

# Here is another form of HOLDER for the dividing mandrel

IN THE modified form of the appliance, which provides for angular movement of the dividing mandrel in addition to vertical feed, three new castings are required. They are simple and straightforward to machine. Instead of the solid quill holder fitted directly to the vertical pillar we have a separate saddle piece, on which is mounted a swivelling quill holder. Provision is also made for fitting a steady bar, or overarm; this calls for a steady bracket casting. No alteration whatever need be made in the vertical table or the method of fitting it to the column.

The first operation on the quill holder is the facing of the rear mounting surface. You can hold the work in the four-jaw chuck, or clamp it to the faceplate, with packing under the smaller of the two bosses, to adjust it so that the axes of both bosses are the same distance from the plate. At this setting, the recess in the back face, to fit the spigot on the saddle piece, should also be bored. The two subsidiary recesses, 9/16 in. dia. X 3/16 in. deep, at 1 in. centres, provide clearance for the heads of the hook bolts; they can be cast-in if the foundry work is accurate, but it is not safe to rely on this. To use a piloted counterbore to machine these recesses is not practicable, and so your best method is to offset the casting 1/2 in. either way from the centre and bore them out. Exact location and dimensions of the recesses are not important, as they simply have to provide clearance for the bolt heads.

## Locking arrangements

The method adopted for locking the swivelling adjustment of the quill holder is unusual. Its object is to provide more positive security than is possible with a central bolt or stud. Resistance to movement is greatly increased, and there is no tendency whatever for the adjustment to shift while it is being finally tightened. Those who are confident that the central fixing with a screw, or a stud 3/8 in. dia., is quite adequate may revert to it without any alteration of the castings, but I still recommend the two-bolt arrangement.

Set up the housing on an angle plate to bore the two holes in the bosses exactly parallel with each other in both planes. First clamp the casting to the angle plate, backed up against the faceplate and with its boss centres squared from the mounting face; any further adjustments needed for centring both holes are made by moving the angle plate on the faceplate. Both bores should be smooth and parallel, and a close

fit for the quill and the steady bar. For any form of split clamp good fitting is essential. The clamp should never be expected to take up slack before it can be tightened. Particularly in machine-tool components, where true alignment and position are highly important, no pains should be spared in the boring and fitting. A reamer may be used for the final sizing, so long as it takes out a mere scrape—not more than 5 thousand can be guaranteed not to chatter or snatch.

While the housing is set up on the angle plate, you can use it, without altering its setting as a jig to provide true alignment of the steady bracket. Set up the casting in the four-jaw chuck, with one jaw reversed, for boring the larger of its two bosses, to the same size and standard of accuracy as the corresponding boss of the housing. A short mandrel, turned to a press fit in the bores of both parts, holds the bracket in the exact position for centring and boring the small end boss. The small end boss of the housing should be bored first, so that when it is shifted to set up the larger boss centre it is in the right position to centre the small end of the bracket.

## Splitting the bosses

Both side faces of the quill housing should be machined true and parallel; this too can be done on the angle plate. It remains only to drill and spot-face the holes for clamping bolts, and split the bosses either by a hand or machine saw. A neat and accurate cut with an ordinary hacksaw is not easy to make; a piece of a broken machine saw blade, held in a suitable holder (there are several kinds to choose from these days) will do a cleaner job. With a fairly large slitting saw, on an arbor or mandrel, used in the lathe, the casting may be clamped to the side of an angle plate mounted on the cross-slide. For the steady bracket, a strap with two bolts, and packing under the smaller boss, will be needed for mounting.

If studs or set screws are used instead of through bolts for the split clamps, the clearing holes are drilled in one half only, the other being tapped. The seating faces for nuts or cap screws should always be spot-faced to provide a true surface.

I have found that some readers are not familiar with the term "spot face," and ask what it means and how it is carried out. The meaning is quite literal; it denotes the facing of a "spot" concentric with the hole, and large enough to cover the diameter of the nut, screw head or washer employed. The face can be produced in various ways, such as by a piloted pin drill or a multi-toothed facing cutter; it matters little so long as the desired result is produced.

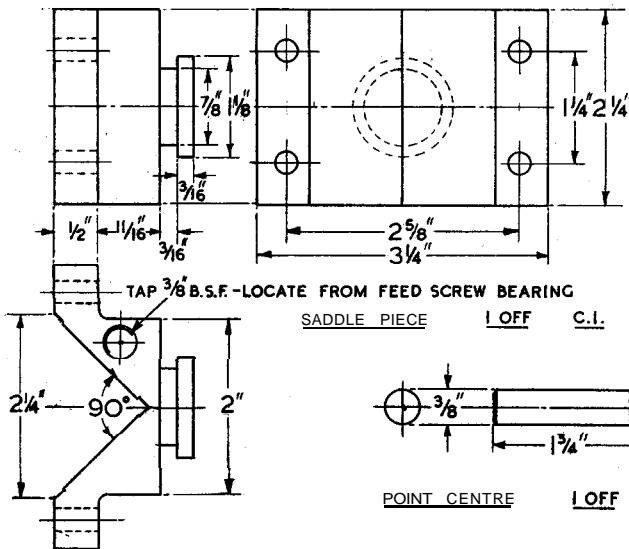
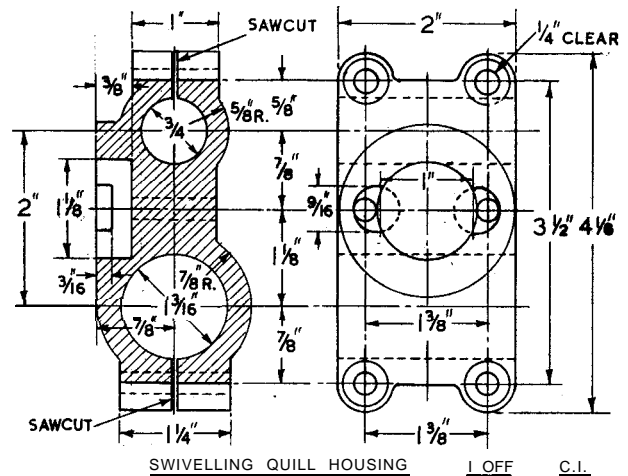
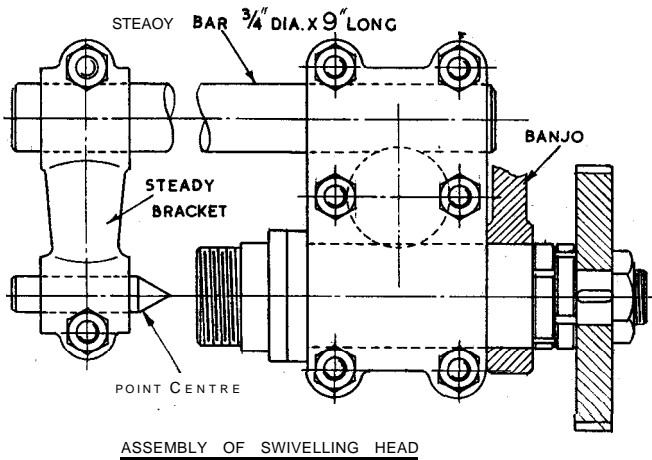
The bolt holes in these components are located as close to the bores as possible, so that they perform their clamping function efficiently with the minimum risk of distorting or breaking the lugs. To cut into the bosses with the spot-facing tool is better than to space the holes farther out from the boss centres. I have often found it necessary to strain the bosses almost to breaking point before a secure clamping grip is obtained.

You can make the steady bar of mild steel so long as it is straight and is correct in diameter. Silver steel or another high tensile material may be used, but it confers no special advantages in strength. The length of bar stated is the maxi-

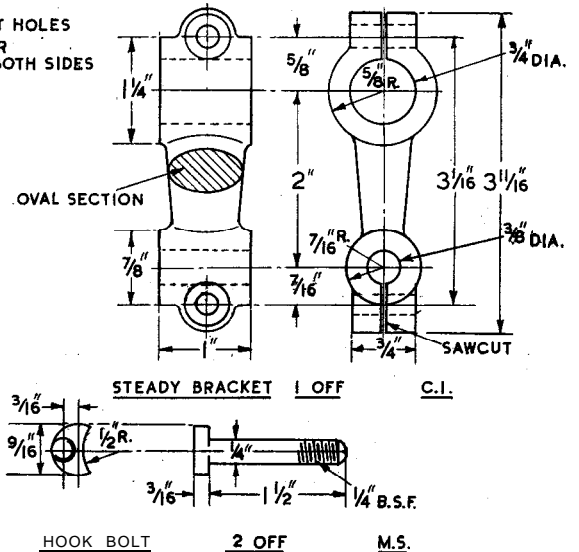
mum which should be necessary or desirable; where work must be mounted on arbors which require outboard support, the arbors should be kept as short and stiff as possible, and the steady bracket adjusted to suit. I have seen dividing appliances in which the extension of the steady bar is out of all proportion to the support provided by the vertical slide, especially when it relies on a key for torque resistance and is secured to the lathe cross-slide by a single centre bolt.

The saddle piece is fitted to the vertical column in the same way as the solid quill holder. Its essential dimensions, including the position of fixing holes, and the tapped hole for the vertical feedscrew, are the same. After the major

If you have none, you must first machine the bar to this diameter to form the screw heads. It is then offset, either in the chuck or in an eccentric feature, to about 3/16 in. for turning and screwing the shank of the bolt, so that one side of it runs out about flush with the head. After the parting off, the head is faced to 3/16 in. thick to fit in the groove of the spigot on the saddle piece. The projecting side of the head is then filed or machined concave; when fitted to the groove, the bolt lies snugly against the head of the spigot. Both bolts must be held in this position, on opposite sides, to allow the housing to be assembled and bolted firmly to the saddle piece.



ALL CLAMP BOLT HOLES  
 1/4" CLEAR  
 SPOT FACED BOTH SIDES



machining has been completed and the saddle fitted to slide smoothly on the pillar with the bolts tightened (with or without shims interposed) between the joint faces, the casting is set up on the faceplate for the grooved spigot on the outer face to be turned. The spigot should fit closely in the recess of the quill housing, and its projection should be very slightly less than the depth of the recess, so that the two components make contact on their broad outer faces-not on the end of the spigot.

For the two hook bolts, you can use 9/16 in. mild steel bar.

The only other detail needed for the modified dividing fixture is a point centre, which may be made from mild steel and casehardened, or from silver steel, hardened and tempered on the tip only to a dark straw, the rest of the length being let down to deep blue or purple. I have not thought it necessary to provide any fine adjustment for the centre, as it is usually considered sufficient to slide the bracket on the steady bar so that the point enters the centred end of the arbor; both end-location and radial adjustment are simultaneously obtained, and the bracket simply needs to be tight-

ened on the bar. Some arbors may possibly call for a hollow centre, or a bush of appropriate size, to steady the end of the arbor in the bracket.

Some may have noticed that the dimension given for the bore of the quill housing, in the group of drawings on page 586 of the December 15 issue, does not correspond with that of the sleeve bearing in the next instalment, that the housing, which was originally bored to the stated dimension, seemed a little weak when seen in the flesh, so to speak. (It is not uncommon, when the first casting off has been machined, for the designer to have second thoughts on these details.) So that the casting need not be altered, I reduced the diameter of the bore and made the quill sleeve to fit.

All other parts of the dividing appliance are the same as for the non-swivelling design, including the mandrel in its sleeve-bearing assembly, or 'quill, and the banjo to carry the indexing plunger for use with lathe change-wheels. It is possible, with this or the simpler non-swivelling head, to extend the indexing arrangement considerably by the use of worm gearing and orthodox division plates.

In all these devices, my object has been to provide the fullest possible range of utility and versatility, with the minimum elaboration or difficulty in setting up. But simplicity has not been obtained at the expense of accuracy or rigidity,

and 'some of the defects common to appliances of this kind have been eliminated, or at least reduced.

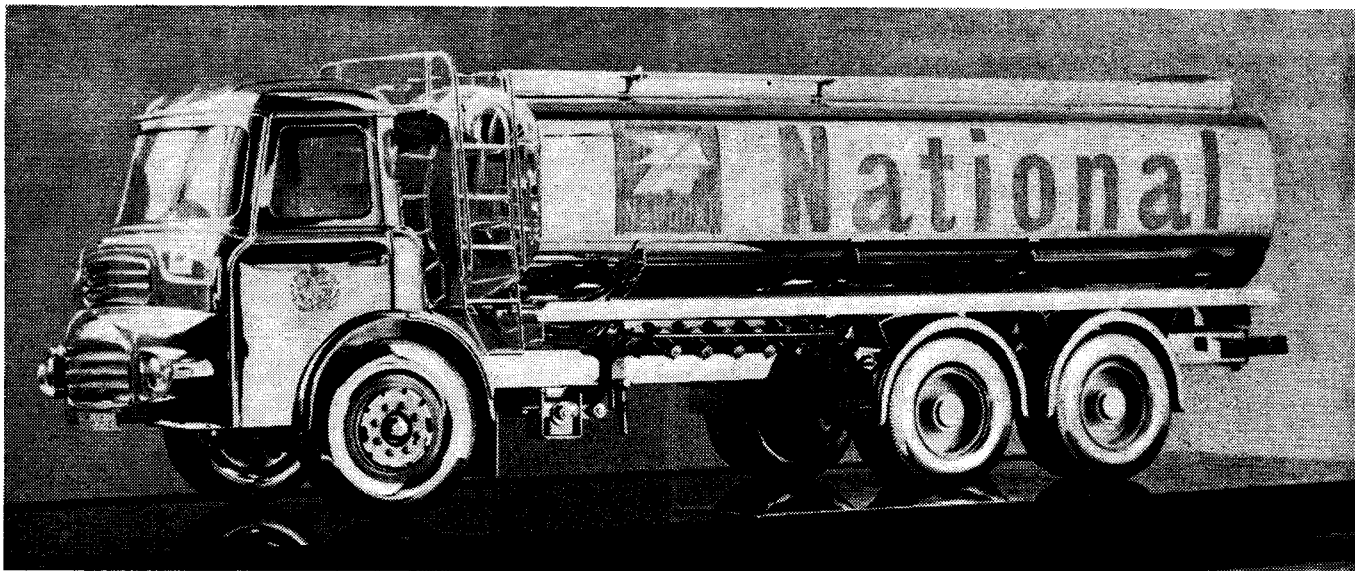
Everyone who has attempted to use milling appliances in the lathe will be aware of the pitfalls which the work involves, especially in critical operations such as gearcutting; yet these operations in themselves are not difficult and should be well within the capacity of any model engineer with a modestly equipped workshop. The trouble is that many of the appliances, from the mere makeshift to the highly elaborate, are not adequate to the working stresses imposed on them. Few appliances are immune from elastic deflection, or spring, which obviously cannot be completely eliminated when the load is imposed at some distance from the point of support. But permanent deflection, often caused by the slipping of articulated joints, is absolutely disastrous. We cannot increase the massiveness of the individual components, or the strength of the joint fixing, beyond a limited amount without making the appliance unwieldy or almost unworkable. But we can do much by studying the basic principles of structure and design; and while I do not claim that this dividing appliance is perfect in either, I believe it to be a step in the right direction.

NED.

*To be continued*

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## MODEL AS TANKER TROPHY



A HANDSOME silver-plated model of a National tanker has been presented by the Leyland Motor Corporation as the award in a new competition to encourage safe driving and vehicle efficiency among tanker drivers in the National Company. It is to be competed for annually. The 1963 winners are the Midland Division, Birmingham.

The model, which represents an Albion Riever 3,000-gallon tanker is 18 in. long overall, giving about 1/18 scale. Mr A. F. Weaver, who is known to many ME readers for his excellent racing car and speed boat models, spent goo hours

on building it, mainly-in brass and copper. It includes every detail, down to the design and wording of the Royal Warrant on the cab door.

All the parts had to be capable of being dismantled for plating, but the use of nuts and screws had to be avoided except where they would not be visible from the outside. The top of the tank is divided into five sections with walkways alongside and between. Each section has its inspection covers, cocks and other fittings. The model is mounted on a plinth of black glass which reflects the underside details. □