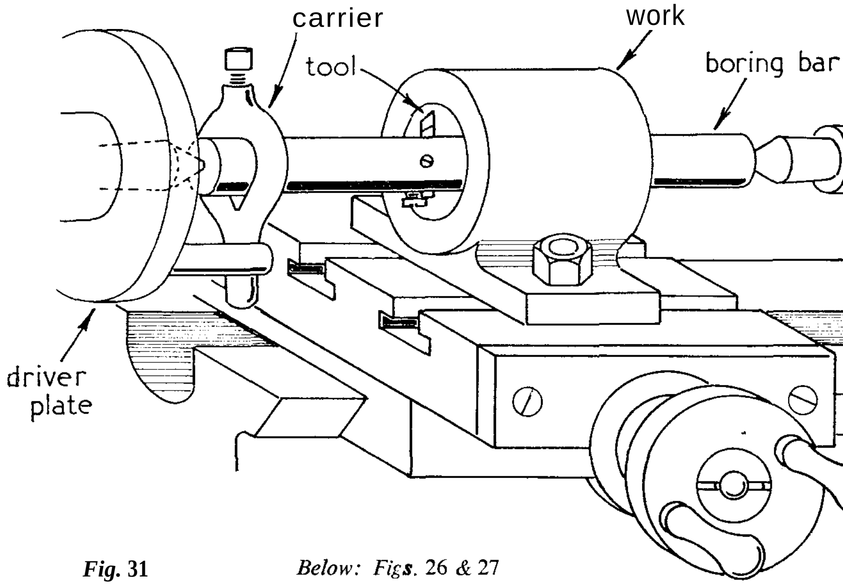
BORING TOOLS

by Duplex



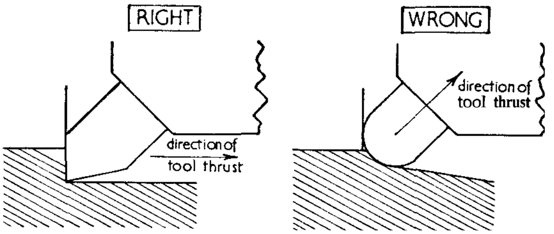
Continued from page 349

***Fig.* 31**

Below: Figs. 26 & 27

The illustration Fig. 26 . below shows diagrammatically the direction of the forces acting on the boring bar as a result of the thrust exerted by the two forms of boring tool. It also demonstrates the effect of a round nose tool on the hole being bored when compared with a tool cutting primarily on its forward face.

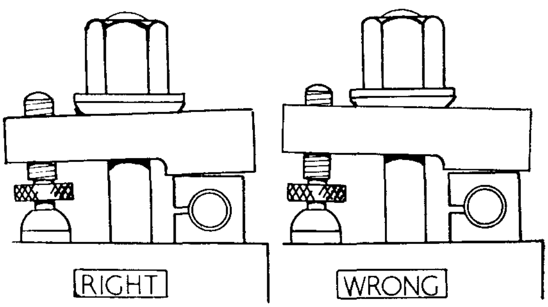
When setting the boring tool the cutter is best located slightly above the centre-line of the work. In this way the tool will be relieved and will not 'dig-in' if the tool loading becomes excessive. However, when boring tapered holes, the cutter must be mounted on the centre-line or the resulting taper will be inaccurate.



In using the split clamp provided with some boring tools, care must be taken to make sure that the bar of the tool is gripped firmly or the bar may turn under load. Pressure should be applied over the split in the clamp and not on its solid side. This point is made clear in Fig. 27. With the type of holder shown in Fig. **28** these remarks naturally do not apply. As will be seen the holder is made from one piece of rectangular mild steel that can be gripped under the toolpost and is provided with a pair of clamping screws securing either of the boring tools shown. As a guide to the making of such holders the dimensions are given in Fig. 29.

Boring tools may, with advantage, be used in the back toolpost. A typical example is seen in Fig. **30.**

We come now to consideration of the Boring Bar. This device, in essence, consists of a spindle mounted between the centres of the lathe and fitted with a cutter that may be adjusted to give the amount of cut required. Boring bars supported on centres are commonly used when machining open-ended cylinders mounted on the cross-slide. A typical arrangement is seen in Fig. 31. The boring bar is an accurate tool; the cutter fitted to it follows a true circular path so that any work passed across that path will have a parallel bore. The bar itself is a substantial affair, partly to afford an adequate housing for the cutter and partly to ensure that there is no chatter

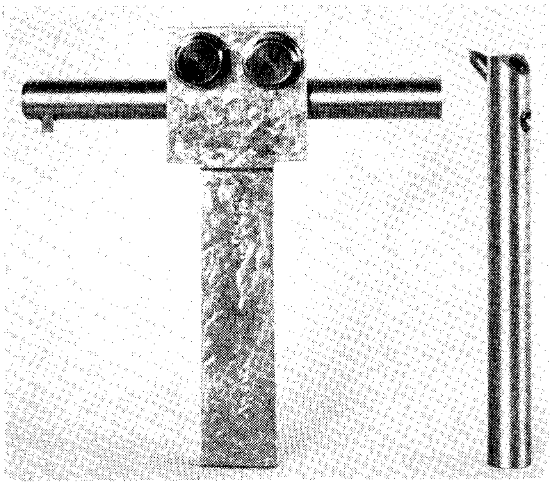


when boring is taking place.

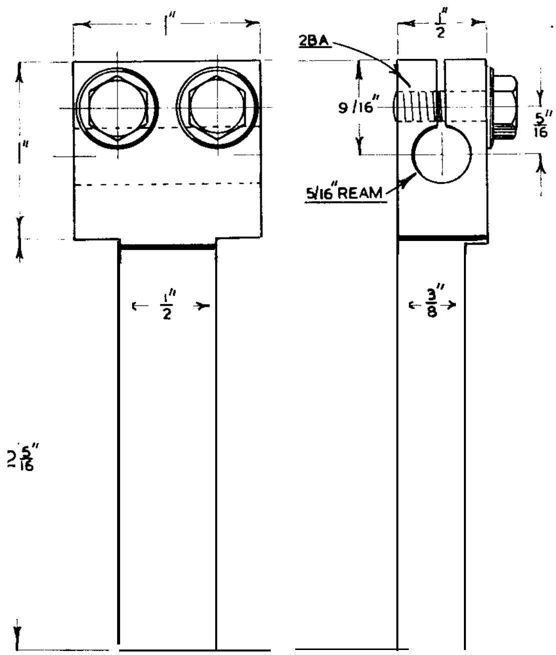
An example is illustrated in Fig. **32.** This type of bar is provided with an adjusting screw for the cutter in addition *to* the customary grub screw for locking it after adjustment. It will be noticed that the centres at the extremities of the bar are recessed to protect them from damage.

Whilst the lock screw is the accepted method of securing the cutter, some use a wedge for the purpose; this is the method employed in the boring bars supplied by Messrs. Myford.

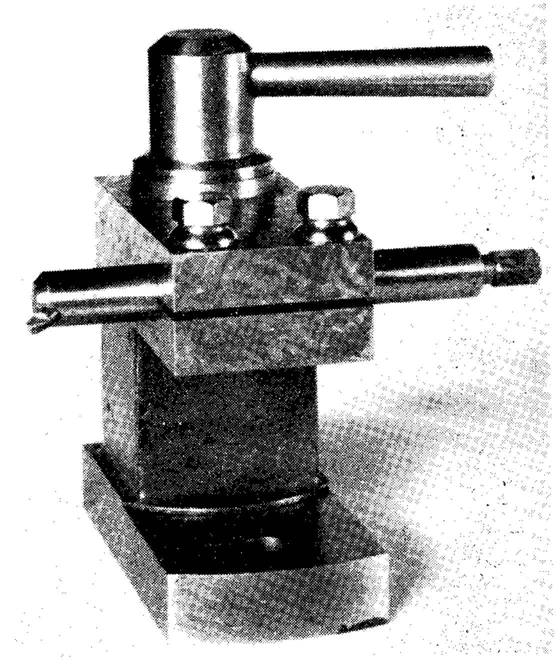
The setting of the boring bar falls properly under two headings. Firstly, ensuring that the cutter will



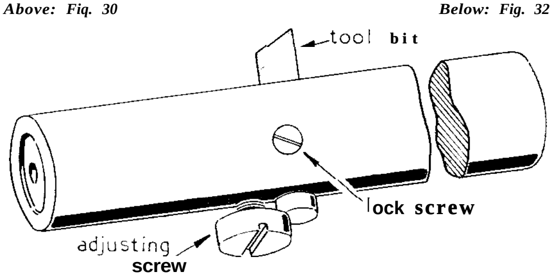
Above: Fig. 28 *Below: Fig. 29*



sweep that part of the work it is desired to machine; and secondly, to make certain that the point of the cutter is at the correct radial distance from the centre of the bar itself. The first of these points is assured by marking out the work, scribing a circle on both its ends and using these circles to mount the work on the cross-slide with reference to the circular path of the cutter. This last is best achieved by placing what is known as a 'Sticky-pin' on the boring bar itself. The 'sticky-pin' is simply a small pointer or scriber set in a lump of plasticine adhering to the boring bar, and the arrangement is depicted in the diagram Fig. 33. By means of this age-old device the work may be accurately set in place.



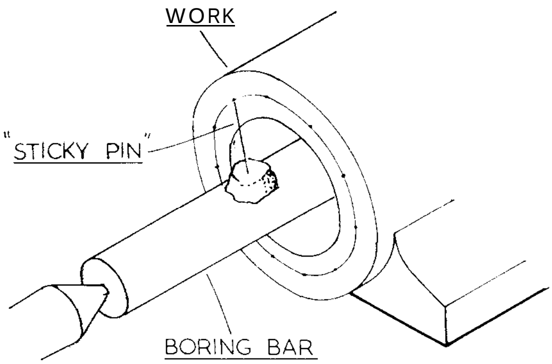
Above: Fiq. 30 *Below: Fig. 32*

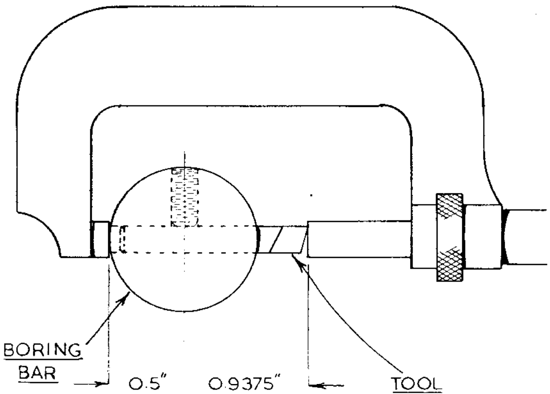


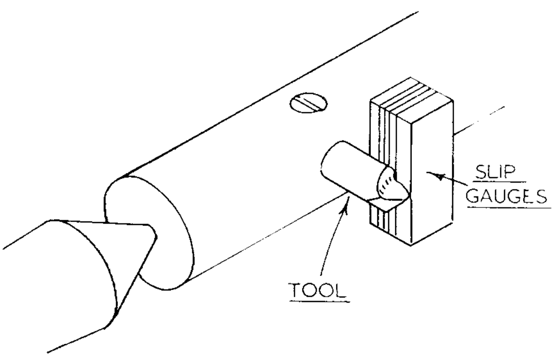
It will be appreciated that the pointer can be adjusted by simply bending it about in the plasticene. The point is tried on the circles at diametrically opposite points and the work is then moved half the amount of the difference before a second try is made. It will be appreciated that several tries may be needed before co-incidence of the scriber point and the scribed circles is achieved and that the sticky pin will need to be adjusted between each try. It must be emphasised that these trials have to be made at both ends of the component. At first it will be sufficient to make these tests at one end only, concentrating on setting the work at the correct height. Thereafter tests should be made at opposite ends alternately until the work has been located correctly in relation to the cutter. When it has, the work is bolted down firmly and the cross-slide locked.

Adjusting the Cutter

Having set the work correctly, the next step is to adjust the cutter in the boring bar. In the first instance the amount of stand-out from the bar can be estimated by eye, care being taken to ensure that the cut is not excessive. But subsequently, except in







Reading down: Figs. 33, 34 and 36

the rather unlikely event of the finished size of the bore being unimportant, the stand-out must be measured accurately. For the most part this measurement can be carried out with a micrometer; but there is sometimes difficulty, particularly if the cutter itself is large, in making certain that the micrometer is really registering the measurement required. In this event other means must be employed. However, when small cutters are being used the micrometer is employed in the manner illustrated in Fig. 34. Let us suppose that the finished size of the bore we are machining is to be 1.875 in. and that we are using a boring bar 1 in. dia. The point of the cutter must then travel in an arc whose radius is 0.9375 in. or half the diameter of the finished bore. If, for example the boring bar in use is 1 in., then the measurement to be taken by the micrometer will be:

0.5 in. (half the diameter of the bar) plus 0.9375 in. (the radius of the finished bore) i.e. 1.4375 in.

When setting the cutter it should first be extended from its seating further than is required. The micrometer can then be used to retain it by turning the thimble until the reading is as shown by calculation. The cutter is then locked and boring can then proceed. This method of setting offers some disadvantages, except possibly in the case of small cutters as has been said; when large tool bits are in use the anvil of the micrometer may project into the cutter seating and the correctness of any measurements will be lost.

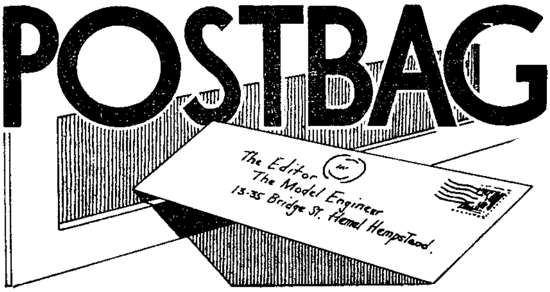
Setting the Tool with D.T.I.

For the most part the use of the dial indicator enables the boring tool to be set accurately in the easiest way. It is best employed when roughing cuts have already been taken and final boring operations are to begin.

In the first instance the indicator must be set to zero at the point where the nose of the boring tool is to be placed. In order to do this an 'Elephant's Foot' anvil is mounted on the indicator spindle, the tool bit is removed from the boring bar and a package consisting in the professional workshop of a set of slip gauges, is set between the periphery of the boring bar and the surface of the anvil. The needle of the indicator is then zeroed under light pressure, the pack of slip gauges is withdrawn, and the tool bit replaced and pushed outwards until, on making contact with the indicator anvil, the needle again reads zero. The steps in the procedure are illustrated in Fig. 35.

The sum a plus b represents the stand-out of the tool from the centre-line of the boring bar and is made up from a = half the diameter of the boring bar plus b = the thickness of the pack of slip gauges required to produce the required stand-out. The boring bar should be turned back and forth during the setting operation to ensure that the point of the tool is at the correct place for adjustment to be made. This is recognisable when the needle on the indicator reaches its highest reading. Then without further turning the boring bar the tool is advanced or retracted until the indicator again reads zero. Before finally locking the tool to the bar, check its setting by means of the pack of gauges used previously. If these are placed alongside the tool in the manner shown in Fig. 36 the correctness, or otherwise, of the setting will be seen at once. In the matter of the slip gauges, we do not all of us possess these accessories, nor indeed are they essential because an efficient substitute can be contrived from pieces of packing and feeler gauges to produce the same result. If packages made this way are measured with a micrometer they will amply fulfil their purpose.

It is also sometimes possible to use the shanks of drills as a check; the range of drills available to-day



The Editor welcomes letters for these columns. He will give a Book Voucher for thirty shillings for the letter which, in his opinion, is the most interesting published in each issue. Pictures, especially of models, are also welcomed. Letters may be condensed or edited.

I.C. Engines

SIR,-I refer to my letter of early January and to Mr. Westbury's letter in the current issue of ***Model Engineer.***

In my letter I expressed my appreciation of Mr. Westbury's recent series of articles on the model I.C. engine which I enjoyed and although I was familiar with most of the engines described I felt that the articles would be a useful guide to those wishing to try their hand for the first time. I was therefore, dismayed to learn from Mr. Westbury's letter that he had "Incurred displeasure" because he had not produced a design for a competitive racing engine.

I would have thought that all those people interested in such a design would appreciate that it could result only from long and patient development with a few inspired guesses to help.

Regarding the possibility referred to in Mr. Westbury's articles of producing a competitive four cycle engine I find myself in agreement with him and would like to raise a point or two.

First a 15 cc. four-cycle engine to be competitive with current top two-strokes which in the 15 cc. class are now capable of say 16,000 rpm. would have to be capable of 22-24,000 rpm. under load. This is a pretty stiff requirement which I think could only be achieved with a flat-twin short stroke, large bore arrangement. The valves would, I think, have to be vertical in the head and the combustion chamber bath tub shaped with ignition plug in the side. This arrangement would give short direct rocker gear and good sized valves without the excess head-area required by angled valves. I suppose the critical point in this type of engine would be the cams and their timing and it is clear that to operate at the speed given they would have to have very extended opening and closing ramps. Ignition would have to be by glow-plug masked to a certain extent. In the motor cycle world they are having a great deal of trouble getting a reliable ignition unit at 15,000 sparks per minute.

I believe some success has been achieved by one private tuner by winding coils with a fabulously expensive wire.

As a Dycyclomaniac 1 am unable to say much about the design of cams or a suitable timing diagram. Perhaps some master of the subject will expound.

In case someone suggests that I should produce an engine of the type described I hasten to say I am already involved in the long and patient business referred to but so far without the inspired guesses.

The rpm. figures quoted earlier are based on those 1 saw some time ago for:-Twin Yamaha 250cc. T.S. 11,500 H.P.52. and 4 Cylinder Honda 250cc. Four Stroke 19,000, H.P.51.

While these figures may not be correct they are sufficiently near to illustrate my point.

Holkham, Wells-next-Sea, Norfolk J. S. DUFFIELD

Locomobile

SIR,-Who was the "Iron Master of Merthyr Tydfil". William Crawshay? The engine shown is a "Locomobile" 4½ h.p. of 1900, but with disc cranks replacing the straight cranks. The shaft keyway in the crank sleeve was a source of weakness in these engines.

Mr. Drummond, our old solicitor, was solicitor to the Locomobile Company in London, run by Sir William Letts, and he told me that 1,000 of these cars were imported during 1901-1902, of which only five now exist, one is here in my garden shed being restored. The first car we had was a Locomobile of this date. Naturally I am exceedingly familiar with the details. Actually these engines were made by the Mason Regulator Co. of Boston, Mass. for the Stanley Brothers who founded the Stanley Steam Cars of which the Locomobile Co. of Bridgeport, Connecticut, U.S.A. was an offshoot. The bore was 2½ in. not 3, by 3½ in. stroke.

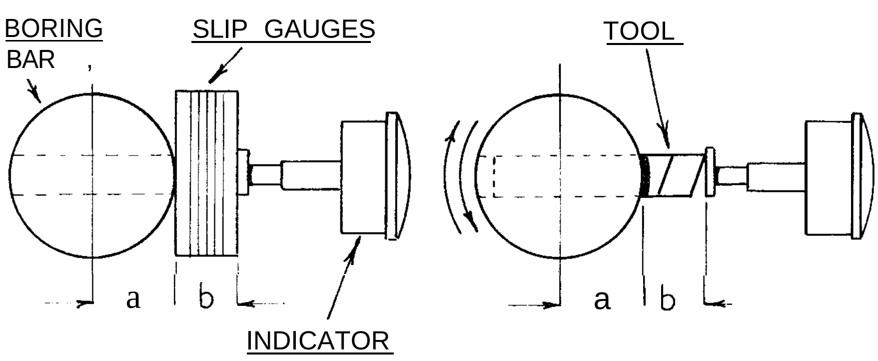
Verily, verily, those were the days!

Barton-on-Sea, Hants. B. STACK.

Model locomotive design

SIR,-Referring to your commentary "Smoke Rings". February 17, 1967 on the subject of small locomotive adhesion and in particular to your expression that more sensible adhesion factors should be employed.

Mr. Harris in his letter November 18, 1966 has indicated that a 5 in. gauge "Director" class locomotive



BORING TOOLS

Continued from preceding page.

advances by fairly close increments and any adjustment needing to be made can be covered with a feeler gauge.

Fig. 35