed Screw (Figure 1)

- (1) Remove the feed screw handwheel.
- (2) Remove the engraved thimble from the feed screw.
- (3) Remove the set screw fixing the mounting bracket to the slider mechanism and remove the bracket.
- (4) Remove the Sel-Lok pin from the limiting collar on the feed screw and wind the screw out of the helicoil insert (left-hand thread). There is no need to remove the zero spacer as this has a clearance hole. Retain the limiting collar.
- (5) Drill the new feed screw to the dimensions shown in Figure 1 and fit the screw into the limiting collar and helicoil insert.
- (6) Adjust the collar until the holes are aligned with those in the feed screw and insert the pin.
- (7) Check that the zero spacer is in position and fit the graduated thimble. This must be fully tightened when aligned to the zero position.

- (8) Fit the feed screw handwheel.
- (9) Grease the slider mechanism with a suitable mineral base grease.
- (10) Replace the crutch mounting bracket and tighten the set-screw.
- (11) Replace the crutch assembly into the centres of the mounting bracket.

RPI SERVICE ENGINEER OR AGENT

Servicing is confined to the fitting of a replacement drive motor and rotary switch, which must be wired with reference to the wiring diagram given on Figure 15. Care must be taken to ensure that the correct motor is fitted for the relevant supply voltage and the direction of rotation is anti-clockwise when viewed from the wheel end of the machine.

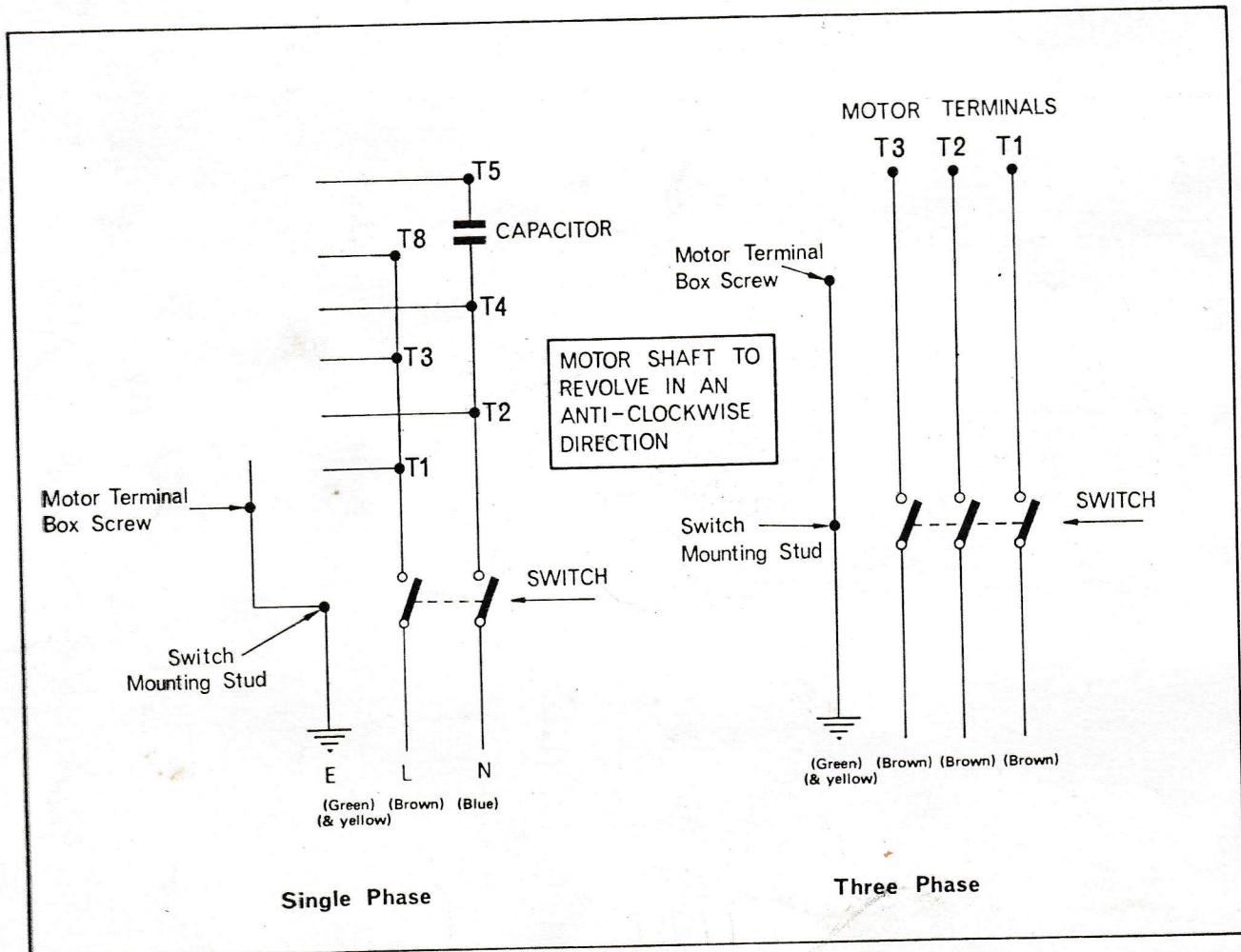


FIGURE 15 WIRING DIAGRAM