The MUNCASTER steam-engine models

***EDGAR T. WESTBURY** glances back with a modern eye to some classic models of the past*

IN THE COURSE of the long history Of MODEL ENGINEER-now, incidentally, approaching 60 years-many notable designs and descriptive articles have been published which have established traditions or marked milestones of progress in model engineering.

Not only are these remembered by old readers but they are often the subject of considerable discussion. and requests for further information about them are constantly encountered. A few of the authors of these features are still with us, and in one or two cases continue to contribute articles; but most of them have passed on and are no longer available to provide either new designs or guidance on their earlier ones.

Many readers have suggested that the M.E. should reprint some of these earlier features, but while this might be a good idea, from certain aspects there are several reasons why the policy has not been adopted by this journal. In the first place, although the designs for models do not necessarily become outdated the mode of treatment, including methods of construction, is subject to certain changes as workshop equipment and technique improve.

In modern setting

To many modern readers, reprinting of old articles or designs may seem to be a policy of retrogression, or at least stagnation; it may even give the impression that there is a dearth of new ideas in model engineering-which is far from being the case. Therefore the idea of verbatim reprints of articles is not considered desirable, but there is much to be said for the revival of old designs in a modem setting.

There can be few model engineers who have not heard of such pioneers as Henry Greenly, C. S. Lake, Fred Westmoreland, H. H. Groves, George Gentry, or the traction engine specialist " Frost-spike," who have been acknowledged masters in a very wide and versatile field of design. Last but not least, the name of H. Muncaster is well remembered as a specialist in the design of all types of steam engines, whose excellent drawings of many types of stationary and marine engines in early volumes of the M.E., and also in the handbook ***Model Stationary Engines,*** published nearly half a century ago, provided scope for the talents of innumerable constructors.

H. Muncaster was a practical draughtsman who not only had a wide experience of steam-engine design but also obviously had a love and devotion to his craft, and to all things mechanical. In the introduction to his book he pays due homage to the many early engineers and inventors who contributed to the development of the steam-engine, and also gives a complete answer to those who would condemn model engineers for "living in the past."

1-A simple oscillating engine

"For the purposes of the model engineer," he states, "it does not follow that the most recent and perfect engines are most suitable; on the other hand, some of the older engines form subjects better adapted and more fitted as prototypes for models, being more picturesque and providing better object lessons."

With which precepts I wholeheartedly agree, and also with his further comments that many of the most popular so-called models " have no prototype in reality, but nevertheless may be useful in illustrating some of the points of the steam-engine, as well as providing a simple motor, where only a small amount of power is required." No model engineer, therefore, need despise the crude and primitive types of models produced by beginners, so long as they lead on to the more realistic types which were Muncaster's speciality.

The simplest form of engine described by Muncaster is one having a single-acting oscillating cylinder (Fig. 1) and this will commend itself to many readers, not only on account of its simple construction, but also because it can be built without castings. It is of the type which would now be classed as " inverted " vertical, having the cylinder below the crankshaft, though in the early days the practice of locating the cylinder at a low level-firmly bolted to the floor if possible-was considered normal and orthodox.

THE PILLAR

The main structural component of this engine is the pillar, shown in Fig. 2, the lower portion of which is of rectangular section, with extended feet at the sides for mounting on the flat square baseplate. At the top end, the section is also rectangular and is cross bored to form a housing for the single main crankshaft bearing. .In the centre, it is turned to circular tapered form, with simple ornamentation in the form of a beading near the lower end.

To save material in making this part, the foot at the base may be made separate and silver-soldered on; or screwing and sweating would probably be satisfactory. This should be done before machining and I suggest that the front and rear sides should then be faced quite flat and true by filing, or any other convenient method, after which the two ends may be marked out, exactly central both ways, and centre-drilled so that the part can be mounted between centres for turning.

The cross holes for the main bearing and the cylinder trunnion may now be drilled, and it is essential that these should be exactly square with the pillar face, so it will be advisable, after marking out their positions, to set the pillar up on the faceplate of the lathe for these operations.

An alternative to the pillar as the

support for the crankshaft bearing is given in Fig. 3. This consists of an A-frame cut from sheet metal, with the bearing housing at the apex, either bushed or otherwise reinforced to provide extra bearing surface. It does not, however, incorporate the port block or other cylinder mounting and it is not explained how this should be fitted. For this particular type of engine, I do not consider it so elegant in appearance as the pillar, neither does it simplify construction.

CYLINDER

The designer suggests that the cylinder (Fig. 4) may be made from a piece of brass tube, with the flange, end cap and portface soldered on, but in practice it will usually be found just as easy to machine it from the solid, as the manipulation of small pieces, which have to be accurately located and soldered simultaneously, is not as simple as it looks. In either case, however, it is essential that the bore of the cylinder should be exactly circular and parallel, the flange faced square with it, and the portface dead flat and parallel to the axis.

These conditions can be assured by machining, as the bore and flange can be dealt with at one setting; a D-bit is recommended for taking the final cut in a blind bore, after which it should be finished by lapping with aluminium oxide or brick dust on a short copper or aluminium lap-not one which extends the full length of the bore, as this will tend to make it tapered or bell-mouthed.

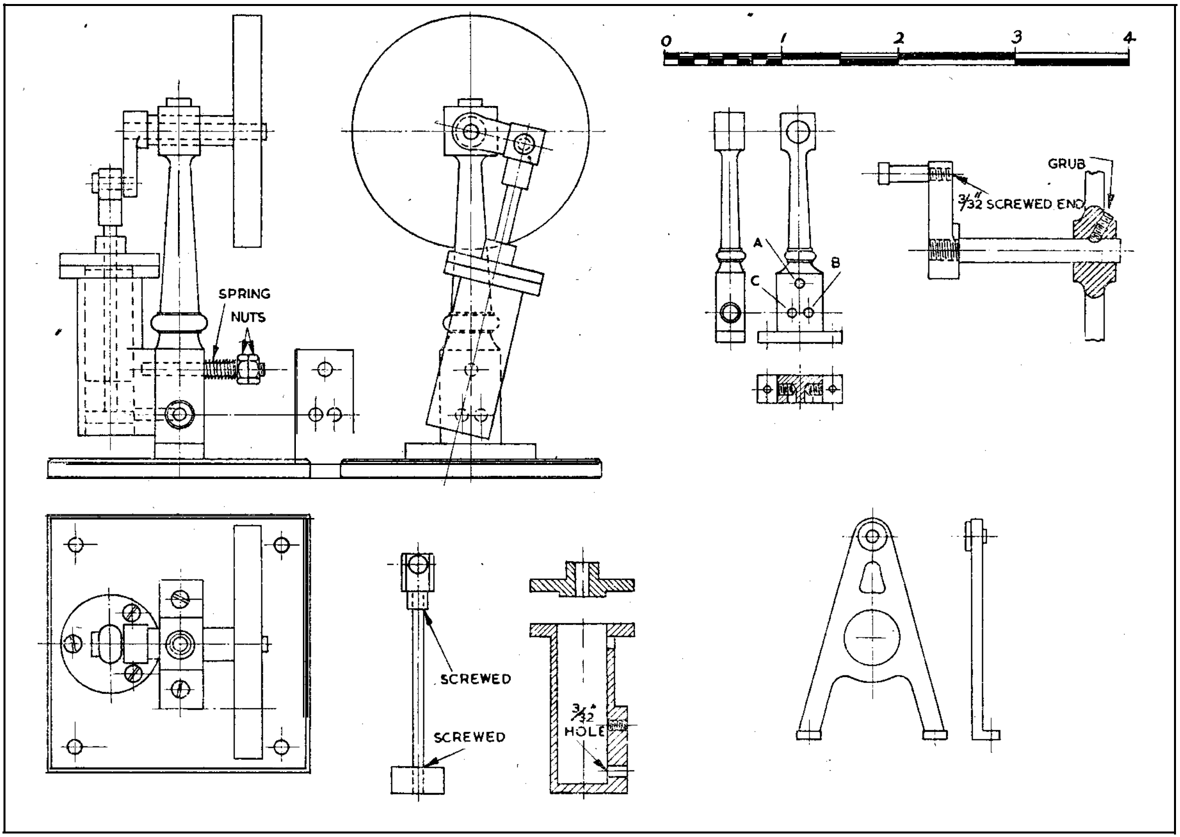
If the cylinder is machined from the solid the smallest diameter of bar which can be used is 1 in. A good deal of material will. be left around the base, after turning as much as possible of the outside, and this will have to be filed or machined away, leaving the portface to be faced flat. A very efficient way of doing this is to make a short mandrel, of a size to fit neatly in the cylinder, and fix this in an angle-plate or a short piece of angle iron, on the lathe faceplate.

Clamp the cylinder endwise on this, checking it first to see that it is parallel with the faceplate; it can then be turned into any position to‘ machine the portface of “nibble” away the rest of the surplus material. By working to the same index reading on the topslide for each cut, the shape may be made practically circular and flush with the upper turned part, needing only a clean-up with a smooth file to take off the sub-angular corners, and a final polish with emery cloth.

The trunnion is fitted to a tapped hole in the face of the portblock, and it is most essential that this should be dead square with the cylinder axis. It could well be drilled and tapped while the cylinder is set up on the faceplate’, to ensure this; the hole should not go right through into the bore, though some constructors may find difficulty in tapping a short blind hole.

If it does go through, however, make certain that the trunnion stud does not project into the bore when tightly screwed in and that there are no burrs left on the inside to interfere with the free movement of the piston. It is an advantage to machine a shallow recess around the tapped hole to relieve the centre of the face; alternatively, this may be done on the corresponding face of the pillar.

Little need be said about the cylinder



The components of the engine

Muncaster steam-engine models . . .

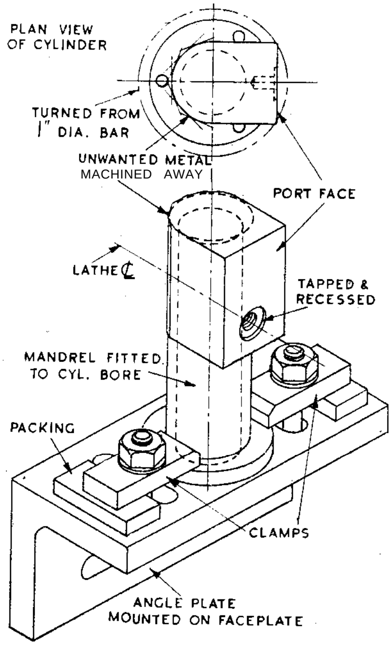
cover (also shown in Fig. 4), as this is a simple job which can be turned at one setting. The spigot should fit neatly in the cylinder bore, and the hole drilled centrally to a working fit for the piston rod. It is attached to the cylinder flange by three 3/32in. or 8 B.A. screws.The piston assembly (Fig. 5) is built up in three pieces, the rod, of 3/32 in. dia. bright mild-steel, being screwed on each end to take the solid piston at one end and the crankhead bearing on the other, both these pieces bemg of brass or gunmetal.

In the drawing, the piston is shown as a plain parallel disc, machined to fit closely in the cylinder, but I strongly recommend, at least to those with little experience in these matters, that a groove should be machined in it for packing with graphited asbestos or cotton yarn. The advice I have given in articles on other engines, that the final machining of the piston should be done after it has been screwed tightly on the rod, still holds good. Final adjustment of the length of the rod, so that the piston just stops clear of the end of the bore at the extremity of its stroke, can best be done on assembly.

CRANKSHAFT

The crankshaft is built up with a web made from rectangular brass bar, into which the main journal and crank-pin are screwed. As an alternative form of construction a disc can be used, and this would not only improve the appearance but could also be balanced if desired. In either case, however, it is essential that both the tapped holes should be square with the web and parallel with each other. No details are given of the flywheel, which is shown as a solid disc, but I recommend that a spoked flywheel with a heavy rim should be fitted.

The main bearing is in the form of a plain bush, made to press tightly in the cross hole at the top of the pillar, and the centre hole in the end of the latter is drilled through into the bush to serve as an oil hole. It is now in order to assemble the parts temporarily, to ascertain that every-thii works freely and smoothly, without binding or tight spots, and that the piston clears at both ends of the cylinder.



Set up for machining the cylinder block

PORT LOCATION AND TIMING

The entire success of an oscillating cylinder engine depends on the accur-ate location of the steam-ports, and this is where many constructors fail to get the best results, as it is by no means easy to mark out and drill holes exactly in the right place. Both the size and position of the two holes in the stationary portblock are depend-ent on their radius from the trunnion centre, in conjunction with the maxi-mum distance of swing at extreme cylinder angularity-which, incident-ally, is not the same thing as half the piston stroke.

In this engine, the maximum dis-tance of swing under these conditions at 3/8 in. radius is 3/16 in., so the ports should be drilled at 3/16 in. centre distance apart, and as the blank space between them should be exactly the same as the port diameter, this dimen-sion should be 3/32 in.; on no account drill larger holes as this would only result in steam wastage between the ports.

Even with the utmost care in locat-ing the holes in the portblock, how-ever, there is still a possibility of error in the position of the single hole in the cylinder face, which may completely nullify all efforts to produce a correctly timed engine. I suggest, therefore, adopting an unconventional method of drilling-these holes, which not only kills two birds with one stone,. as it were, but also ensures positively that they are correctly located in relation to each other,

First of all, the hole m the cylinder is marked out as correctly as possible and drilled undersize, say 5/64 in. or No 48 drill, the hole being con-tinued right through the 'opposite wall of the cylinder. The engine is then assembled and the crankshaft turned to swing the cylinder to maximum angle in one direction, where it is clamped in place by the nut on the trunnion stud with a suitable distance piece.

LAPPING

By running the drill through the hole in the cylinder the position of the hole in the block may be spotted or drilled to full depth, after which the cylinder is shifted to the other extreme position by turning the crank, and the operation repeated. The ports are then opened out to 3/32 in. or No 42, and the hole in the outer cylinder wall closed by a plug screwed or soldered in.

Finally the two side holes in the portblock, forming steam and ad-mission connections, are drilled to meet the ports and tapped to take screwed pipes, the faces of both cylin-der and portblock then being lapped on a piece of plate glass to produce a truly flat and smooth finish.

When finally assembled, a light spring is fitted to the trunnion and the locknuts are adjusted to hold the cylinder against the block, but with no more tension than is necessary_to keep it in steamtight contact against the working steam pressure. The engine will run in either direction, according to which of the two con-necting pipes is connected to the steam line, so that it could readily be made reversible by fitting a change-over cock.

If made according to directions and carefully finished, this should not only be a satisfactory working model, but also a handsome and dignified one.

● ***To be continued.***