

AUTOOL GRINDER

IF THE PLATE ILLUSTRATED BELOW IS NOT FIXED ON YOUR MACHINE IN A PROMINENT POSITION, PLEASE REQUEST ANOTHER AND ENSURE IT IS FITTED.

**WARNING — DANGER**

THIS IS A GRINDING MACHINE. IT WILL WORK BETTER AND LAST LONGER IF IT IS REGULARLY CLEANED AND LUBRICATED.

CARELESS OR INCORRECT USE COULD BE DANGEROUS.

READ AND UNDERSTAND THE INSTRUCTION BOOK BEFORE OPERATING IT.

DISCONNECT THE POWER SUPPLY AT SOURCE BEFORE REMOVING ANY COVERS, GUARDS, OR PANELS.

DO NOT COVER OR REMOVE ANY NOTICES FROM THIS MACHINE.

NOTE THE VARIOUS SAFETY POINTS GIVEN BELOW AND IN THE TEXT AND OBSERVE THEM WHEN OPERATING THE MACHINE.

MAKE SURE THAT THE MACHINE IS ELECTRICALLY EARTHED - GROUNDED.

ISOLATE THE MACHINE ELECTRICALLY BEFORE TOUCHING OR CHANGING A WHEEL, WHEN SETTING UP AND WHEN CLEANING THE MACHINE.

FOLLOW THE SAFETY INSTRUCTIONS WHEN CHANGING A WHEEL. AFTER SWITCHING THE MACHINE OFF WAIT UNTIL THE WHEEL COMES TO REST BEFORE MAKING ANY ADJUSTMENT.

MOVE THE CUTTER AWAY FROM THE GRINDING WHEEL WHEN SETTING UP, CHANGING A CUTTERHEAD, AND WHEN DRESSING THE WHEEL.

WHEN IN THE AREA AND WHEN USING THE MACHINE WEAR SUITABLY APPROVED GOGGLES OR A VISOR.

NEVER RUN A GRINDING HEAD UNLESS ALL THE GUARDS ARE IN PLACE.

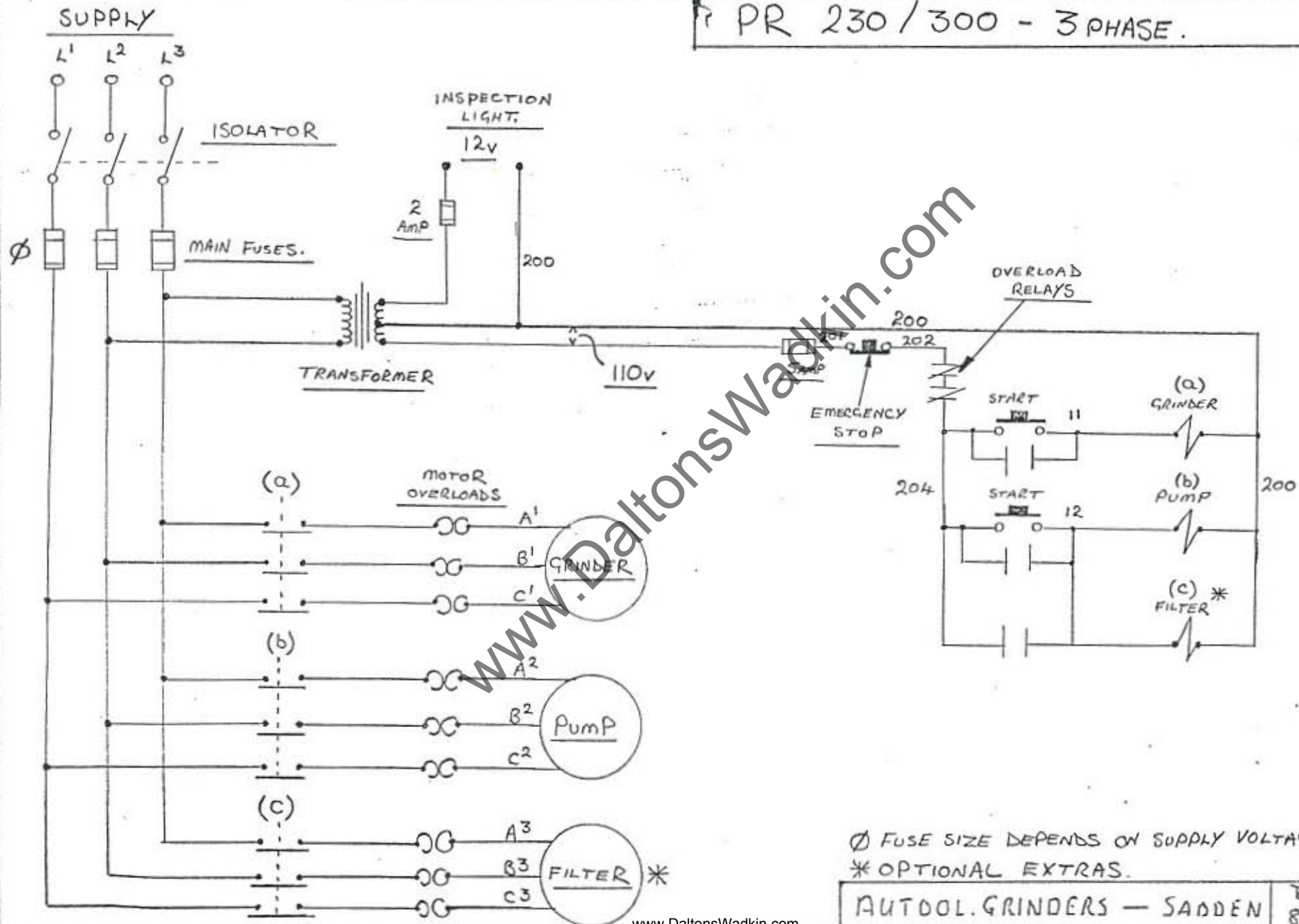
CHECK THE WHEEL FOR CLEARANCE AND THE GUARDS FOR SECURITY BEFORE STARTING UP.

GRIND WET, BUT DO NOT RUN COOLANT AGAINST A STATIONARY WHEEL.

KEEP THE FLOOR AROUND THE MACHINE CLEAR AND FREE FROM SCRAP PIECES, SAWDUST, OIL, GREASE AND WATER.

READ AND FOLLOW THE INSTRUCTIONS GIVEN IN THIS MANUAL, AND WORK IN ACCORDANCE WITH GOOD SAFETY AND OPERATIONAL PRACTICES.

PR 230 / 300 - 3 PHASE.



Ø FUSE SIZE DEPENDS ON SUPPLY VOLTAGE.

\* OPTIONAL EXTRAS.

AUTOOL. GRINDERS - SADDEN

DRK  
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AUTOOL PROFILE GRINDER MODEL PR 230Technical Specification

Grinding wheel diameter	230 mm ( 9 in.)
Grinding wheel width	5 mm
Grinding wheel bore	1½ in.
Grinding wheel motor	1 hp ( 1½ hp on request)
Maximum traverse	Model PR 230 (240mm 9½ in.)
Maximum traverse	Model PR 300 (310 mm 12½ in.)
Maximum cutting circle	250 mm (10 in.)
Minimum cutting circle	100 mm ( 4 in.)
Coolant tank capacity	70 litres
Overall height	1600 mm (5ft 3 in.)
Working width	2460 mm (4ft 9 in.)
Working depth	1000 mm (3ft 3 in.)

ATTENTION - Safety Precautions

Note the various safety points given below and in the text and observe them when operating the machine.

Make sure that the machine is electrically earthed - grounded.  
Isolate the machine electrically before touching or changing a wheel,  
when setting up and when cleaning the machine.

Follow the safety instructions when changing a wheel. After switching the machine off wait until the wheel comes to rest before making any adjustment.

Move the carriage away from the grinding wheel when setting up, changing a cutterhead, and when dressing the wheel.

Gently lower the cutterhead assembly on to the machine. DO NOT DROP.  
Take care that hands and fingers are not trapped.

Do not fully tighten a cutter nor loosen it from fully tight whilst the cutterhead is on the grinding machine. Fully tighten prior to fitting using a setting stand.

When in the area and when using the machine wear suitably approved goggles or a visor.

Never run a grinding head unless all the guards are in place.

Check the wheel for clearance and the guards for security before starting up.

Grind wet, but do not run coolant against a stationary wheel.

Note that the wheel is of vitrified bond which by its nature is hard and brittle. Because of this, and its thickness, exercise caution when applying side pressure.

Keep the floor around the machine clear and free from scrap pieces, sawdust, oil, grease and water.

Read and follow the instructions given in this manual, and work in accordance with good safety and operational practices.

## INTRODUCTION

The machine is designed for grinding square or circular head cutters used on moulders, spindle moulders, shapers etc. The machine uses a template formed to the reverse of the mould profile required and accurately forms cutters to the correct profile each time they are ground - without reliance on traditional grinding skills. Accuracy and repeatability of profile is guaranteed regardless of the cutting angles or the style and pattern of the cutterhead.

There are two basic essentials in cutter grinding. The first is to remove the least amount necessary to form and restore the cutting edge - otherwise cutter life is needlessly wasted. The second is to produce a fine ground finish which experience shows is essential to long machine life. These conditions are difficult to meet even with the most careful hand grinding, but easily met on Autool profile grinders as fine screw adjustment of the cut is provided, and template control allows full spark-out of the grind to give an excellent finish.

In emphasising that less skill is required to profile grind using Autool grinders, it would be imprudent to employ an operator without previous grinding knowledge or skills. The use of these machines still requires traditional skills in cutter selection, fitting and grinding.

The method recommended is to grind cutters in the actual cutterhead as this gives greater accuracy of one cutter to another in radial height and alignment than is possible with hand setting. Cutters are balanced before fitting and remain in balance when ground on a profile grinder. The main and side clearance angles can be varied but do not then alter with wheel wear. Whilst cutters can be ground with absolutely equal radial height, this does not guarantee that all cutters will register on the finished surface without first jointing. Grinding in the head gives a narrower heel when jointed, and a better finish if cutters are not jointed.

NOTE - we reserve the right to improve Autool machines as our policy of continuing development demands. For this reason your machine may vary in appearance or dimensions from that shown in this manual.

## FITTING THE MACHINE

To lift the machine place suitable rope slings at each side under the suds tray and bring one end of each to the front of the machine, making sure that the slings pass on the inside of the elbow rest. With linear traverse table machines brace slings at the front to avoid contact with the table when lifted. Move the table to its maximum inward position and block the table movement before attempting to lift the machine. Make sure that the machine rides level when lifted.

Place the machine on a solid floor adjusting screws in the machine base to level it, using a level on the machine arbor and on the stylus vee-way. On a concrete floor grout the machine in position with liquid cement. After allowing time for the grout to set, completely tighten the bolts and again check for level.

## ELECTRICAL DETAILS

The electrical cabling between motors and control gear is completed before the machine is despatched, leaving a short lead from the isolator only for test purposes. Using approved cabling, connect the isolator to the factory supply via a junction box or an approved 3 phase plug and socket.

The colour codings are either :-

- |                      |                  |
|----------------------|------------------|
| 1 cable green/yellow | - earth (ground) |
| 3 cables brown       | - live (hot)     |

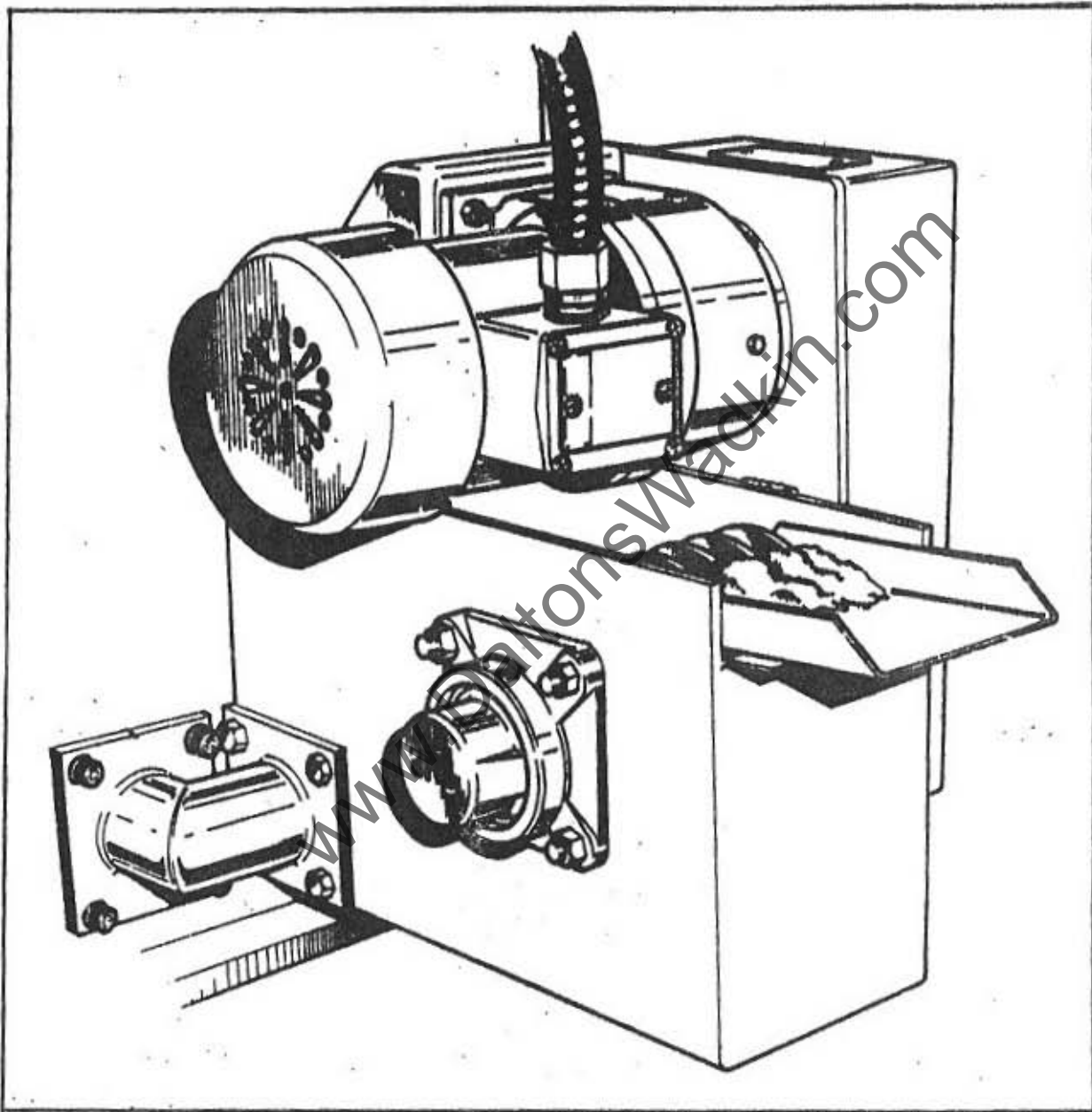


Fig. 1 Magnetic coolant filter (optional)



## Electrical Details - continued

or

1 cable green/yellow	- earth (ground)
1 cable brown	- live (hot)
1 cable black	- live (hot)
2 cable blue	- live (hot)

Check that the cabling and fuses of the main distribution board correspond to the details on the machine electrical plate. Make sure that the machine is correctly earthed (grounded).

It is essential that the grinding wheel grinds in a downward direction, i.e. clockwise rotation when viewed from the drive side of the grinding wheel. If this is not the case reverse any two connections of the live (hot) cables. The pump motor is internally wired prior to despatch and should have correct rotation when the grinding wheel is correct. However, check rotation, noting the directional arrow.

STARTING AND STOPPING THE MACHINE

The controls are

Push button to start the grinding wheel motor (Note safety precautions).

Push button to start the coolant pump

(do not run pump with the wheel stationary).

Push button to stop both motors

(Automatic lock-off turn or pull outwards to release before starting motors)

Isolator

(For safety reasons isolate the machine before setting up)

GRINDING COOLANT

The coolant tank should be filled with coolant consisting of a soluble oil and water mix. This can be poured into the suds tray. Add oil to the mix as recommended, usually in a ratio of one part soluble oil to 25 parts water. Replace coolant by a fresh mix every 2-4 weeks. AUTOOL supply a suitable concentrated soluble oil but the following are also suitable.

Shell - MEx and BP  
Shell Dromus 10  
Solvac Clear  
Vacuum Oil Co.

The U.S. equivalent is Mobilmet No. 140 but this is a milky fluid. We recommend the use of clear fluids as with these the cutter rest and cutter are clearly visible.

NOTE - the coolant tank has gravity separation of solid waste and needs cleaning out at regular intervals perhaps when replacing the coolant. We can, if required, supply a magnetic coolant filter as an optional extra.

Before grinding make sure that the coolant pipes are set and adjusted to flood the upper and lower faces of the cutter with an adequate supply of coolant. The object is to prevent overheating rather than cool the cutter after this has overheated. Take particular care when grinding tungsten carbide tipped cutters that adequate coolant is supplied.

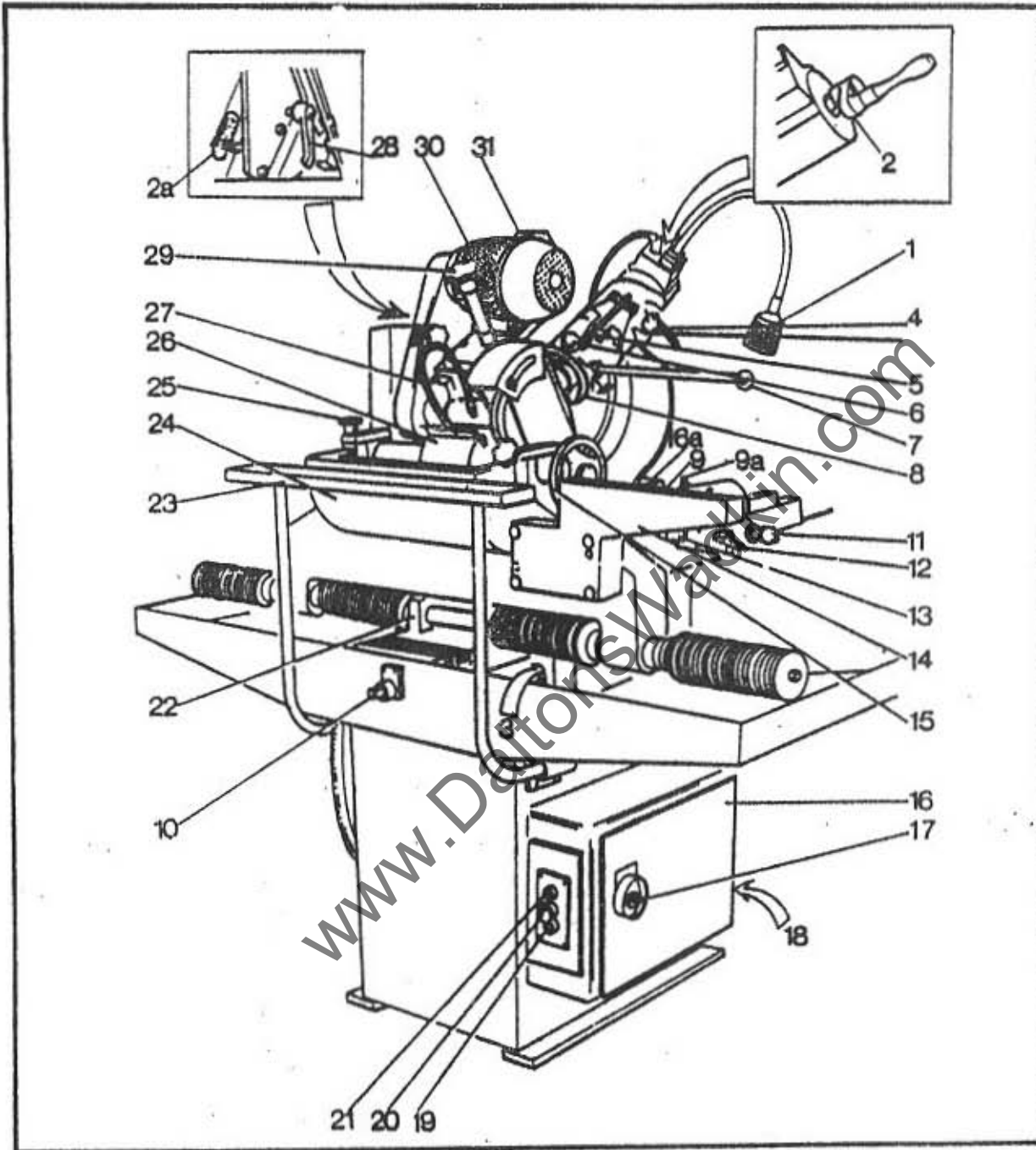


Fig. 2 Au tool PR300A



AUTOOL PROFILE GRINDER - MODEL PR 230A ✓  
PR 300 A

1. Spot Light.
2. Crank handle for adjusting grindstone relative to wheel dresser (coarse)
3. Hexagon clamping nuts for carriage.
4. Locking lever for side clearance.
5. Index plate.
6. Index plunger.
7. Tilt handle.
8. Handwheel for adjusting grindstone relative to wheel dresser (fine).
9. Template
- 9a. Stylus pin.
10. Adjusting screw for carriage.
11. Handwheel for lateral adjustment of stylus.
12. Locking lever for lateral adjustment of stylus.
13. Handwheel for cross traverse movement of stylus.
14. Template carrier.
15. Cutterblock arbor handwheel.
16. Electrical control cabinet.
17. Disconnect switch.
18. Electrical mains conduit entry hole.
19. "START" push button - coolant pump motor.
20. Master "STOP" button
21. "START" push button - wheel head motor.
22. Adjustable carriage shaft support.
23. Adjustable steady.
24. Hand-controlled cutterblock carriage.
25. Handwheel for cutterblock arbor clamp.
26. Cutterblock.
27. Coolant pipe
28. Locking lever for rise and fall adjustment.
29. Rise and fall handle.
30. Grinding wheel drive motor.
31. Terminal box for electric motor.

NOTE: AUTOOL MODELS PR 230H and PR300H have a linear table but are otherwise generally as sketch opposite.

CONTRA PROFILE

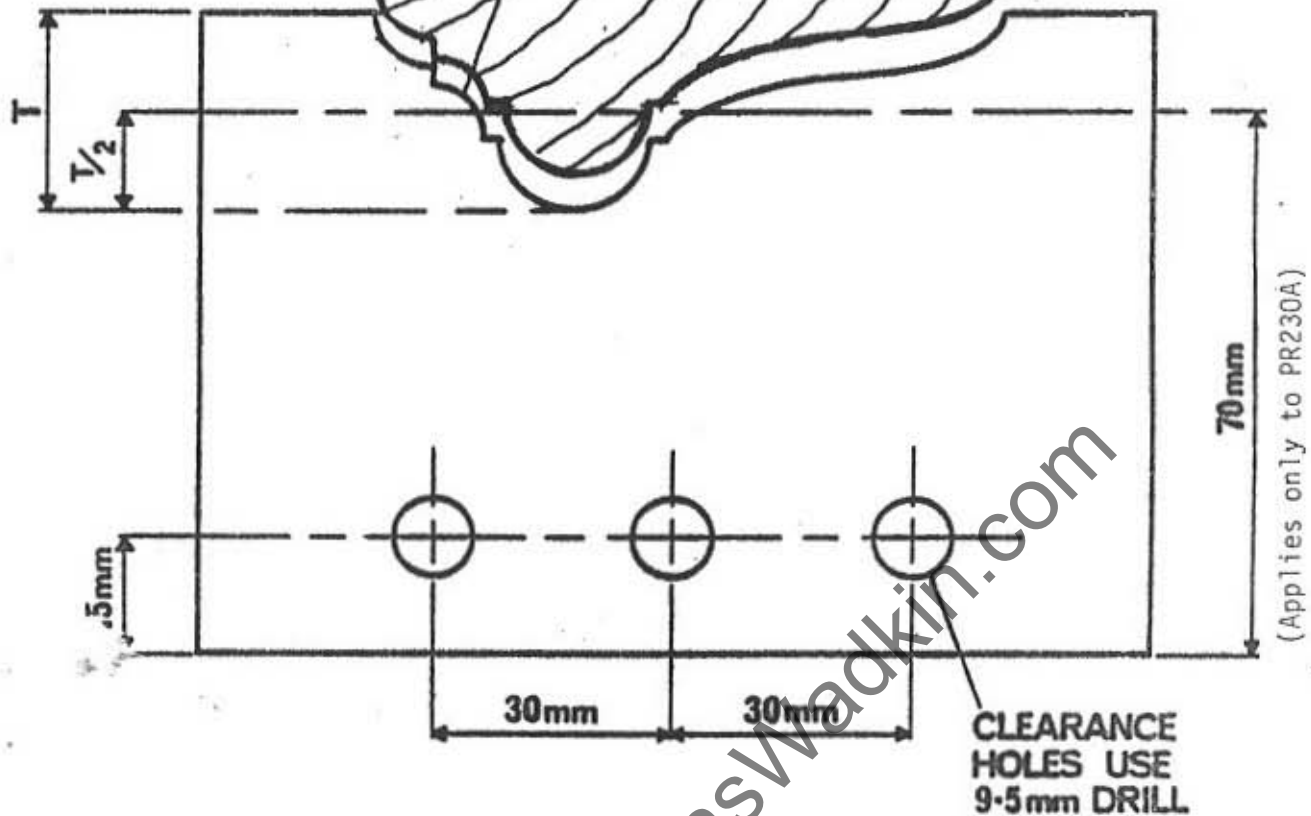


Fig. 3

Fig. 4

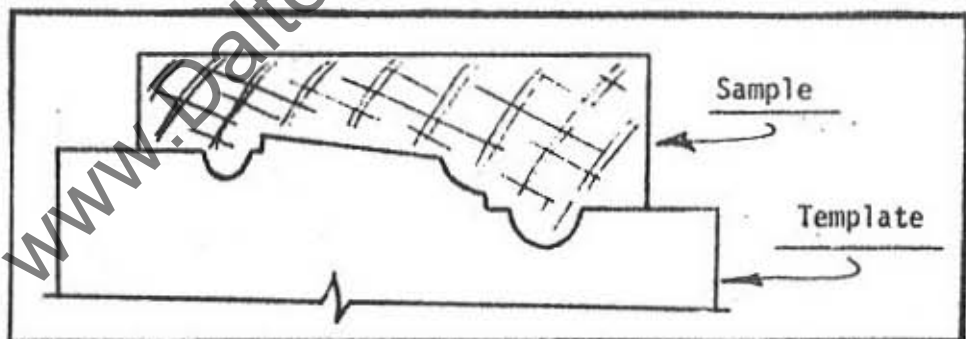
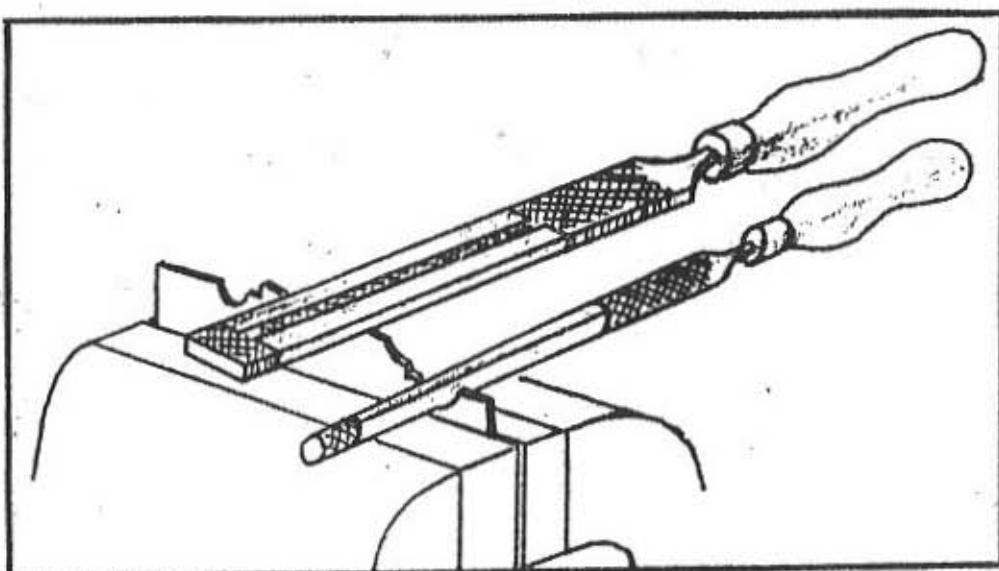


Fig. 5



## TEMPLATE PREPARATION

To produce templates certain basic items are necessary.

- 1 - Blank, drilled templates (Autool can supply)
- 2 - Workbench with soft-jawed vice
- 3 - Suitable grinder for roughing-out, preferably with a thin cut-off wheel to vee-out large sections.
- 4 - A fine metal-cutting bandsaw, jigsaw or hacksaw. ~~X~~
- 5 - Complete set of rough and fine-cut files of various shapes. ~~X~~
- 6 - Engineers blue ~~X~~ *W*
- 7 - Engineers scriber ~~X~~
- 8 - Good quality steel rule, steel square, engineers protractor, circle and curve guides
- 9 - Fine emery cloth.

*yisor.*

Make templates from drilled Autool blanks to the reverse of the mould required and at least  $\frac{1}{4}$  in. (20 mm) wider than the cutters to be used. Before marking out the template check that the back edge is true. If not, flat-file as necessary. Also check that both ends are square and true. The template is easier to prepare if first coated with engineers blue. Use the scriber to mark guide lines such as minimum and maximum mould depth, fence and bed lines and finally the profile itself. Finally re-coat the template and clean out the mould profile lines only to avoid mistakenly grinding to guide lines.

## TEMPLATE MARKING

The template is fastened by socket-head screws through drilled holes in it, so sideways movement can only be made in 30 mm steps. Fine screw adjustment of the stylus provides final alignment.

Fasten the template temporarily in position and mark traverse of the carriage on it. Do this by centralising the stylus width-wise and marking the template opposite this when moved to the extreme positions left and right. Form the mould profile at any position between these lines. Scribe lines corresponding to the cutterblock width and the fence or bed lines. These dimensions will vary with the width of cutterblock and so record them for future use.

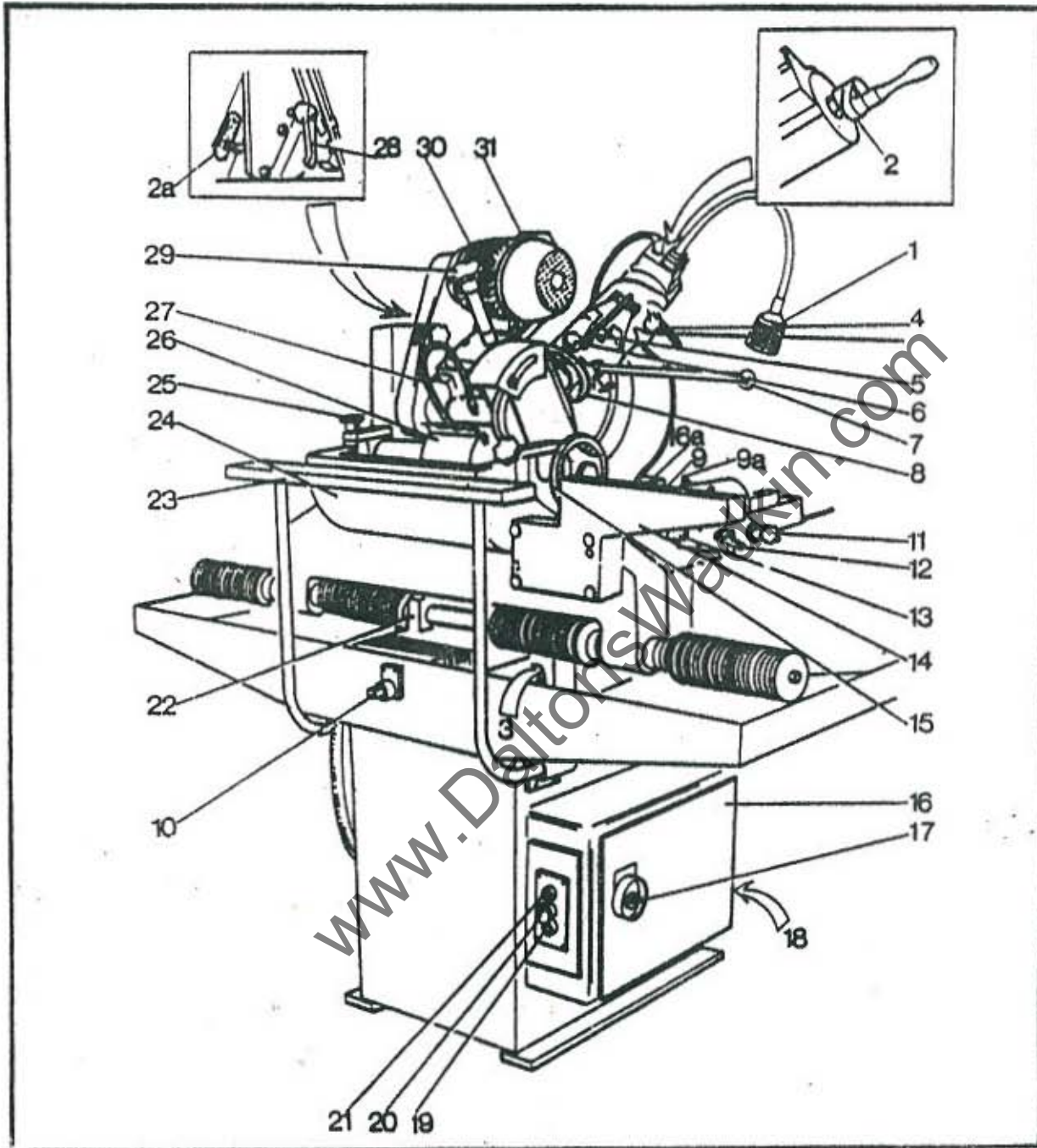
If the dimension from the end of the cutterblock to the fence or bed line of the moulder has not previously been noted, do this now. Fit all heads on the moulder and set all cross-traverse movements to the mid setting. If the outfeed fence adjusts, set this to the average fence-side depth of cut. Carefully mark the fence line on the horizontal cutterblocks and the bed line on the side cutterblock.

Scribe a centreline 70 mm from and parallel to the back edge of the template, then set-out the mould equally on each side of this. The mould profile must be seen as though from the outfeed end of the moulder and with the bed or fence lines corresponding to those already marked on the template. Fig. 3.

When using a drawing, paste a full size copy of this on the template. If using a sample, first square-cut this then place it end-on the template and scribe around it's profile.

Grind, saw or file the template to shape taking great care to make the profile accurate and true as irregularities show prominently both on the finished cutter and on the mould. Finish-off to a smooth edge using fine emery cloth backed up by a shaped file to avoid distorting the profile then burnish the edge as a final operation. Figs. 4 & 5.





### FITTING THE CUTTERBLOCK

Select the correct arbor. Individual arbors are needed for different bore sizes. Autool can supply arbors to any requirements. Remove the end handle and loose bearing. Fit the cutterblock and secure in place between the fixed and screw-adjusted collars or by the self locking mechanism of the cutterblock. Replace the outer bearing and the end handle.

Cutterblocks must repeat the same setting on both moulder and grinder each time fitted. Align cutterblocks on the grinder as described later. All end clamped types repeat their position on the moulder arbor but variation is possible with integral and hydraulically clamped cutterblocks. Before securing these take care to butt them against a shoulder or spacer on the moulder arbor. After fitting the cutterblock clean the bearings and seatings then gently lower the cutterblock arbor assembly into the support. Set the arbor so that the locating collar close to the handwheel butts against the outer face of the support.

NOTE - The arbor handwheel can be either to the right or left-hand end of the arbor as preferred. Determine which position before making templates.

### PRE-SETTING CUTTERS

Select and fit suitable balanced cutters to form the mould required. Cutters can be fitted and fully tightened on a setting stand prior to fitting the head on the grinder. Alternatively cutters can be set on the grinder but should not be fully tightened - to do this transfer the head to a setting stand. In both cases balance blank cutters before fitting them, then ensure that they are set absolutely in line laterally and project by exactly the same amount. In subsequent grinding the same amount of metal will be ground off all cutters, so the cutterhead, once balanced, will remain in perfect balance. See later instructions for setting cutters on the grinder.

### CARRIAGE ADJUSTMENT

The carriage is free-floating, with a horizontal lateral movement (side-to-side) and an arcuate or linear cross-movement (in and out). The complete unit also adjusts towards or from the grinding wheel via the crank handle on the square-ended adjusting screw (10). and secures by two screws from underneath (3). Adjust the unit as necessary, i.e. to feel balanced during grinding when of the arcuate-movement type or to give working movement when of the linear type. This position varies according to the planing diameter of the cutterblock and is approximately correct when the scale setting equals the planing diameter.

Set the arm support so that when the carriage is back against it there is working clearance to operate the grinding wheel dresser.

### STYLUS ADJUSTMENTS

Lateral adjustment via handwheel (11) is secured by lock (12) and is used to align the template and cutterblock width-wise. Move the carriage laterally so that one end of the cutterblock approximately lines up with the grinding wheel, then fit the template so that the cutterblock end line on it is opposite the stylus (9A). Set the stylus to its central position width-wise then adjust the position of the cutterblock on its arbor so that the cutterblock, grinding wheel, stylus and template are correctly aligned. Fig. 6.

The cross traverse adjustment (13) of the stylus is used to control the grinding cut. When regrinding use this to progressively increase the grind until all cutting edges are restored. It can also be used in this way when grinding blank cutters. Normally, though, the stylus is pre-set to grind the full depth of profile without further adjustment. To do this first dress the grinding wheel, then cross-adjust the stylus so that this barely clears the deepest point of the profile on the template when the cutter rests on the support and just touches the grinding wheel.

### STYLUS PROFILE

The stylus profile must match that of the grinding wheel. The regular stylus can be used with either a half-round or square-section grinding wheel. On current machines the stylus is secured from the front by a screw and is self-aligning. The original type is secured by a screw from the underside and can be turned to use either the square or half-round profile but, before securing, square-up the stylus using the end of the template as a guide. To replace the stylus, remove the securing screw and lift out.

### MOUNTING THE GRINDING WHEEL

Remove the grinding wheel side guard, also the nut and outer flange from the arbor. Clean all mating faces. Check the grinding wheel for soundness by lightly tapping it with a piece of wood. A sound wheel has a clear ring whilst an unsafe wheel sounds cracked. Fit the wheel, if sound, with one compressive paper washer between the wheel and each flange, then secure in place. The arbor can be held by pegg spanner engaging in the drilled holes in the drive pulley (accessible by opening the drive guard).

### CAUTION

Grinding wheels should be an easy fit, never force them on to the arbor. Do not over tighten the wheel. Replace the guards before starting and check that the wheel is free to rotate. Allow a new wheel to run free under power for a few minutes with all personnel standing well clear. In the unlikely event of a grinding wheel breaking check the arbor, flanges and guard for damage before fitting another wheel. Take notice of safety regulations relating to grinding wheel usage.

### GRINDING WHEEL SPEED

The arbor has a two-speed drive of either 2880 or 2500 revs/min. The surface speeds of which are

Arbor Speed	Grinding wheel diameter			
	9"	7.3/4"	230 mm	200 mm
2,880	6,800	5,800	35	30
2,500	5,900	5,000	30	26
Rim Speed	ft/min		M/Sec.	

Normally new wheels run at the lower rotary speed and worn wheels run at the higher speed to maintain a rim speed of about 5900 ft/min (30 m/sec.)

**CAUTION** - Ensure that all grinding wheels have a maximum running speed in excess of 2880 revs/min.



## GRINDING WHEEL TYPES

**Regular Grit Wheels** - These are the most widely used types and are suitable for a wide range of high speed and similar tool steels. They are dressed and formed by the built-in dresser. Initially 9 in (230 mm) in diameter, they can be dressed down to about 6½ inch. (165 mm) before being discarded. Grinding wheels must be 5 mm thick and are available in 46/60 grit for roughing out and finish grinding, or in 220 grit for fine finishing and to form to square or angular sections. Normally the 46/60 grit wheel is used for the majority of grinding and the 220 grit wheel is used merely for finishing square and angular internal corners.

The grinding wheel specification is printed on the compressive washer as five groups of number and letter combinations.

Group	Identifies	Progression	Example Autool wheels	Other makes
One	Abrasive type	-	AA = Aluminium oxide.	May differ
Two	Abrasive size	8-large grain 600-small grain	46-46 grit size	Universal numbering
Three	Grade or bond strength	E - soft Z - hard	K = Medium grade	May differ slightly
Four	Structure	1 - close 15 - open	8= average structure	May differ slightly
Five	Bond type	-	V - vitrified bond	May differ slightly

As a general guide coarse-grit wheels (low number in Group 2 ) give a fast stock removal but a poorer finish, whilst fine-grit wheels (High Number) give a slow grind but a good finish.

Soft-grade wheels wear quickly but grind well. Hard bonded wheels wear very slowly but tend to glaze and require frequent dressing. An open-grade wheel is free-cutting and more suitable when there is a large contact area between grinding wheel and knife. A close-grade wheel is better when the contact area is small.

The knife itself must be taken into account, e.g. hard knives need soft-bonded wheels, and softer knives hard-bonded wheels. The steel specification also affects how a wheel grinds and this can vary widely.

## FORMED WHEELS

These are of diamond or C.B.N. bonded as a relatively thin layer on an aluminium body to half round, square, single or double angle profile and with a width of 5 mm or narrower.

Wear on these wheels is minimal when compared with regular-grit wheels. It is not practical to dress them as they wear, and if wear is uneven the cutter profile they produce may differ slightly from that required. The normal practice is to use worn wheels when roughing and new wheels for finish-grinding. Because these wheels are not aligned by dressing, manually adjust the grinding head to give a 0.020" (0.5 mm) gap between the wheel and the cutter support.

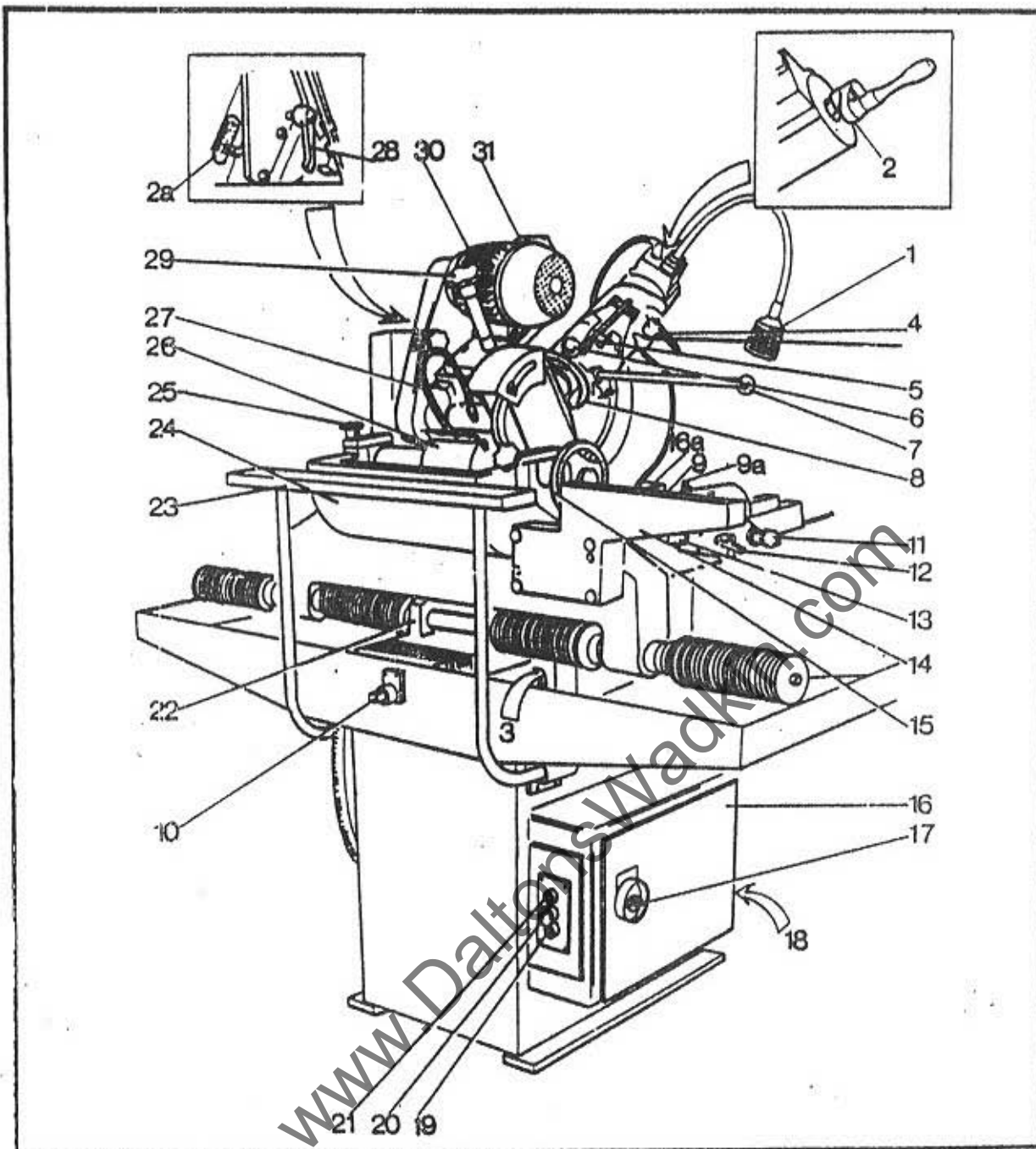


Fig. 7

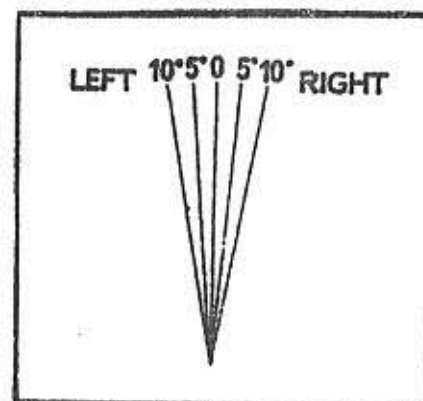


Fig. 8

## FORMED WHEEL TYPES

The following types are available:-

CBN	-	For HSS and other alloy cutters
Diamond	-	For tungsten carbide tips only, e.g. for forming brazed-on tips on solid profile cutterheads or loose carbide tips. Not suitable for conventional cutters with brazed-on facings.
Diamond Composition	-	For grinding both the tungsten carbide facing and the steel backing of conventional cutters. This is a special Autool wheel type.

Formed wheels are available in different grits and concentrations and this is shown in their identifying number, viz. 220-D-50 indicates a 220 grit diamond grinding wheel of 50 concentration (B instead of D indicates CBN). As with regular grit wheels the grit size dictates the quality and speed of grind possible. A low number gives a faster grind and a commercially acceptable finish, a high number gives a superior finish but a slower stock-removal rate. The concentration indicates the amount of diamond or CBN in the wheel. Whilst 50 concentration is normal in other applications, for wheels used in profile grinding it is usual to use 75 or 100 concentration. The additional number is for reference purposes. When ordering replacement wheels quote the full number and the wheel size, type and bore.

We strongly recommend the exclusive use of Autool formed wheels which have been developed expressively for profile grinding.

## GRINDING WHEEL STORAGE

Grinding wheels should be stored in medium temperatures (150° C) away from strong sunlight and where they are unlikely to be moved or subjected to damage. Some grinding wheels deteriorate with age and it is advisable to hold them in stock no longer than 12 months. Since many manufacturers have minimum order quantities which may exceed your 12 month requirements it is advisable to buy grinding wheels from ourselves or our agents, who have regular turnover and who are prepared to supply you in the quantities you require.

## GRINDING WHEEL ADJUSTMENTS

### MAIN CLEARANCE ANGLE

The main clearance angle is adjusted by handwheel (29) and is secured by lock lever (28). A scale (2A) shows the relative height of the wheel to the barrel centreline. For average conditions use the zero setting to give a clearance angle of approximately 27½ degrees. The stronger edge formed at lower settings is suitable for hard timbers or with cutterheads having a large cutting angle, e.g. square blocks. The weaker cutting edge formed at higher settings gives more clearance with soft, stringy timbers and allows more honing clearance. The clearance angle remains constant regardless of grinding wheel wear and gives a consistent gap between the timber and the cutter heel regardless of the type of cutterblock or its cutting angle.

### SIDE CLEARANCE ANGLE

The grinding head tilts on its barrel to position the grinding wheel vertically or to 5 or 10 degrees to either left or right. Use tilt handle (7) to tilt the head, index plug (6) to position it, and lock lever (4) to secure the barrel. Fig. 7 & 8.

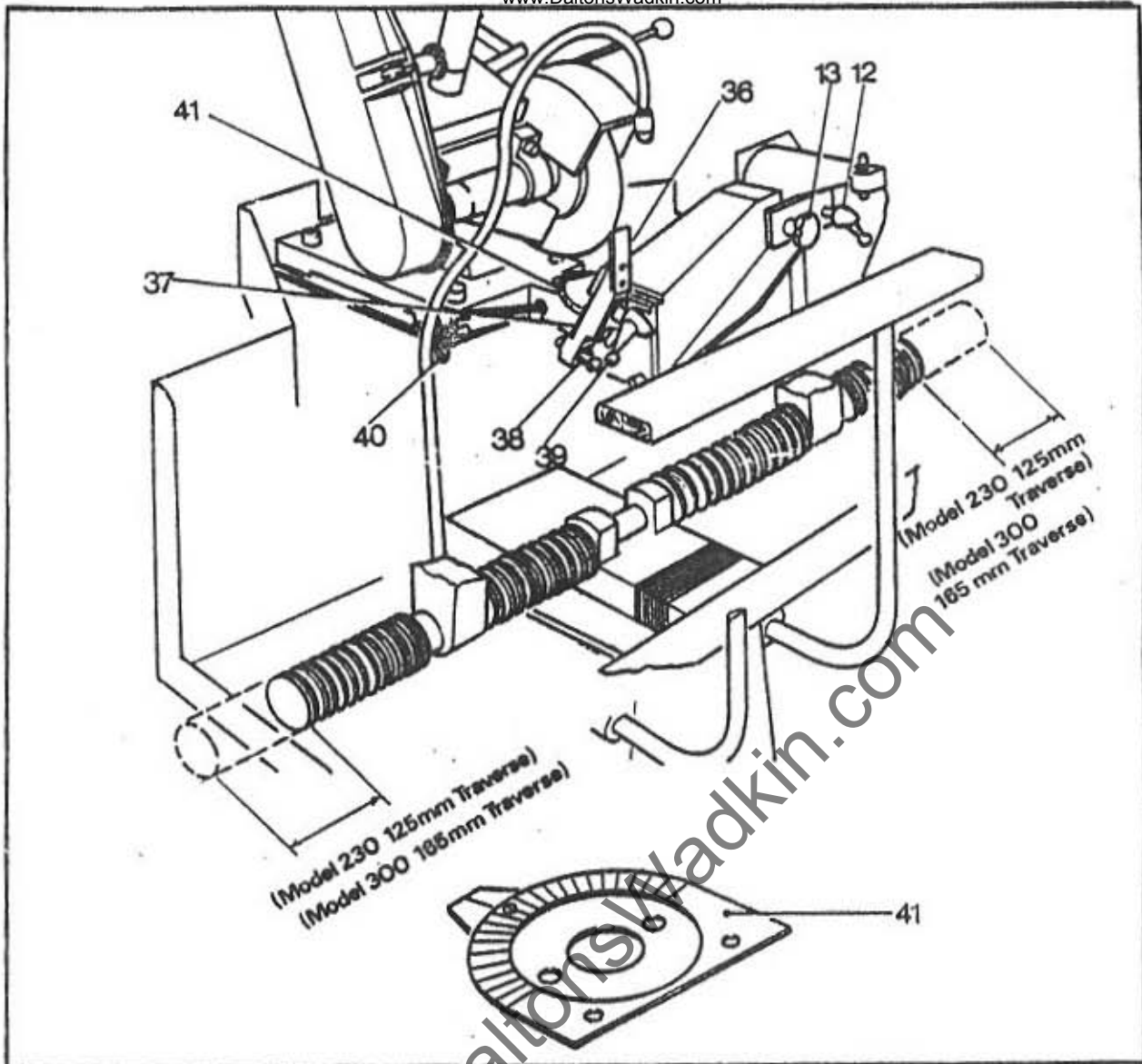


Fig. 9

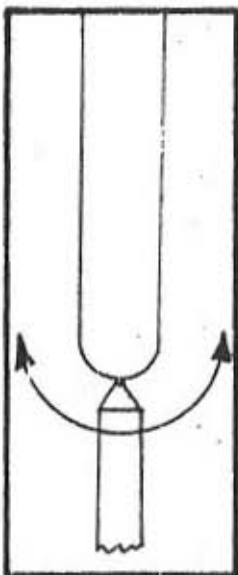


Fig. 10  
Half-round  
dressing.

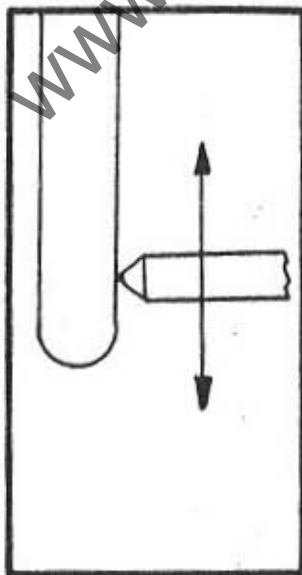


Fig. 11  
Side  
Dressing

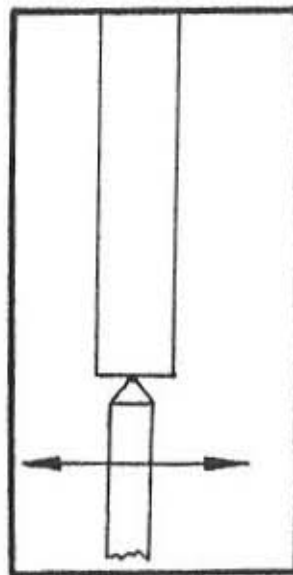


Fig. 12  
Square  
Dressing

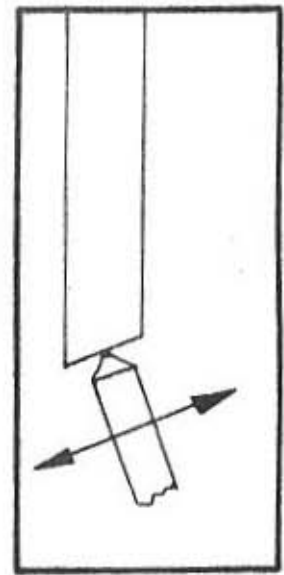


Fig. 13  
Angle  
Dressing

To adjust the head, first make sure that the locating lever is fully engaged. Apply downward pressure on the control lever to counter balance the weight of the grinding head, release the lock and the locating lever, tilting the head via the control lever. Re-engage the locating lever when at the correct tilt angle and lock.

In normal conditions 5 degrees side clearance is sufficient.

### DRESSING THE GRINDING WHEEL

Caution - wear eye protectors when dressing

Dress regular grit grinding wheels after fitting, after resetting the clearance angle, as necessary during grinding and always prior to the final grind. Fig. 7.

Dressing shapes the wheel, restores its cutting ability and precisely re-aligns it with the stylus.

The grinding wheel has screw adjustment towards the diamond via handwheel (8) when dressing, and rapid movement away from it to change the wheel using the crank handle on the square-ended screw (2). Lock (4) secures the barrel.

The diamond dresser is mounted on the dresser assembly at the opposite end to the cutter support. To use the dresser, release lock (39) and rotate the assembly (37) through 180 degrees checking that it is flush with the support at both sides before securing. When reverting to grinding rotate the assembly so that the cutter support is at the top and the assembly flush at both sides before securing. Make sure that the assembly is square-on, i.e. reading zero on scale (41). Lock (40) secures this movement.

The wheel can be dressed to half-round, square, single or double angle section. Before dressing make sure that the grinding wheel is vertical. Swivel or rotate the dresser through its full movement to ensure that it does not foul the wheel, adjusting the grinding head if necessary. Start up the grinding wheel and dress it, as described below, by slowly feeding the wheel until it is fully dressed. When dressing to a half-round or square section the wheel is automatically re-aligned to the stylus, so no further adjustment should be made to the setting of the grinding head other than adding side clearance. With single and double angle wheel sections the wheel will probably require adjustment after dressing to avoid fouling the cutter support.

### Half-round dressing

Set the dresser to the operative position and lock, then move the lock lever (39) to the horizontal position facing right (release by drawing it clear of the spline and turning). To dress, release lockscrew (40) and swivel the assembly through 180 degrees, gripping the tail-end of lock lever (39) to give easier control. Fig. 10.

Square dressing Set the dresser to the operative position but do not secure lock (39). Release lock (40), then swivel the assembly until the indicator is opposite centre zero, then secure. To dress, oscillate the dresser across the wheel. Fig. 11.

Double angle dressing. Set the dresser for the first angle as for single angle dressing. On completion re-set the swivel position to the second angle and again dress, but without re-adjusting the position of the grinding head.



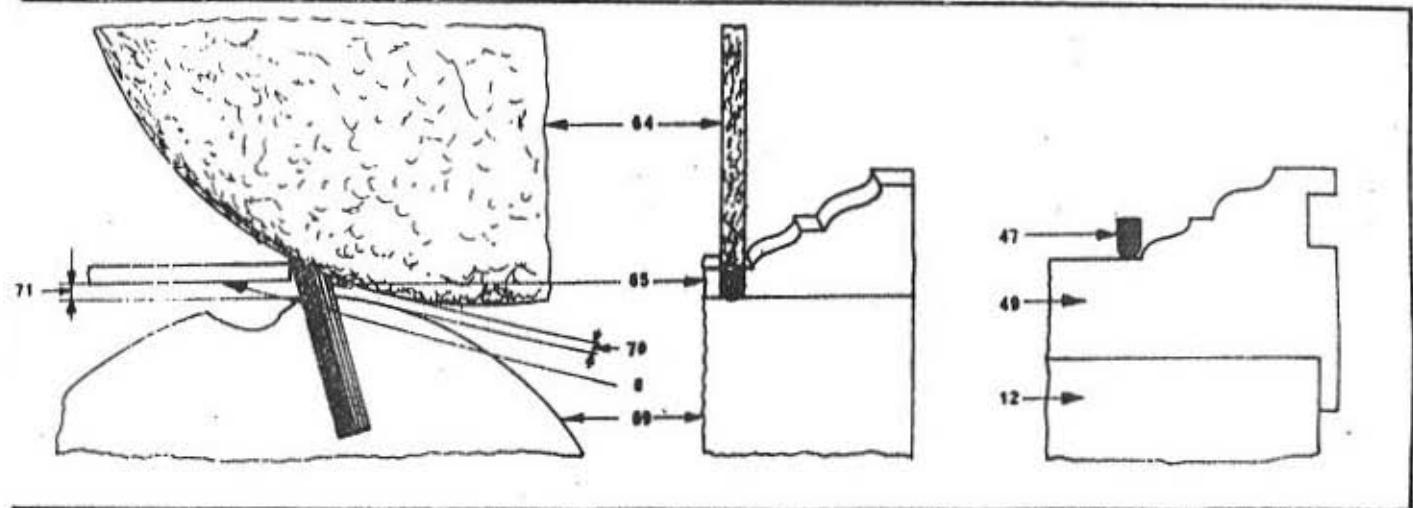


Fig. 14

Checking Cutterblock Clearances

- 64 Grinding Wheel
- 65 Cutter
- 69 Cutterblock
- 70 Cutterblock/grinding wheel clearance
- 71 Cutterblock/cutter support clearance
- 47 Stylus
- 49 Template
- 12 Template Clamp

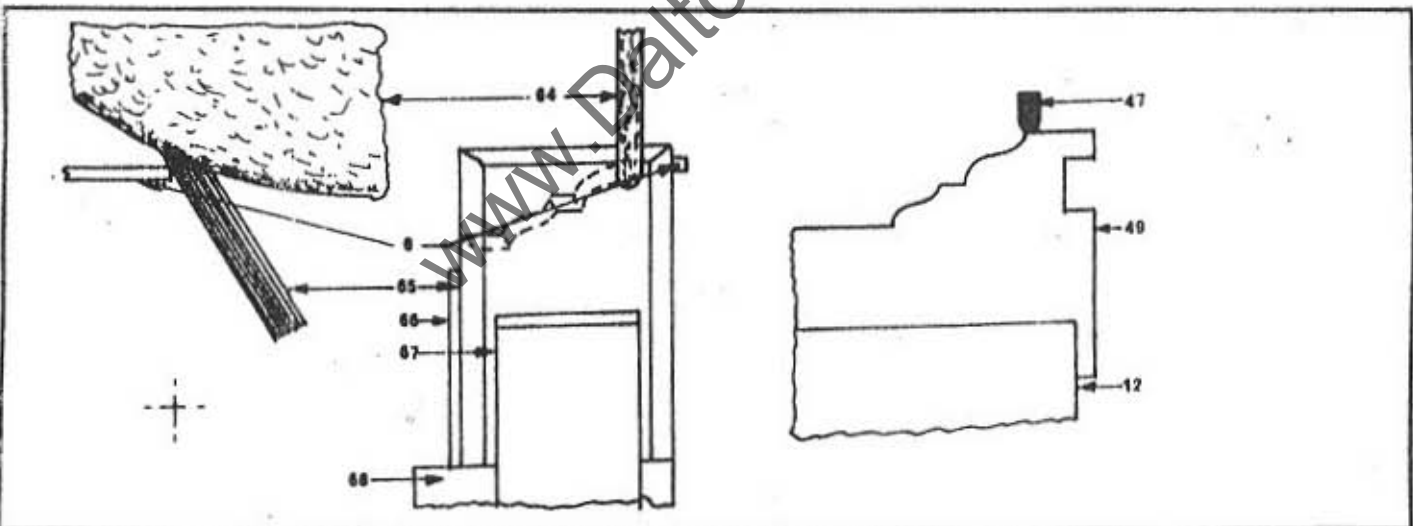


Fig. 15

Setting the Stylus

- 64 Grinding Wheel
- 8 Cutter Support
- 65 Cutter
- 66 Side Fence
- 67 Cutter Clamp (or cutterblock)
- 68 Back Fence
- 47 Stylus
- 49 Template
- 12 Template Clamp.



Single angle dressing. Set the dresser to the operative position but do not secure lock (39). Release lock (40), then swivel the assembly until the indicator is opposite the angle required as shown on scale (41) and secure. To dress, oscillate the dresser across the wheel. Fig. 13.

#### Dressing to Width

Grinding wheel makers cannot guarantee that their wheels are absolutely flat and true, so it may be necessary to side-dress some wheels when newly fitted. Set the dresser to the operative position but do not secure lock (39). Release lock (40), swivel the assembly to the extreme left-hand position and secure, (Pre-set stops govern the extreme left and right hand positions of the swivel movement). To dress, oscillate the dresser across the side of the wheel taking care not to foul the wheel flanges. Dress the opposite face of the wheel after swivelling the assembly through 180 degrees. Fig. 11.

#### Resetting the Dresser

If the diamond becomes worn or needs replacing re-set it as follows. Fit a fine grit wheel making sure that the correct compressive paper washers are used. Set the dresser as though to side-dress the left hand (bearing) side of the wheel. Swivel the diamond towards the grinding wheel arbor by about  $\frac{1}{4}$ " (6mm). After releasing the locknut adjust the diamond towards or away from the wheel so that it makes light contact only with the side of the wheel when rotated. When correct secure.

#### SETTING CUTTERS ON THE GRINDER

See previous notes under pre-setting cutters.

Move the carriage so that the stylus contacts the template at the shallowest point of the mould profile (the least cutter projection). Holding the two in contact, check clearance between the cutter support and the cutterblock wedge. For a one-off run a clearance of  $\frac{1}{16}$ " to  $\frac{1}{8}$ " (1.5 - 3 mm) is sufficient, but when cutters are to remain in the head for several regrinds clearance should be increased to  $\frac{3}{16}$ " -  $\frac{5}{16}$ " (4 - 6 mm). To vary clearance cross-adjust the stylus as required. When set, check that the grinding wheel clears the cutterblock body. If it does not, reduce the clearance angle of the grinding wheel, use a smaller grinding wheel or set the stylus further forward.

Move the carriage so that the stylus contacts the template at the deepest point of the mould profile (the further projection of the cutters), and hold in contact. Set the cutter so that it just touches the grinding wheel whilst resting on the support. Check that the cutter is square and properly aligned, then lightly secure it. Set and lightly secure the remaining cutters in the same way. A convenient method is to set a single cutter as described, then use this as a guide on a setting stand to set remainder. All cutters can then be fully tightened before replacing the head on the grinder. Never fully tighten cutters whilst on the grinder. Fig. 15 Adjust the stylus laterally for alignment.

#### GRINDING OPERATION

Grind by gripping the arbor handle with one hand and the handwheel with the other. Control and move the carriage so that the template follows the stylus to form the cutters to correct shape. During this the cutters must rest on the cutter support immediately in front of the grinding wheel, so apply rotary pressure via the handwheel. The cutter profile is controlled by the template via its contact with the stylus and is correctly formed when the full profile can be followed on all cutters without further grinding taking place.

Before starting to grind, see that the grinding wheel is secure, free to rotate and that the guards are in position. Check that the machine is set to form the correct clearance angle and that the grinding wheel is vertical.

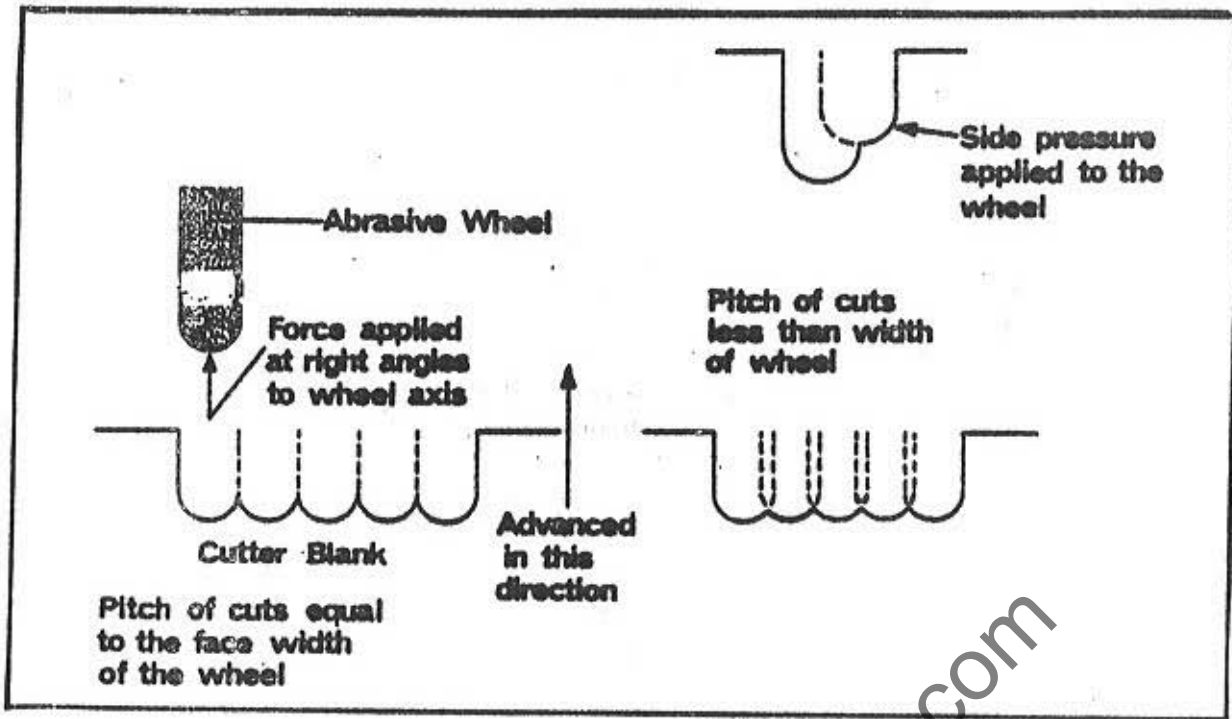


Fig. 16

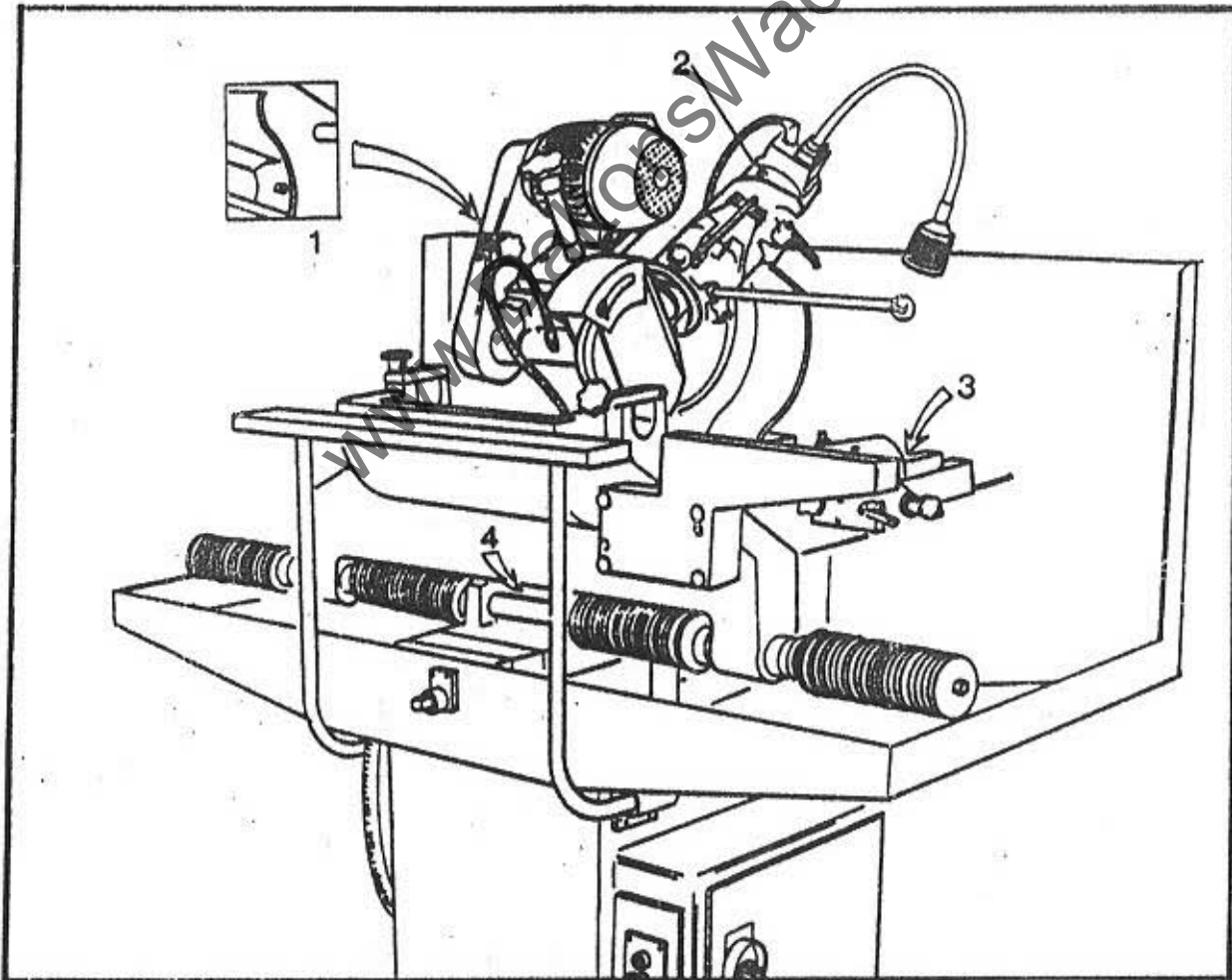


Fig. 17

FIG.18.

Dummy Block (Based on 7" Cutting Circle)

- A. 15° Cutting Angle
- B. 20° Cutting Angle
- C. 25° Cutting Angle
- D. 30° Cutting Angle

(Also marked in angles on the dummy block).

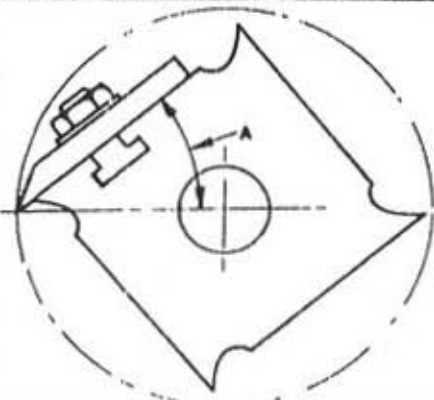
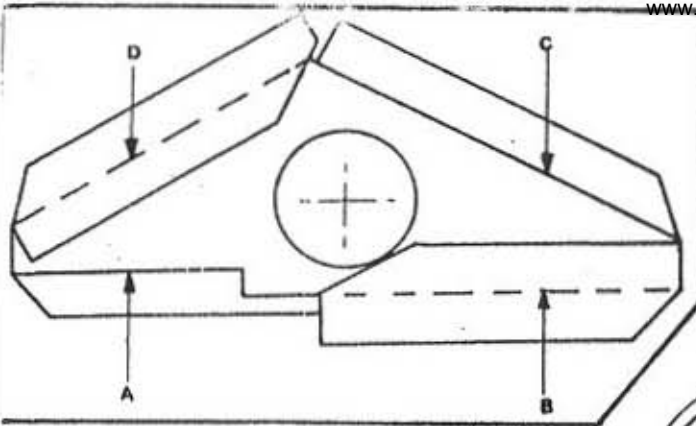


FIG.19.

Method of measuring cutting angles on various cutting heads.  
'A' is the cutting angle.

FIG.20.

Method of fitting a cutter to the 'D' 25° face.

- 68 Back Fence
- 66 Side Fence
- 73 Short Levelling Screw
- 67 Cutter Clamp
- 72 Clamp Locking Lever
- 65 Cutter
- 64 Grinding Wheel
- G Gap (or minimum cutter projection) of 1/2".
- 8 Cutter Support.

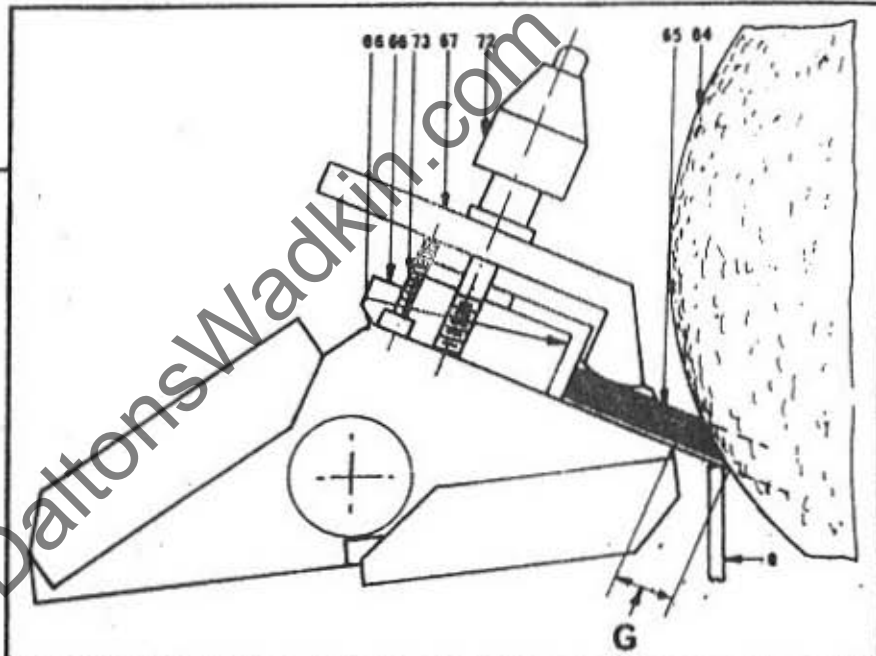
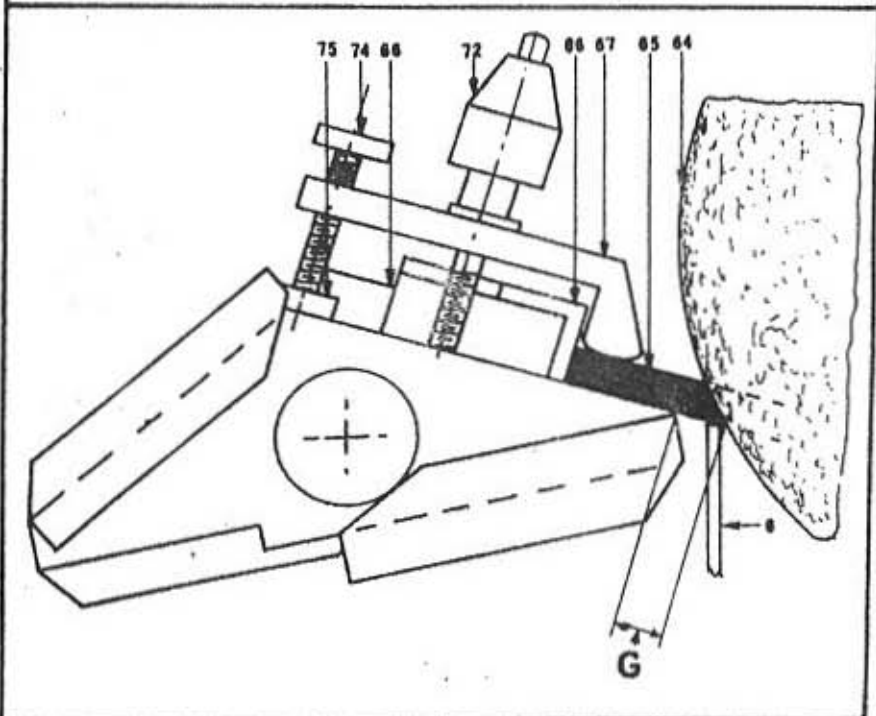


FIG.21

Method of fitting a cutter to the 'C' 20° face.

- 68 Back Fence
- 66 Side Fence
- 67 Cutter Clamp
- 72 Clamp Locking Lever
- 65 Cutter
- 64 Grinding Wheel
- G Gap (or minimum cutter projection) of 1/2"
- 8 Cutter Support
- 74 Standard Levelling Screw
- 75 Nylon contact pad (removable)



Start up the grinding wheel and coolant, set the lower coolant pipe against the rear of the cutter support to deflect coolant upwards against the underside of the cutter. Set the top coolant pipe to direct coolant on to the top of the cutter close to the wheel but not on to the wheel itself. Fit eye protectors and make sure that others in the immediate area are also wearing eye protectors.

### GRINDING BLANK CUTTERS

During the initial grinding process the grinding wheel must be vertical. When grinding blank cutters, or when regrinding previously profile cutters which are badly chipped, first make a series of plunging cuts to rough-out the profile. The pitch of these plunging cuts should be equal to the thickness of the wheel. Cuts of closer pitch would apply side pressure to the wheel which could cause it to fracture in extreme circumstances. Move the carriage squarely into the grinding wheel so that pressure is only applied directly on to the wheel rim. In the same way grind away all the uneven projections remaining before finally following the full profile. Fig. 16

### FINISH GRINDING

When the cutter profile has been fully formed dress the wheel, tilt to one side for side clearance, and regrind. Reverse the tilt and grind a second time to finish the profile completely. Adding side clearance slightly widens the shape to form the correct profile. The machine is so designed that only side clearance is ground-in where it is needed, and is automatically held clear at other points so that the full profile can be followed without danger of spoilage.

Finally traverse across the full cutter width two or three times to spark-out and so improve the ground finish.

### GRINDING MULTIPLE CUTTERS

When grinding several cutters in a cutterblock to the same profile, these can be rough-ground and finished individually with the stylus at a single setting. If grinding blank cutters it may be preferred to grind in a series of deepening steps, cross-adjusting the stylus as necessary. In this case it is an advantage to grind all cutters at each setting to keep them in step. When grinding from blanks frequent wheel dressing is essential. Always dress prior to the final grind.

### LUBRICATION AND MAINTENANCE

#### IMPORTANT:

Abrasive dust will damage moving parts and slideways on the machine. It is, therefore, of paramount importance that the operator pays particular attention to machine cleanliness. A daily procedure should be instituted to ensure that bearing surfaces are kept free from grinding dust and dirt.

Grinding dust could also prove hazardous to moving parts, bearing and slideways of other machines in the vicinity. Under no circumstances should the machine be cleaned down with a blower or compressed air.

The spindle unit is fitted with sealed bearings which are permanently lubricated and all bushes employed are 'bronze oil retaining type'.

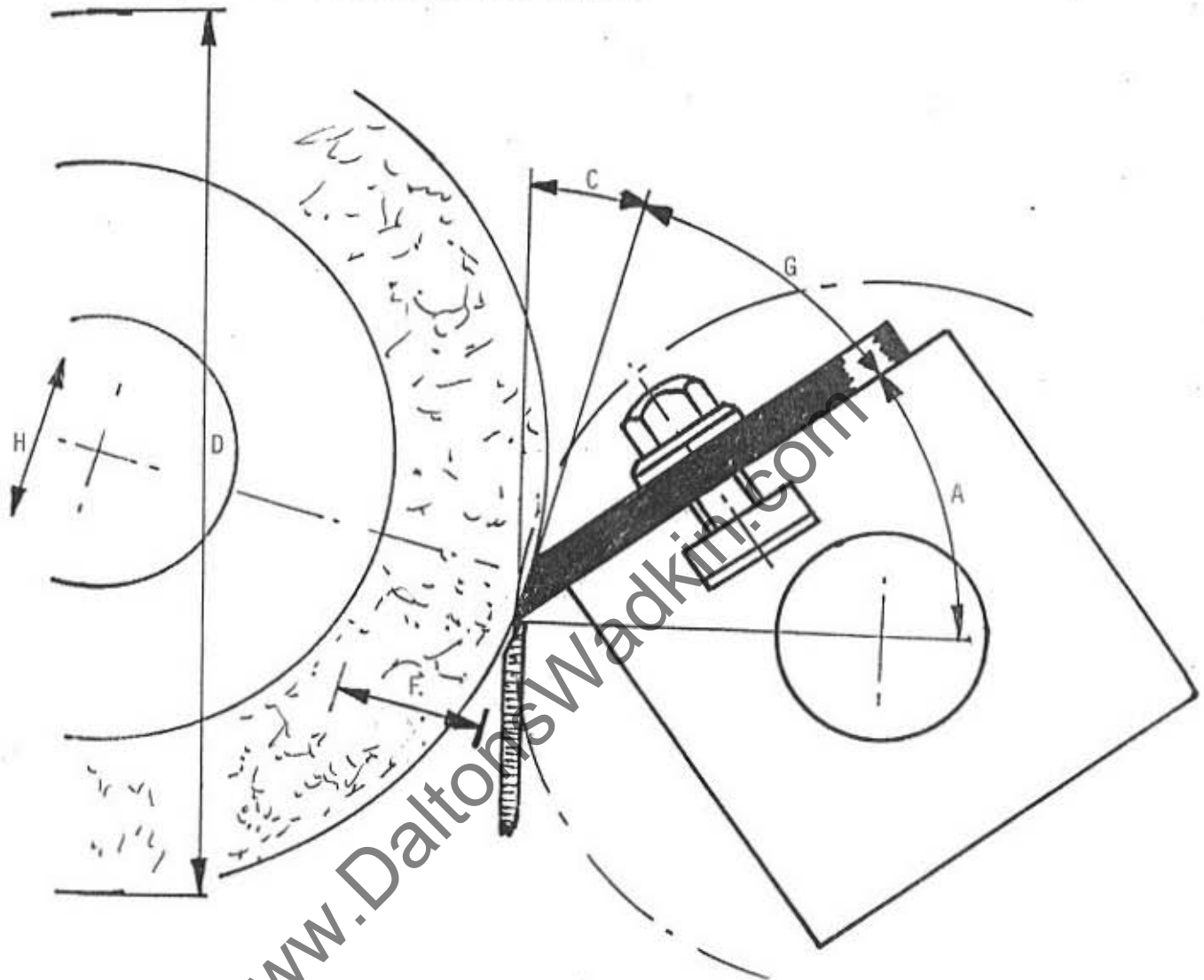
There are only four oil lubricating points on the machine. These are located at points 1,2, 3 and 4 illustrated. Lubricate weekly with medium/light oil.

### SPARE PARTS

When ordering spare parts give full details of these together with the machine type and number.



## SQUARE CUTTERBLOCK SETTING DETAILS



C - Cutting angle 38-42 degrees.

C - Clearance angle, varies with wheel height setting.

G - Ground angle, varies with A, C and cutter projection.

D - Grinding wheel diameter 230-170 mm.

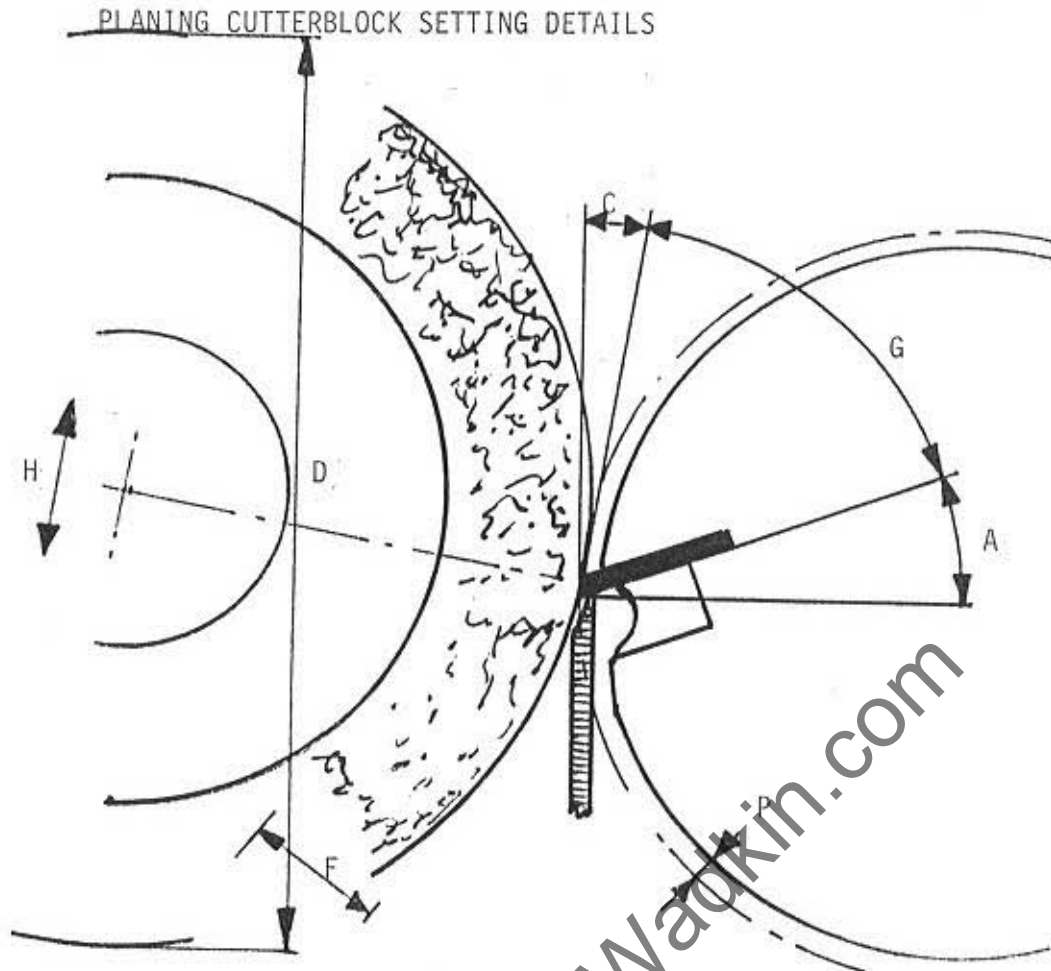
H - Grinding wheel height, '-' shows settings below zero.

F - Projection of grinding wheel beyond flanges.

C	10 degrees				15 degrees				20 degrees			
G	38-42 degrees				33-37 degrees				29-32 degrees *			
D	230	210	190	170	230	210	190	170	230	210	190	170
F	50	40	30	20	50	40	30	20	50	40	30	20
H		-23	-20	-17	-17	-15	-12	-10	-5	-7	-4	-2

Dimensions shown in mm.

\* Less than minimum recommended angle of 35 degrees, but angle quickly increases with greater cutter projection to give a strong edge when moulding.



- A - Cutting angle, range 15-30 degrees.  
 C - Clearance angle, varies with wheel height setting.  
 G - Ground angle, varies with A, C and cutter projection.  
 D - Grinding wheel diameter 230-170 mm.  
 H - Grinding wheel height, '-' shows settings below zero.  
 F - Projection of grinding wheel beyond flanges.  
 P - Minimum cutter projection needed to give 1 mm grinding allowance. Use greater projection to allow more regrinding before cutters need re-setting.

Dimensions shown in mm.

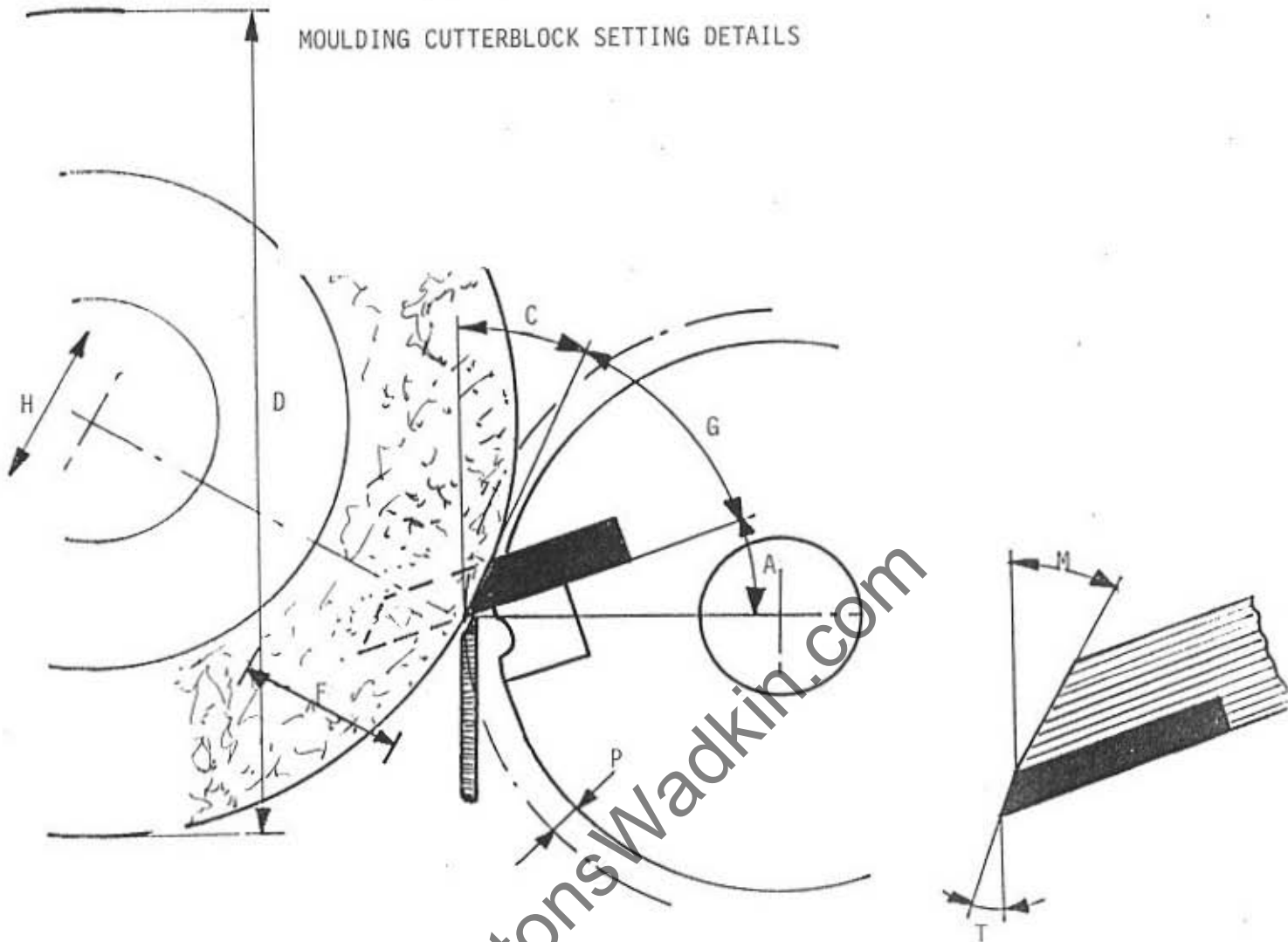
	15-30 degrees				15-30 degrees				15-30 degrees			
A	15-30 degrees				15-30 degrees				15-30 degrees			
C	10 degrees				15 degrees				20 degrees			
G	50-65 degrees				45-60 degrees				40-55 degrees			
D	230	210	190	170	230	210	190	170	230	210	190	170
F	50	40	30	20	50	40	30	20	50	40	30	20
H			-25	-21		-20	-17	-15	-13	-11	-9	-7
P	2				3				4			

NOTE: Whilst the larger diameter grinding wheels cannot be used for forming a 10 degree clearance angle, because no moulding is required, it is convenient to use worn grinding wheels for this operation.

A 10 degree clearance angle is suitable for hardwoods and low-resin softwoods. When planing softwoods which quickly build-up a resin deposit behind the cutting edge it may be necessary to increase the clearance angle to 15 or 20 degrees. A bigger angle is also more practical when cutterheads are to be jointed to reduce the width of heel formed by this operation.



# MOULDING CUTTERBLOCK SETTING DETAILS



- A - Cutting angle, range 15-30 degrees.  
 C - Clearance angle, varies with wheel height setting.  
 G - Ground angle, varies with A, C and cutter projection.  
 D - Grinding wheel diameter 230-170 mm.  
 F - Grinding wheel height, '-' shows settings below zero.  
 F - Projection of grinding wheel beyond flanges.  
 P - Minimum cutter projection needed to give 1 mm grinding allowance. Use greater projection to allow more regrinding before cutters need re-setting.  
 M - Main clearance angle on TCT cutters.  
 T - Tip clearance angle on TCT cutters.

Dimensions shown in mm.

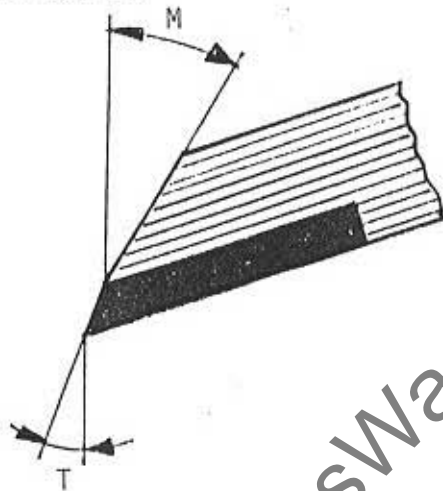
A	15-30 degrees				15-30 degrees				15-30 degrees			
C	10 degrees				15 degrees				20 degrees			
G	50-65 degrees				45-60 degrees				40-55 degrees			
D	230	210	190	170	230	210	190	170	230	210	190	170
F	50	40	30	20	50	40	30	20	50	40	30	20
H			-22	-19	-20	-17	-15	-12	-10	-8	-7	-5
P	2				3				4			

A	15-30 degrees				15-25 degrees				15-20 degrees			
C	25 degrees				30 degrees				35 degrees			
G	35-50 degrees				35-45 degrees				35-40 degrees			
D	230	210	190	170	230	210	190	170	230	210	190	170
F	50	40	30	20	50	40	30	20	50	40	30	20
H	0	-1	-2	-3	10	10	10	10	20	19	18	17
P	5				6				7			

## MOULDING CUTTERBLOCK SETTING DETAILS

NOTE: A grinding wheel height of between zero and 10mm gives an average setting suitable for most circular and similar moulding heads, including slotted collar cutters, router cutters and similar. The clearance angle formed is approximately 27 degrees, forming a ground angle which on average is 40 degrees - an acceptable angle for both regular and jointed operation. Grinding wheel wear has little effect on the clearance angle at this setting and compensatory adjustment is not normally necessary. It is not normally necessary to vary from this recommended setting, but where needed the head can be raised to reduce resin build-up behind the cutting edges. on softwood operation, or lowered to form a stronger edge when working difficult hardwoods.

## TUNGSTEN CARBIDE CUTTER



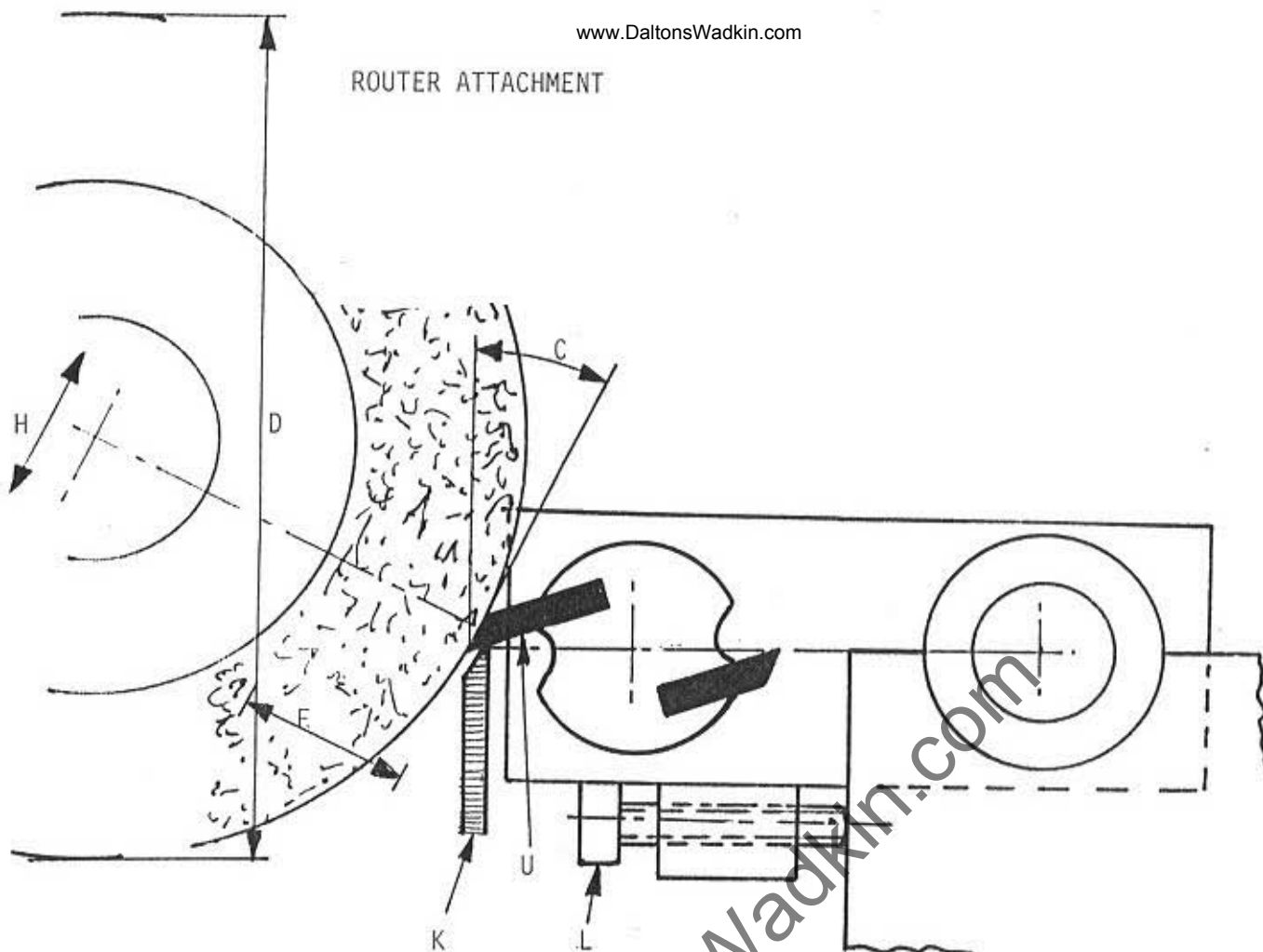
## TUNGSTEN CARBIDE CUTTER SETTING DETAILS

It is preferable to grind carbide tips independent of the backing steel, but where this is not practical, i.e. on cutters with the carbide brazed-on, initially grind the full profile using a special composite diamond grinding wheel. It is then practical to grind the backing steel and tip at different clearance angles, using the regular grit wheel for the backing and a diamond wheel for the tip. Doing this reduces the excessive wear on the composite wheel resulting from grinding the backing and tip simultaneously. It is usually possible to regrind the tip 2/3 times before regrinding the backing steel becomes necessary.

With many moulds it is acceptable to use a single side clearance angle, as the change in the main clearance angle also affects side clearance. Where the mould includes sections at or approaching square too the cutterblock arbor, i.e. the edge of a rebate cutter, it is better to use two side clearance angles, viz. 5 degrees for the tip and 10 degrees for the backing, (or 10 and 15 if provide and preferred). When doing this it is essential to use special stylii available from Autool for this purpose, otherwise a double angle will be formed on the main clearance angles but not on the side clearance angles.

A	15-30 degrees				A	15-30 degrees			
M	27 degrees				T	17 degrees			
G	40-45 degrees				G	50-55 degrees			
D	230	210	190	170	D	230	210	190	170
F	50	40	30	20	F	50	40	30	20
H	5	5	5	5	H	-15	-12	-10	-8

## ROUTER ATTACHMENT



This attachment is used for profiling small alloy or t.c.t. tools including router bits, carver and French head cutters, small diameter cutterblocks and shank-mounted tools.

The attachment replaces the regular arbor and is secured by the regular clamps. Loose half-clamps, as provided with current machines, should be fitted nearest to the operator. Alternative tapped holes are provided when the attachment is supplied with the machine, but these can be added to any existing machine fitted with half-clamps. Router bits, shank-mounted tools and arbors are secured by a collet which is tightened either by a handwheel or by a retaining collar. By fully releasing the handwheel, or by removing the collar, the collet can be removed and replaced by any other suitable collet to accept tools of different shank sizes. The 14 version accepts shanks up to 14mm and the 25 version accepts shanks up to 25mm diameter.

## SMALL DIAMETER CUTTERBLOCKS

These fit to a short parallel arbor which is secured by any collet of suitable size. Arbors can be provided suitable for any cutterblock bore and cutting width.

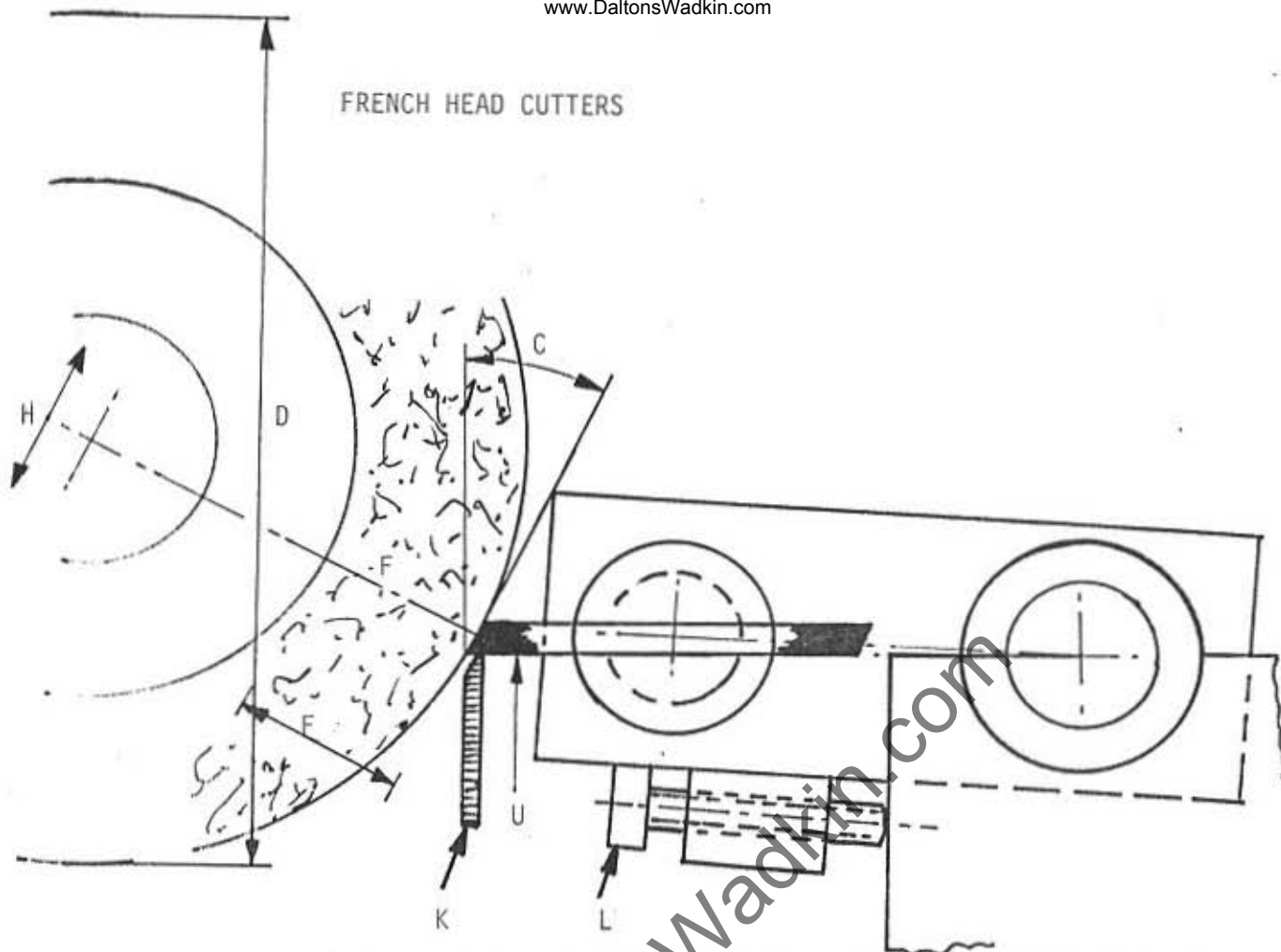
- C - Clearance angle, varies with wheel height setting
- D - Grinding wheel diameter 230-170mm
- H - Grinding wheel height '-' shows settings below zero
- F - Projection of grinding wheel beyond flanges
- K - Cutter support
- U - Underface of cutter
- L - Levelling screw for router attachment

Fit the attachment and adjust the levelling screw so that the arbor centreline is level with the top surface of the cutter support. In operation the cutter rests on the cutter support in the normal way as shown.

Typical settings, dimensions shown in mm.

	25 degrees				30 degrees				35 degrees			
D -	230	210	190	170	230	210	190	170	230	210	190	170
F -	50	40	30	20	50	40	30	20	50	40	30	20
H -	0	-1	-2	-3	10	10	10	10	20	19	18	17

## FRENCH HEAD CUTTERS



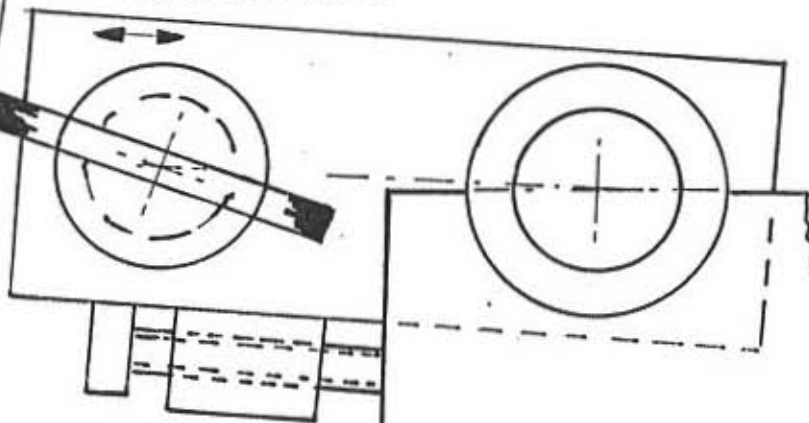
Part names and grinding wheel settings are generally as described under 'small diameter cutterblocks'.

Fit the cutter in the slot provided in the arbor so that there is equal projection at each size. Alternative screws of different length are provided for different cutter widths-on-cut.

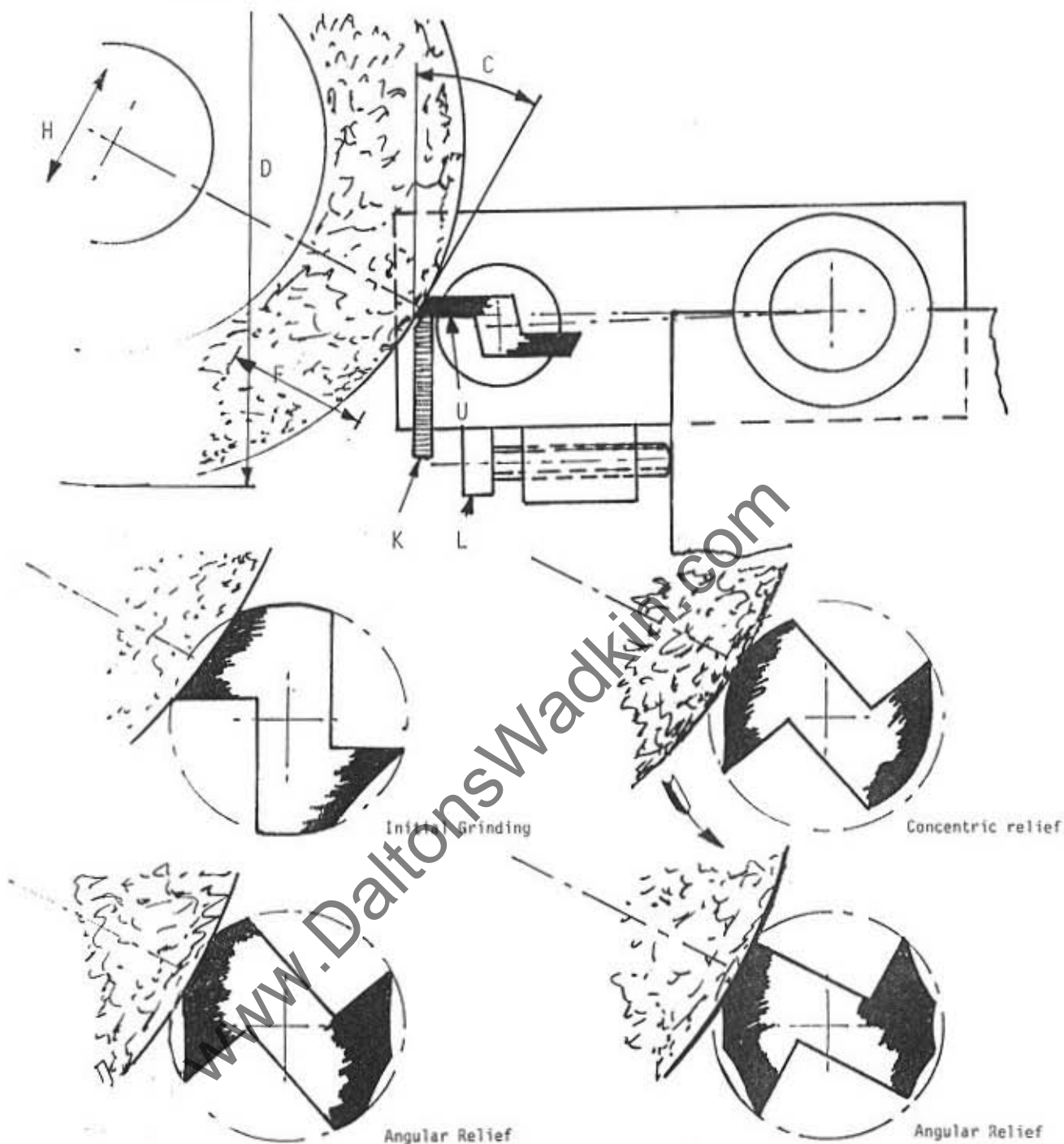
Fit the arbor and adjust the levelling screw so that the underface of the cutter is horizontal and level with the top of the cutter support when the dividing head is engaged at a suitable location.

Turn the arbor loose in the collet to initially position it, then secure it and use the fine adjustment of the dividing head and the levelling screw for final setting. The cutter support is only used in setting the cutter, and is then turned clear. Use the dividing head to position the cutter for each cutting edge.

Cutter notching. Some French head cutters have a safety notch for the securing screw or a bottom ring support. To form these mark the position of the notch or notches and fit the cutter in position so that this edge is parallel to the arbor. Lock the dividing head and fit the arbor so that the cutter edge is square (tangential) to the grinding wheel. Line-up the cutter width wise and lock the longitudinal traverse of the table. Lock the cross traverse of the table with cutter edge just touching the grinding wheel, then use the fine infeed movement in combination with the fine longitudinal movement to cut the groove as a series of plunge cuts then as a final longitudinal traverse.



## ROUTER CUTTERS



Part names and grinding wheel settings are generally as described under 'small diameter cutterblocks'.

These fit directly in a suitable collet; different collets are available from Autool. The attachment reverses for opposite hand cutters. Adjust levelling screw so that the underface of the cutter is horizontal and level with the top surface of the cutter support when the dividing head is engaged at a suitable location.

Turn the cutter loose in the collet to set it initially and secure in place, then use the fine adjustment of the dividing head in combination with the levelling screw final setting. The cutter support is only used in setting the cutter and is then turned clear. Use the dividing head to position the cutter for each cutting edge. Wing-type router cutters of the type shown are ground with a clearance angle of between 25 and 35 degrees. A side clearance angle of 15 degrees is recommended (optional feature) when grinding cutters of this type.

With cutters of very small diameter or having no back relief it may be necessary to grind extra clearance. This can be formed in one of two ways:-

**Concentric relief.** Use one of the two slots provided in a special dividing head, setting the cutter position on the cutter rest when the index pointer is at the extreme end of the slot, i.e. so that the cutter will turn below the cutter rest but not above. Grind the cutter with normal ground clearance initially, then continue to grind the profile whilst rotating the cutter to form concentric relief.

**Angular relief.** Initially grind the cutter in the normal way, then grind a series of angles either by using the alternative dividing head positions or physically turning the router cutter between grinds.