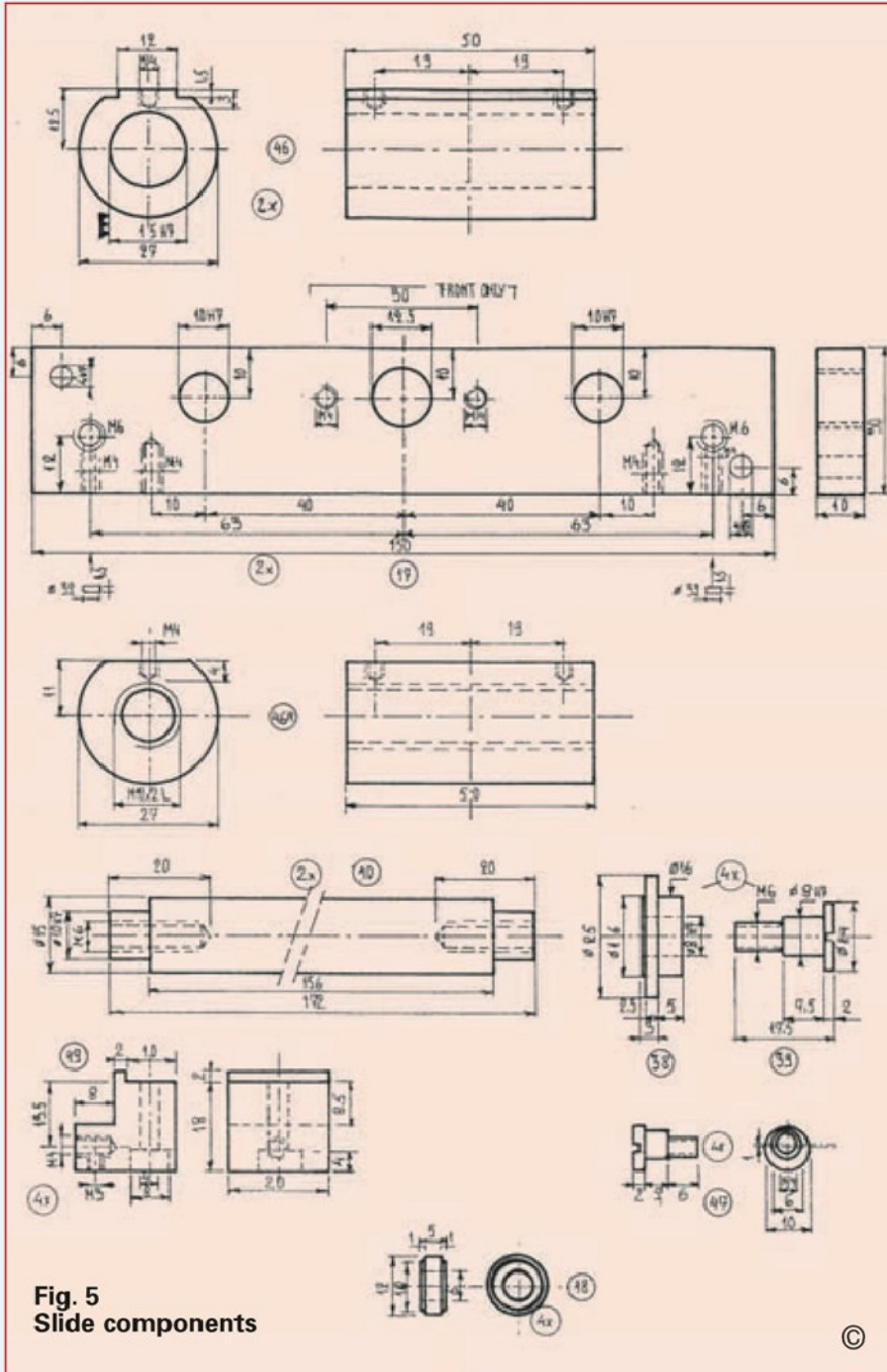


# UNIVERSAL CUTTER GRINDER (2)



**Fig. 5**  
Slide components

In the course of part (1), which appeared in issue 92 of Model Engineer's Workshop, the workhead, its bracket, and base were covered. We now proceed to consider the remaining items. It may be noted that a General Arrangement drawing appeared with part 1, and it may be useful to refer back to it for added clarity.

## The slide

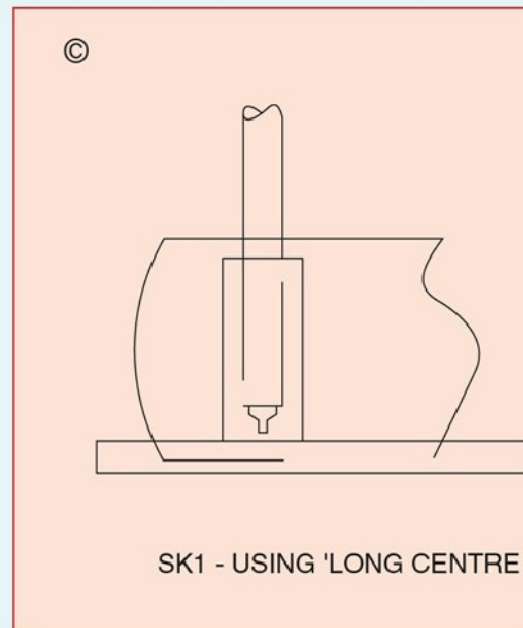
The front and rear components of the slide (item 17) can be produced now. Use bright flat steel 10 x 30 mm. If your mill has good DRO facilities then achieving the required accuracy should cause no special problems. Otherwise, I favour producing the two parts as a pair, holding them in

Victor Elsendoorn continues the description of his device, which is constructed from stock materials



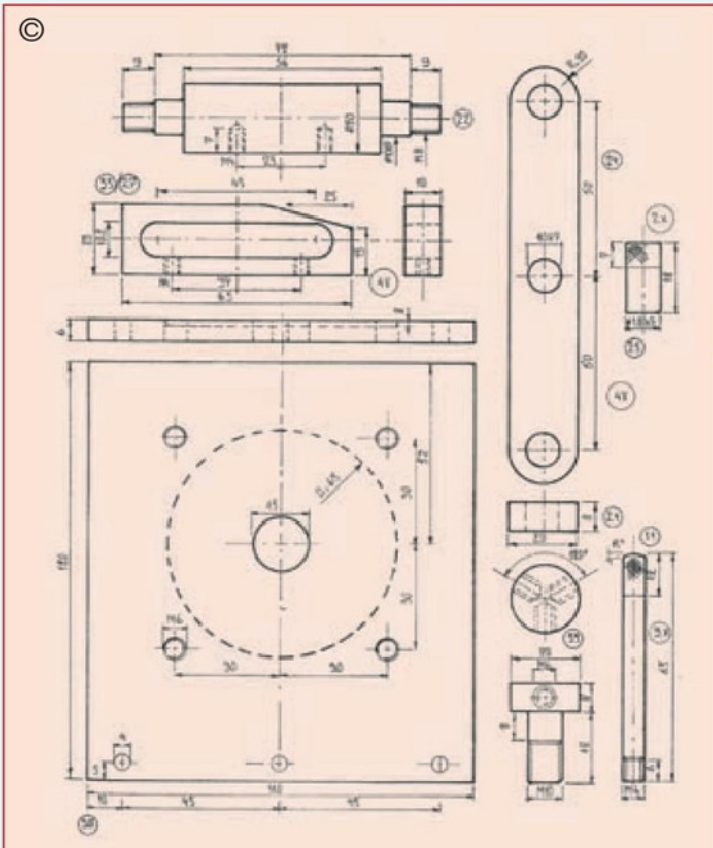
relative position with two 4mm dowels placed through the holes noted on the drawing. To ensure that the relative position of features on the two are accurately maintained, drill two holes 4mm H7 in the positions noted on the drawing. In order to position the both slide bars (item 40) well, I made a "long centre drill", by mounting a standard centre drill in one end of a 15 mm dia bar, fixed with a grub screw. The other end of the bar should be reduced in size so that it will fit your drill chuck. This tool can then be used to drill the positions for the two slide bars so that their spacing exactly matches that of the slide bushes, (as shown in Sk 1).

Bore and ream one hole first then place one bar through to hold the position while

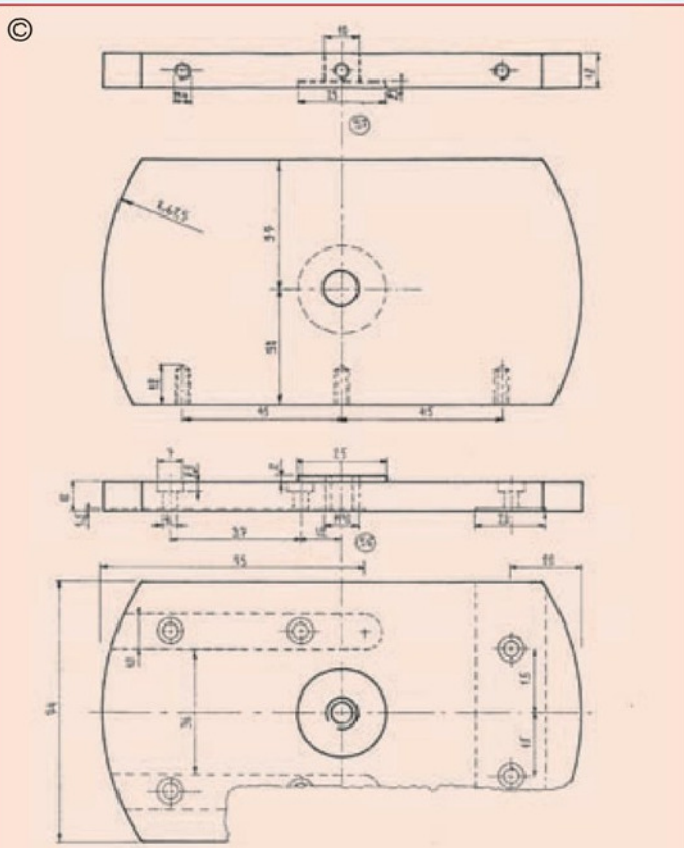


SK1 - USING 'LONG CENTRE'





**Fig. 8**  
Motor support parts



**Fig. 9**  
Motor support plates

are introduced in order to enlarge the contact surfaces on both sides of the mounting block item 37.

The knob is screwed on the spindle and can be adjusted and locked with the special nut item 15. Again, make sure that the M8 thread is absolutely true to centre in the knob otherwise it will wobble when turned.

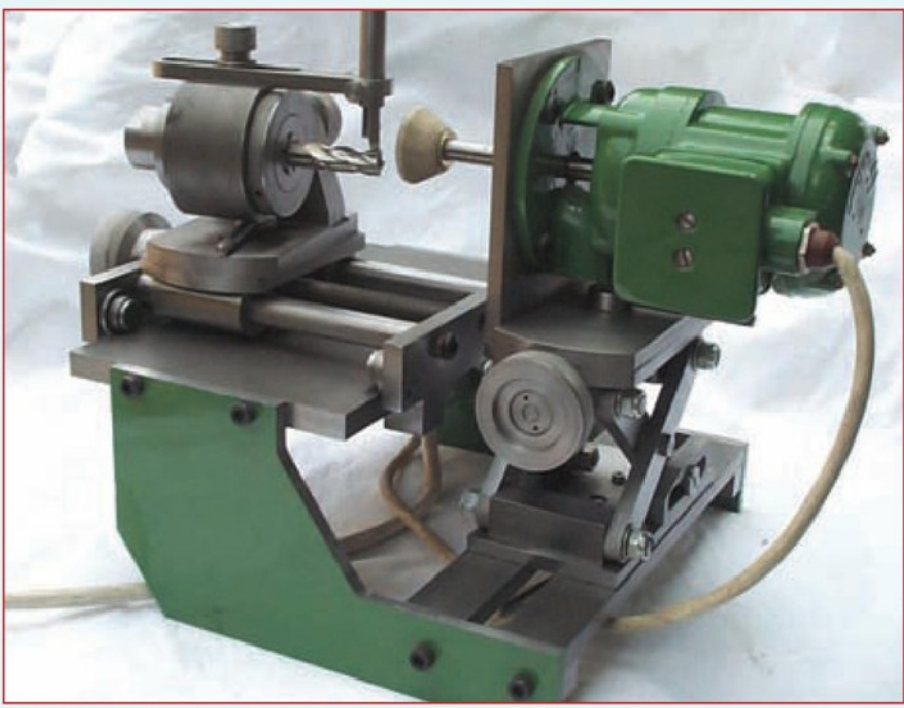
My spindle nut (item 46A) is made out of brass, as I happened to have some. You might decide to use one of the bronzes.. Make sure that the lead screw fits the nut without backlash. When the thread cutting is finalized the "T"-surface can be milled. The slide can then be assembled. If all the parts have been accurately produced, the smooth movement of the lead screw and slide will be a credit to the maker.

**The frame assembly**

The frame plate (18) is made out of good quality bright mild steel flat, 150mm x 12mm. If your material is in good unmarked condition, the material can be used without any machining on the long sides. The short sides have to be milled of course. The wheels (item 38), on which the slide will travel, have to be produced in pairs. By doing so both will have exactly the same diameter. The wheels are screwed on the slide with special screws (item 39), which are then used to adjust the wheel play. The screw is locked with a grub screw from the under side. In order to avoid damage to the thread a small brass disk (3.2mm x 1.5mm) is inserted between the grub screw and the special screw.

To prevent the slide from lifting from the frame, four rollers (items 47,48,49) are mounted on the under side of the slide. The roller (48) can be adjusted with the eccentric screw (47), which was produced in the four jaw chuck.

The two sides of the frame (items 19) were, in my case, cut and welded from black mild steel plate. This makes it possible to create the right shape quite easily and also saves material. Both parts are welded together (from both sides), care being taken to avoid distortion. After fettling the welding, both sides were milled flat making use of a fly cutter. The edges were then milled with an end mill in order to bring both frame sides to the exact shape and size. In order to make the positioning of the frame plate (18) and the motor rail (21) easy, notches are cut in. The production of the motor rail will not



**3. Motor height adjustment handwheel visible from this angle**



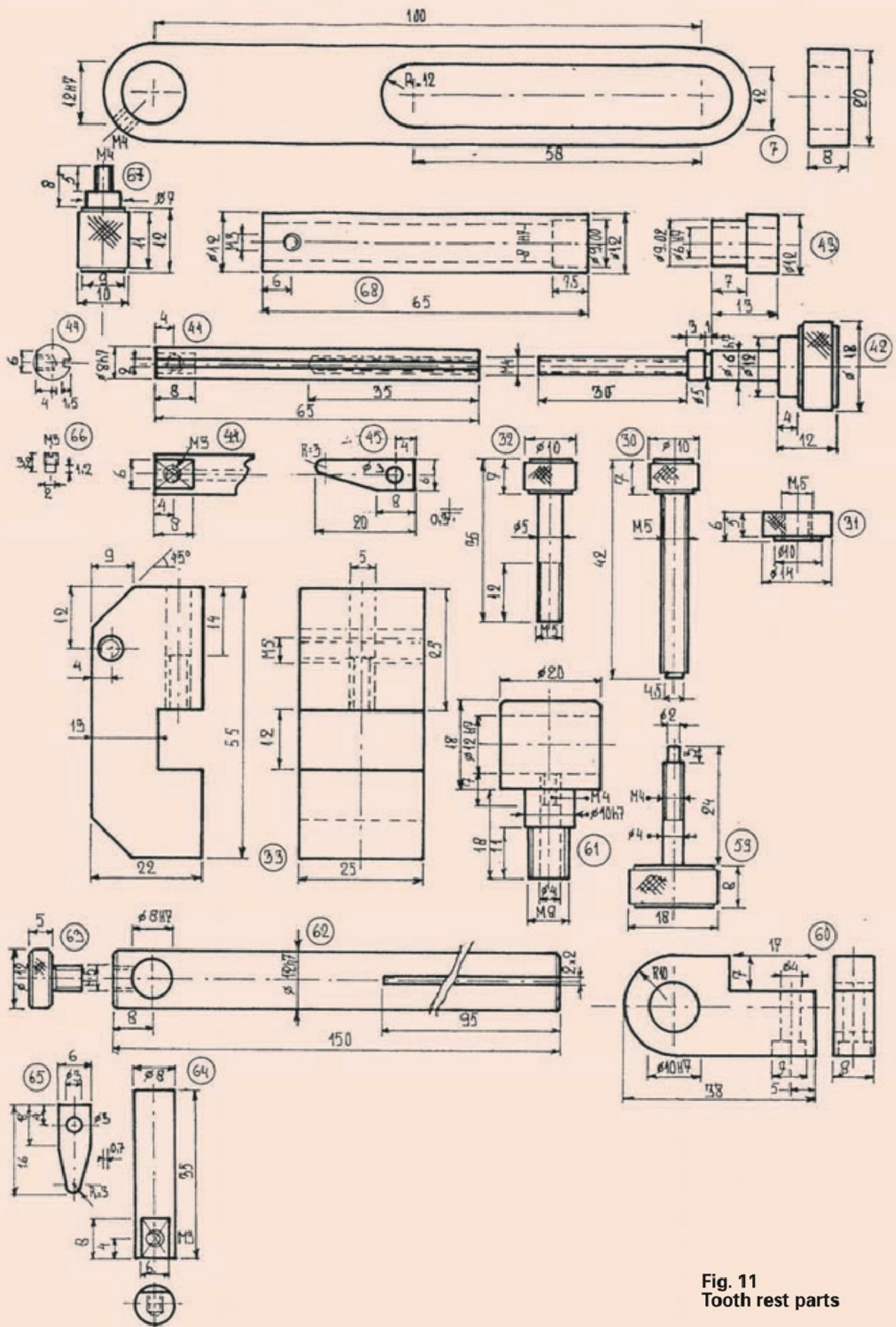


Fig. 11  
Tooth rest parts

need any explanation. Make sure that the block (item 69) fits between the rails when they are positioned on the support blocks (item 20).

## The motor support

Motor height adjustment is achieved by means of a crossed arm construction. The motor support is based on an angle plate (items 57,58), which will be supported by a swivelling plate (items 56, 57). The construction is very similar to that of the support plates for the work head. The motor chosen is actually for a three-phase coolant pump. The advantage of this motor type is that it has a long shaft, which in turn makes it possible to use the work head sideways. Configured in this way, the helical flutes of an end mill can be sharpened. The grinding wheel is positioned 50 mm in front of the angle plate.

The four cross arms (item 24) should be produced together. These have to be made very accurately since a small difference in one of the arms will cause the mechanism to seize up in use. The height adjustment is controlled a lead screw (item 51) with knob (item 50). The lead screw has a standard M12 thread. The best way to produce this screw is on the lathe, to guarantee an absolutely straight thread, although some may prefer to part cut the thread on the lathe and then finish with a die. The construction of the knob and bearing mechanism is similar to that already covered for the slide.

Item 54, the lead screw nut should be produced in the four-jaw chuck. I drilled the centre hole for the M12 thread in the same way, enabling the centre position to be found easily. Also, by tapping the hole with help from the tailstock centre, the result proved to be dead square. The arms are secured by M8 Nyloc nuts like those used in the lead screw construction. The production of the base plate needs little comment, except to note that again, grooves are milled to make sure that all parts are correctly positioned and aligned. The clamp(item 28) secures the motor in position.

## Adjustable tooth rest

Accurate cutter setting depends on a reliable tooth rest. To improve convenience, I developed an adjustable one. It takes a little longer to make, but that pays off when the machine is in use. Bringing the cutter tooth into correct position is something that has to be done very accurately, and the adjustable rest helps to do this job quickly.

A tube is produced out of mild steel 12 mm dia. (item 68). The inside is drilled and reamed to 8h7. One end is bored out to 9.00 mm for a depth of 7.5mm. Here, the cap (item 43) has to be turned to fit tightly. The supporting shaft is produced out of 8 mm steel, and features a full length keyway which I chose to cut with a slitting saw. Others might prefer to work with a small slot drill or end mill. The set screw (item 66) works in the keyway to prevent the shaft from turning. The leaf spring will be mounted by an M4 screw into a drilled and tapped cross hole at one end of the shaft. The spindle and knob are produced out of 18 mm steel. Unwanted rotation of the spindle is prevented by a small spring acting against the cap. All



other items are self-explanatory.

The other "plain tooth rest" is a straightforward job (items 59 to 66).

## Electrical circuit

I elected to wire in a motor reverse switch. It is therefore possible to choose the direction to ensure that the wheel works against the cutter edge. This prevents burrs being left on the freshly sharpened edge. This may increase the possibility of the wheel coming loose, and it would be preferable to use a Nyloc retaining nut, to guard against this.

## Safety

The comments on safety fall into three essential categories. Firstly electrical, this machine uses a mains voltage motor so make sure that earthing arrangements are satisfactory, and connections, insulation, and switchgear are up to the job. If in doubt get an electrician. Secondly, as

noted above, while a wheel guard has not been shown, it is considered mandatory. It is conceivable for a bursting grinding wheel to shed fragments at speeds of around 300mph or 500kph. Finally, grinding operations produce high velocity dust and sparks. Wear safety glasses!

## Conclusion

This machine has proved to be small, easy to operate, and extremely versatile. Especially in those countries in which castings are not easy to obtain, this machine represents an alternative way forwards, since it is produced from stock material. With the benefit of hindsight, (and the experience gained from using the grinder for an extended period) I would like to suggest one small modification. It might be worth the effort to add small sealed ball races to the wheels to make possible an easier, smoother movement of the slide. Certainly, I enjoyed making the machine and I wish others every success in making one too.

