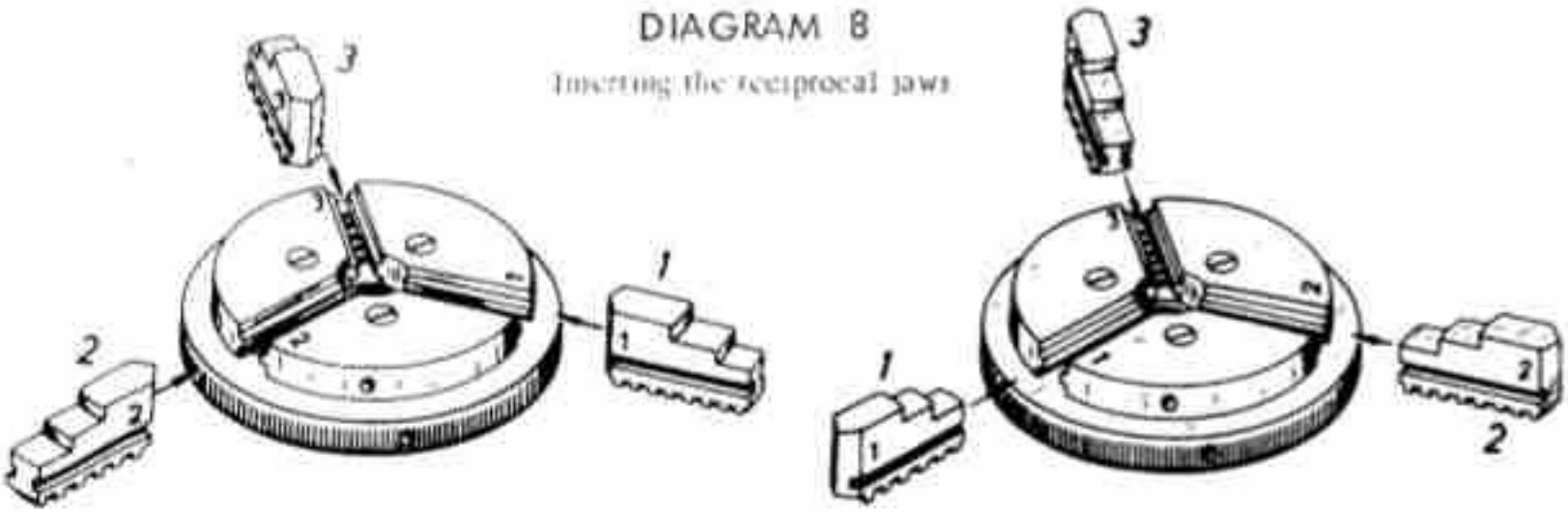
workpiece, but this, as you will surely appreciate, is of no importance to the cutting operation. Then : Switch on the motor, hold the workpiece firmly in one hand and move the tailstock sleeve forward with the other hand. In the same way, after reversing the workpiece, the centering hole is drilled at the other end. This method, without doubt, requires a certain amount of skill and the inexperienced operator will probably not meet with success at the very first attempt.
From the point of view of workshop practice this method can only be regarded as a make shift procedure. The correct way in practice of producing a centre hole requires the use of a three-jaw chuck. (Order No. 1001.) This is screwed on to the spindle head sleeve (in the same way as the face plate on the originally mounted lathe), the drill chuck (Order No. 1005) with the drill clamped in comes on the tailstock side, after the centre has been removed. In this case, then, the drill remains stationary and the workpiece is rotated.

Longitudinal turning :

The originally mounted face plate together with its centre bit is re-mounted and the lathe dog firmly clamped to the workpiece by tightening up the fixing screw. The workpiece together with the lathe dog are then tensioned between the centres, so that the pin in the lathe dog rest in a slot in the face plate. Care should be taken that the centres do not grip the workpiece tightly, though of course without any play. Lubricate the centres with oil from time to time. You will note that the centre of the spindle stock rotates conjointly, whilst that of the tailstock remains stationary. Tensioning of the workpiece between the centres is achieved by advancing the tailstock sleeve. After tensioning, re-clamp the tailstock sleeve. In addition, care should be taken that the clamping screw in the spindle head, which secure the spindle head sleeve, are tightened up.

DIAGRAM 8

Inserting the reciprocal jaws



Mounting the tool holder :

The tool holder (Diagram 10) and its T-nut are inserted in the slot of the support and on this the turning tool is tensioned. The tip of the turning tool must locate at the height of the centres. If necessary several small metal shims are placed underneath the turning tool (Diagram 10) The turning tool holder is adjusted so that the turning tool is at right angles to the workpiece (Diagram 9).

DIAGRAM 9

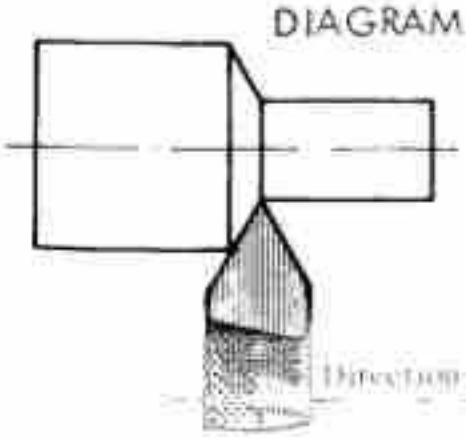
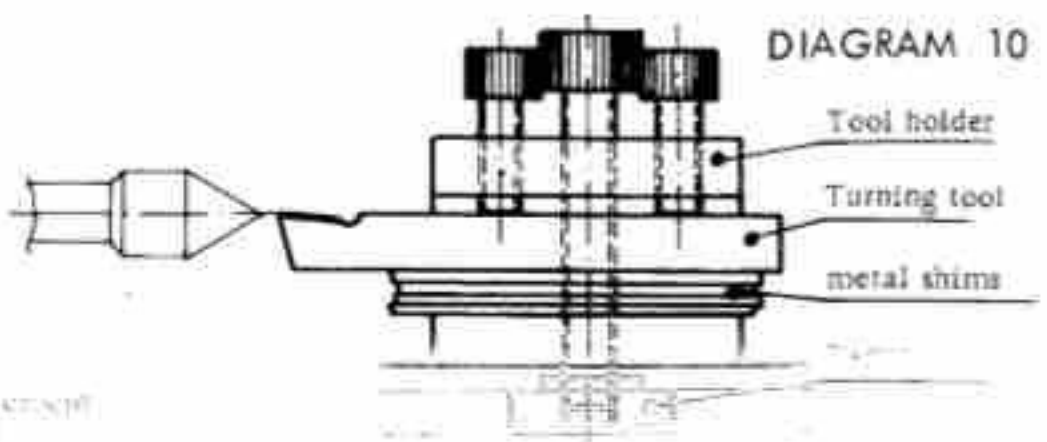


DIAGRAM 10



Types of turning tools :

Each kind of work requires a suitable tool for the purpose. Thus for rough turning, planing, face (transverse) turning, thread cutting, etc. the appropriately shaped turning tools must be selected.

Rough turning tools : The object in rough turning is to remove a large quantity of shaving in a short time.

Planing tools : By planing one attains a smooth surface of the workpiece. For this purpose a planing tool with a rounded off (chamfered) cutting edge is used. Side cutting tools: These are used for transverse turning and for the turning out of sharp angled corners.

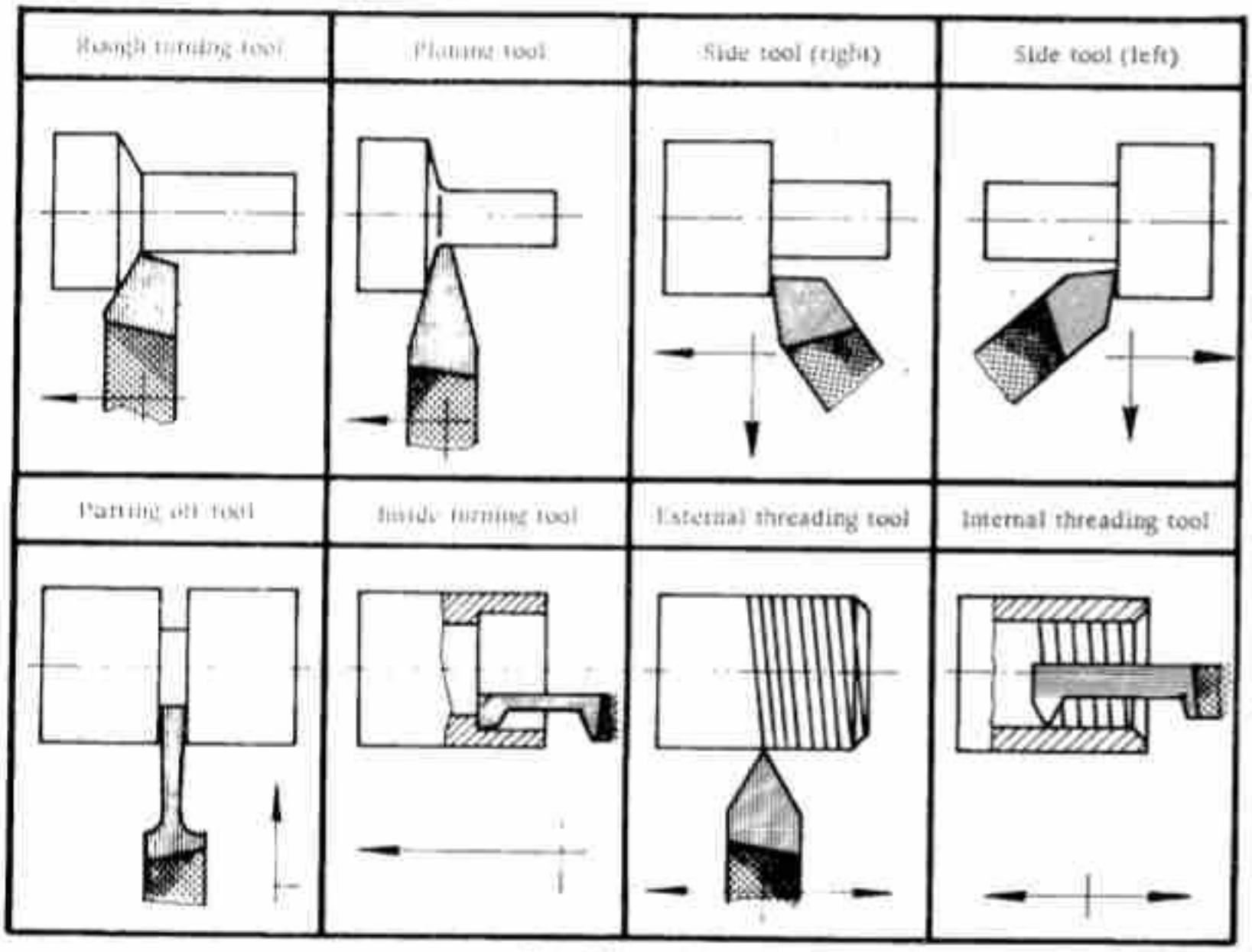


DIAGRAM 11

The initial shaving :

For turning we use the working speeds given in the table. After setting to these you start up the machine with the turning tool lifted. To turn off a thin shaving the turning tool is brought up to the workpiece so that its tip just touches the workpiece following which the support is moved to the right with the cutter tensioned. Movement of the support is done by rotating the handwheel on the longitudinal spindle. The support is moved until such time as the turning tool is located between the centre of the tailstock and workpiece. By rotating the handwheel on the transverse support the depth of shaving is adjusted. (Observe the division scale on the handwheel; by rotating the handwheel one division the turning tool is moved up 0.002"). The actual work movement takes place by rotating the linear spindle handwheel, whereupon the support carrying the turning tool moves up against the spindle head, so removing the shaving. Only after several smaller shavings have been removed in this way and one has become acquainted with the working of the machine, should one go over to bigger shaving depths.

Step turning :

For the next exercise try turning steps of varying diameter.

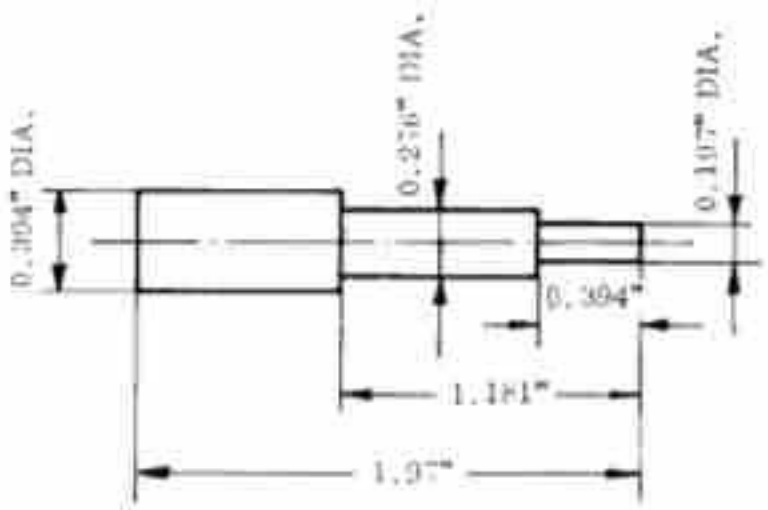


DIAGRAM 12

Based on the above drawing we will make the first step. To do this you move the support back on the tailstock side, set the depth of shaving by the cross spindle (about 0.0197") and move the support against the spindle head in the familiar way by rotating the linear spindle (1.181" according to the drawing.) This procedure is repeated until the diameter of 0.276" has been attained.
The second step is cut in the same way.
For turning longer workpiece to a maximum diameter of 1/4" and when working with a three-jaw lathe chuck, the workpiece can be fed from the left through the centre hole of the spindle.

Face (or transverse) turning :

Not only the convex surface of a cylindrical workpiece, but also its face surface, can be machined on a lathe. The turning of this surface is termed face (or transverse) turning. To face turn, the workpiece must be tensioned on the face plate or in a three-jaw chuck. The tool holder with the clamped-in turning tool is set up in such a way that an angle of 90 degrees is formed between the turning tool and the surface to be machined. The work movement is effected by actuating the transverse spindle and the adjustment of shaving in this case is by the linear spindle.

Use of turning tools :

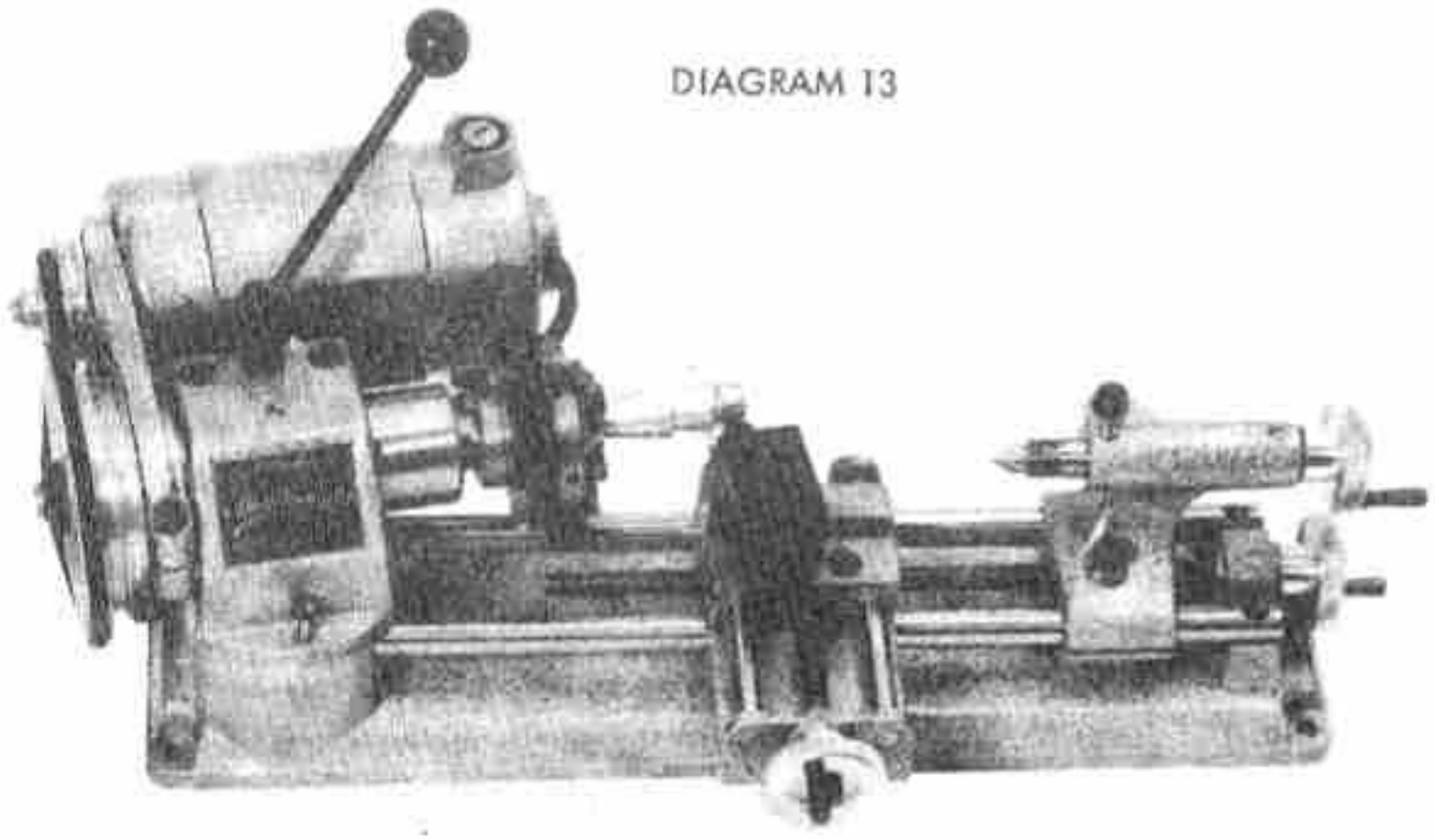
In the tool box (Order No. 1099) there are 2 turning tools. The right handed Side Tool is for normal linear and transverse turning. The rough turning tool is intended primarily for rough turning, i.e. for the removal of large shavings, prior to precision turning to the exact diameter with the right handed side tool.
The point tool may also be used for the pre- (or rough) turning of face surfaces. It is also used for turning ring grooves. Regrinding of the tools contained in the tool box is only recommended in the case of the experienced home worker or modelmaker.
Other tools such as parting off tool, inside turning tool, left handed side tool, external threading tool, internal threading tool can be ordered as extras.

Conical (taper) turning:

For tapering, the spindle head is turned through the desired angel (division marking 5-5 necessary after slackening off the tension screw and removing the locking pin and then re-tightening. If the cone should taper in the direction of the spindle head, the tail

head must be adjusted anti-clockwise. The shaving here is direct on to the workpiece. Conical turning differs only in this respect from linear turning. To realign the spindle head the tension screw is slackened off, the spindle head is turned by hand to zero and recoupled to the marker pin. The tension screw is then tightened.

DIAGRAM 13



The UNIMAT as a grinding machine :

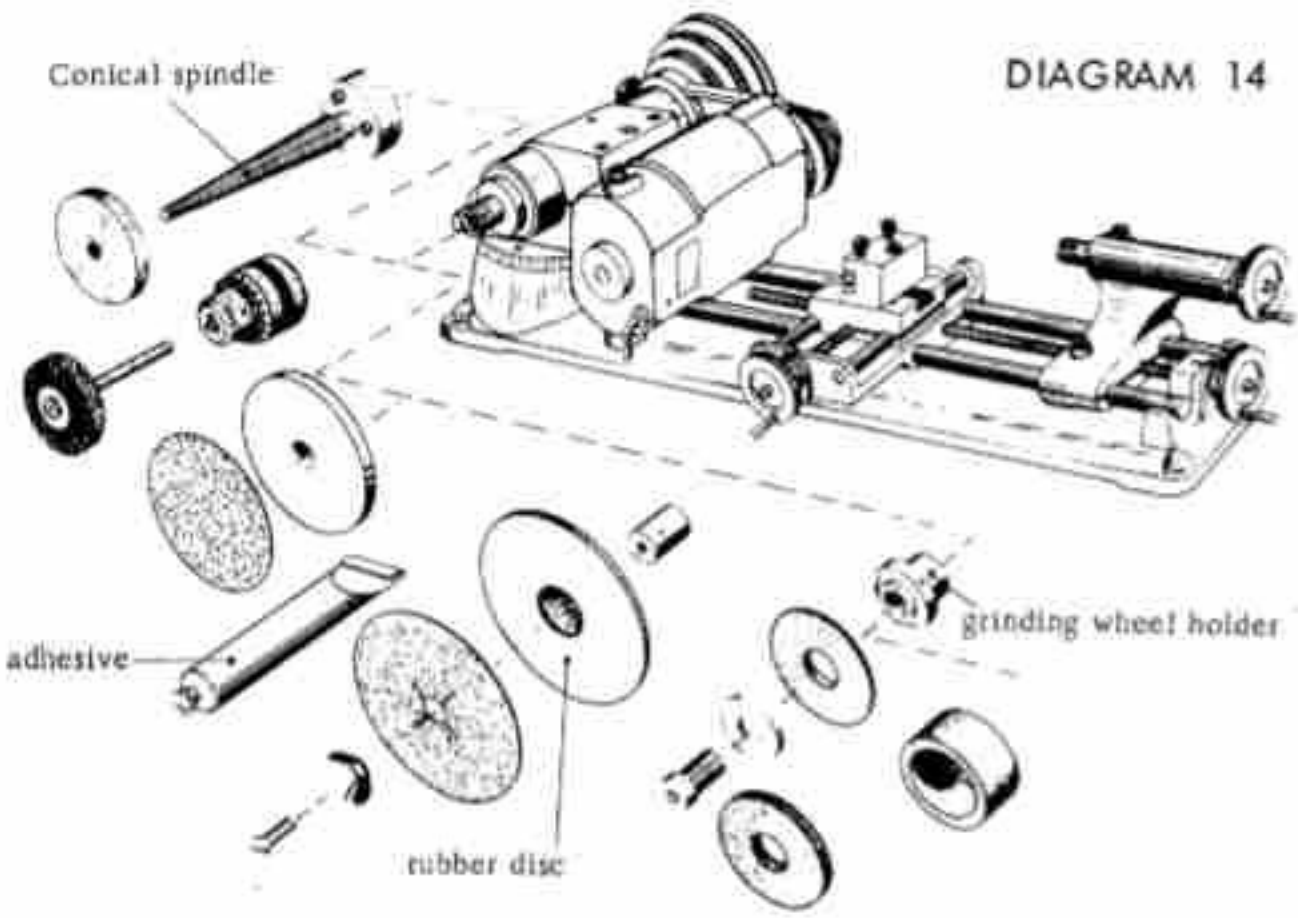


DIAGRAM 14

By mounting a grinding wheel on the grinding wheel holder supplied with the machine and by screwing the same on to the spindle of the spindle head sleeve the UNIMAT has been converted into a useful grinding machine (move tailstock and support right over to the right) and on it all normal grinding work which occurs in workshop practice can be performed. It is desirable to swing the spindle head out 90 degrees, so that on the one hand the grinding wheel is freely accessible and on the other hand the grinding dust does not foul the support guide.
It is expedient to cover the guide columns of the bed with paper. When sharpening tools one should take care to ensure that the angels which the various surfaces of the tool have to one another are retained. In other words, the newly ground surface must lie parallel to that formerly ground-. The beginner should let an expert show him tool grinding, which requires a certain amount of practice.

Surface grinding :

With the aid of a cup wheel simple surface grinding can also be carried out. For this work the tool is simply mounted on the support and clamped by means of a pivoted vice, so that it bears against the grindstone and projects over the support. Adjustment is by means of the linear spindle and the work movement is via the transverse spindle. The spindle head collar must be firmly clamped during grinding. From time to time the grinding wheel must be trued up with a diamond. Blows and knocks on the wheel are to be avoided.

The UNIMAT as a drilling machine :

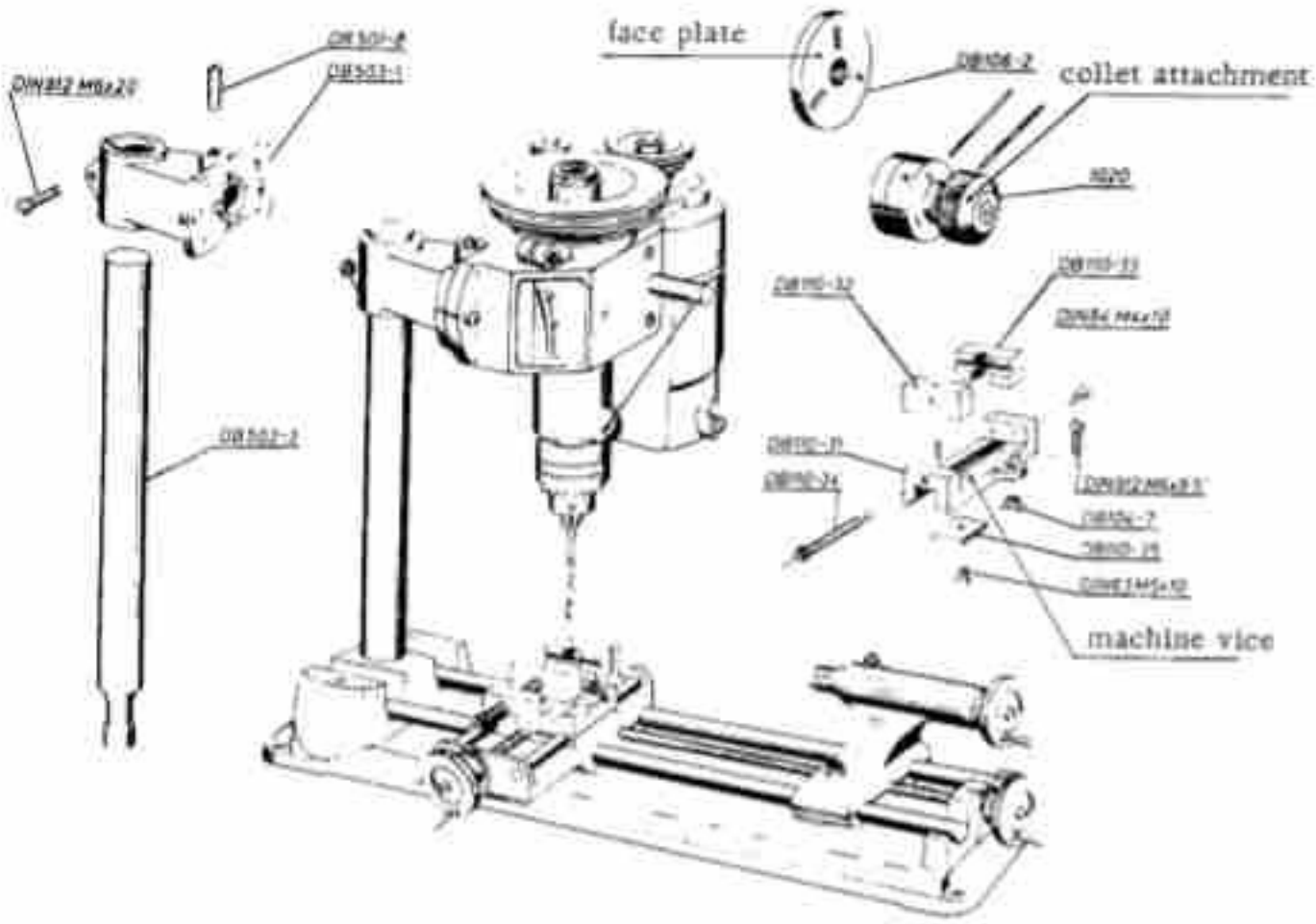


DIAGRAM 15

After slackening the tension screw on the machine bed underneath the belt pulley the complete spindle head and the motor can be lifted out. You can then as you wish, build up either a manual or an upright (or pillar) drilling machine. To make up a hand drilling machine you merely need to screw the drill chuck E 6 G on to the lathe spindle (tightly clamp head sleeve) and for better handling of the equipment secure the clamp head to the headstock.
To produce an upright (or pillar) drilling machine you require the vertical column supplied by us as part of the basic equipment, this being securely clamped by the tension screw to the lathe bed in place of the headstock. Then mount the clamp head on the vertical solumn and tighten it up. Fit the headstock on to the clamp head and clamp securely by means of the tension screw.

Vertical setting of the drill spindle :

For this purpose the surface plate is screwed on to the headstock sleeve in place of the drill chuck, the support slid under the surface plate and thereafter the whole headstock mounted on the support table after slackening off the clamping screw (on the clamp head). The vertical setting thus obtained is secured by fixing the tension screw on the headstock. The headstock can then be remounted at the top and the surface plate and drill chuck reversed. The height of the headstock is adjusted on the drilling column according to the height of the particular work-piece itself is normally laid upon the surface plate which serves as the drilling table, this being secured to the support by means of the grooved (or keyed) screw.
According to requirement oblique holes can also be drilled by distorting the headstock. The drill advance is achieved by slackening the two clamping screws on the headstock and turning down the pinion. (See Diagram 15). It is advantageous only to slacken off the two clamping screws to such an extent that the sleeve does not fall down by its own weight.

The UNIMAT converted in this manner into a drilling machine can also be used in this combination for surface tool grinding (sharpening) by the insertion of grinding tools (bits) or grinding wheels.

The UNIMAT as a milling machine :

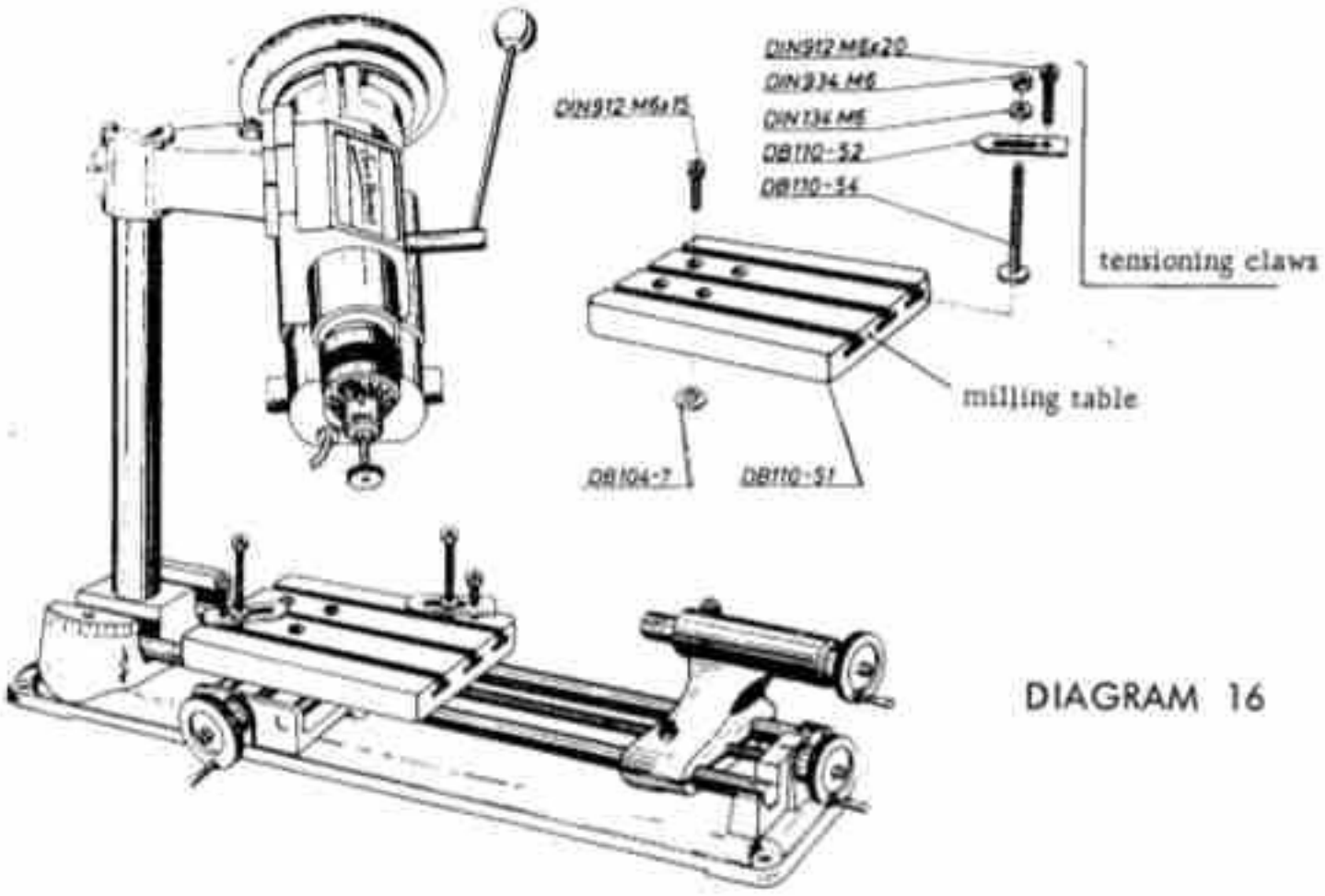


DIAGRAM 16

For milling, the UNIMAT is set up vertically as when used as a drilling machine. The milling cutter is held in the drill chuck screwed on to the spindle head sleeve (for precise tensioning use the collet attachment). According to shape, the workpiece is tensioned in the lathe chuck mounted on the transverse support by means of the grooved (keyed) screw (for round material), in the pivot vice with clamping width up to about 1.064" (for prismatic shapes), or on the milling table (larger and bulky pieces).
Tension screws are supplied with the milling table for workpieces of up to about 1.181" in height. The circular table (Order No. 1261) screwed to the lathe chuck flange may also be used as a milling table with the aid of the grooved (keyed) screw. The workpiece can be fixed on to the circular table with the tensioning claws supplied.
Height setting of the milling cutter is achieved by means of the rack and pinion gearing of the headstock sleeve (Slacken the clamping screw in the headstock, retightening again afterwards). The workpiece is advanced either by means of the transverse support or the linear support. The support, with which the shaving is fed and which does not move during the operation, must be fixed by means of its clamping screw.
The milling cutters contained in the tool box (slot cutter, cylindrical cutter and countersink) constitute universal tools, with which you can carry out all the normal milling work which crops up (vertical and plane milling, groove (or keyway) milling, hole cutting, etc.). By the removal of fine shavings of 0.008" to 0.04", according to material, even the beginner can obtain clean surfaces. The rotating speeds are taken from the speed tabulations.