

# The **MUNCASTER** steam-engine models

**EDGAR T. WESTBURY** is reviewing some classic models of  
the past in the light of modern techniques

*Continued from 21 February 1957, pages 270-272*

**R**EADERS will no doubt have noticed that the drawings of the simple engine described in the last article were not fully dimensioned, and just in case there should be any complaints about this I will anticipate them by saying that Muncaster, in common with many pioneer model designers, did not consider it necessary to give more than a few leading dimensions on drawings.

I have, however, added a scale which should be helpful in supplying the deficiency, in conjunction either with a simply-made scale rule or a pair of proportional dividers.

The present-day engineer is accustomed to drawings which have every dimension, including in many cases limits and clearances, fully marked, as this is absolutely necessary in industrial production, where different parts have to be made, or even successive operations carried out on single parts, by individual workers out of direct touch with each other.

## Use initiative

In cases where all the machining and fitting on a one-off job are in the hands of a single constructor, however, meticulous marking of every essential and non-essential dimension is by no means so important. While I should be the last to condone inaccurate or slipshod work in any kind of model engineering, I believe that one can become a slave of the blueprint, and it is good engineering practice to work occasionally to what the professional engineer would consider inadequate drawings or specifications, if only because it helps one to cultivate a sense of proportion.

In the field of natural history, reasonably accurate re-constructions of prehistoric animals were made from fragments of fossil bones long before they could be verified by further evidence; and many model engineers have produced good work with nothing more in the way of information than a few rough sketches and possibly a photograph or two.

I must confess that I have not a great deal of patience with the type of reader who makes a major issue out of a missing dimension or a slight discrepancy in a drawing; the more complicated drawings become, the more difficult it is to avoid minor errors which escape the most careful checking, and the more likely they are to deter the timid beginner from tackling construction.

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## 2-Double-acting oscillating engines

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### DOUBLE-ACTING OSCILLATING CYLINDER ENGINE

Unlike the previous engine, the construction of this example, illustrated in Fig. 7, favours the use of castings for the main structural parts, though they can be produced by cutting from the solid and fabrication. For instance, the hollow base, **D**, could be made by soldering or brazing a rectangular frame of strip material to a flat plate, and the bearing supports or A-frames, **F**, could be made by bending strip material to the profile, as seen in the end view, and soldering or brazing in the curved supporting rib or crossbar.

It is most important that these frames should stand exactly perpendicular to the base when fitted and that the top surfaces which form the bearing seatings should be exactly the same height and in alignment. While it is possible to correct errors in these respects by packing under the feet of the frames or the bearings, this is certainly not a practice to be encouraged.

If the cylinder, **A**, is made from stock material, the circular portface may be made from a piece of 7/8in. dia. bar, filed or machined to fit closely to the side of the barrel and preferably secured by silver soldering. At the same time, short half-round pieces can be fitted above and below this face. It will be seen that a boss or spigot is provided on the opposite side of the barrel to receive the point of a pivot screw, and this should similarly be fixed, exactly in diametric alignment with the portface.

The drawing shows a raised beading in the centre of the cylinder; this is not a necessity, but is desirable both from the point of appearance and also to stiffen the cylinder wall. For machining the bore and facing one end flange, I recommend mounting on an angle plate with a strap bearing on the spigot, but care should be taken not to apply so much pressure as to risk distortion of the barrel. The other end flange is faced by mounting on a mandrel.

### Mark off centres

It is absolutely essential that the centre indentation in the spigot should be dead in line with the hole in the centre of the portface, and in order to ensure this, it would be a sound policy to mark off these centres with a surface gauge, with the cylinder resting on the machined flange face to locate the horizontal line, and then mounting it on a mandrel resting in V-blocks for the vertical line. The intersections on both sides are then centre-drilled, and the Cylinder mounted between centres for machining the portface.

Flanged covers are secured, each by four screws, to the ends of the cylinder, and as the engine is double-acting the upper cover is fitted with a gland, or "stuffing-box" as it was termed by the early engineers. It is important that this should be exactly central and truly tapped; these conditions can be ensured by using the methods which I have described for engines of my own design.

No exact details are given of the

# Muncaster models ...

piston, but from other engine dimensions it is clear that this should be 5/16 in. wide, and a groove 3/16 in. wide x 1/8 in. deep may be turned in it to take graphited packing. The rod is 5/32 in. dia., and the crankhead bearing, which is screwed to the upper end, must be split as shown in Fig. 8, to enable it to be assembled on the crankshaft.

The cylinder is mounted between the fixed portblock, B, and the pivot block, C, both of which are screwed to the base between the feet of the A-frames, and it is most essential that the centres of these should be dead in line and that the face of the block, B, is squarely located so that the portface of the cylinder beds truly against it while being quite free to swing when the pivot screw is properly adjusted.

This is perhaps a somewhat difficult condition to ensure, at least for the beginner, and I suggest that one method of doing so is to fix the blocks together temporarily by sweating, with an aligning dowel in the pivot holes (leave the tapping of the pivot block *pro tem*), and facing off the base surface by machining or filing exactly square with the face of the portblock. Even this, however, will be of no avail if the mounting surface of the base is not dead flat and true; it is also necessary to locate the two blocks correctly in relation to each other when they are screwed in position.

## Aligning mandrel

To do this, an aligning mandrel is made from a dead straight piece of 5/32 in. silver-steel rod, long enough to extend across the base and pass through both blocks. After squaring up their positions, the portblock should be fixed first by its two screws and then the pivot block; in each case it will be possible to spot the positions of the tapping holes in the base from those in the blocks to avoid the risk of error.

Small clamps are useful for holding the parts in place during these operations and if not already available they should be made or obtained right away, as they will certainly be needed for innumerable subsequent jobs.

When fitted to complete satisfaction, the hole in the pivot block may be tapped and a locking screw fitted to the top (though I should personally consider that a locknut on the screw would be more satisfactory); the portblock is also equipped with a centre stud to fit the hole in the centre of the cylinder portface.

The crankshaft, G, may be either built up or machined from the solid; it is not necessary to give details of either method as they have been described on innumerable occasions in connection with other engines. I may observe, however, that this offers quite a good opportunity for the beginner to get some practice in marking out and machining an orthodox type of crankshaft from a piece of flat bar, which should be of about 1 in. x 3/8 in. section.

I would, however, suggest a slight modification to this component, as drawn; it would appear that the only end location of the shaft is that provided by the flywheel on one side and the driving pulley on the other. I do not consider this to be very good

practice, as although it serves its purpose, in the event of either fitting being shifted, accidentally or otherwise, it would be possible for the crankhead to be forced out of alignment.

A much better method would be to provide positive end location on the inside of the main bearings, either by enlarging the idle portion of the journals to form locating collars, or better still, extending the bearing surface inwards up to the webs of the crank. Incidentally, I do not understand why it should be necessary to place the bearing frames so far apart in this engine as it is a cardinal precept in any engine design to support a crankshaft as close up to the webs as possible.

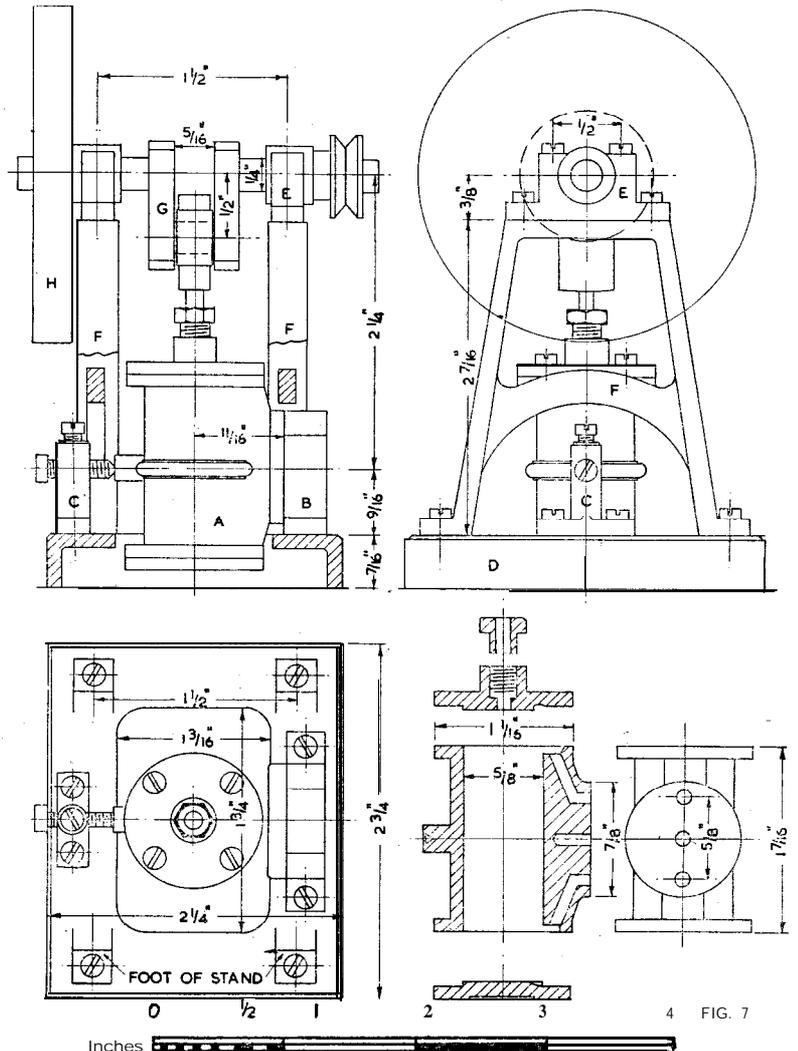


Fig. 7: General arrangement of double-acting oscillating engine, and details of cylinder

Extreme right, Fig. 8:  
Details of the split bearing  
for piston rod

Right, Fig. 9: Portblock,  
showing formation of the  
inlet and outlet passages  
on both sides (to suit  
the twin-cylinder engine)

Left, Fig. 10: Arrange-  
ment of complete plant  
with vertical boiler, show-  
ing cylinder portblock,  
reversing valve, etc.

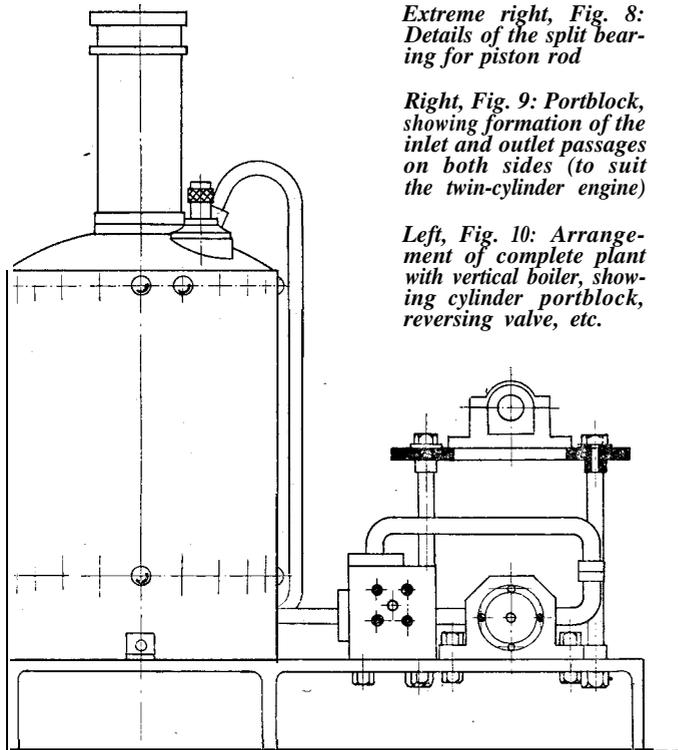


FIG. 10

The main bearings, *E*, are of the plummer block type, and correct practice dictates that they should be split, though this is not a practical necessity in a small engine as solid bearings can be threaded on from the two ends of the crankshaft. They must, of course, be correctly aligned but this is easily ensured if they are made and fitted properly, and any small discrepancy which may cause the shaft to run tight when finally fitted can be corrected by running a reamer or lap through both bearings when they are screwed down *in situ*. (This, of course, pre-supposes that the shaft journals are properly machined or assembled in exact alignment).

### CYLINDER PORT LOCATION

In drilling the steam ports in the cylinder and portblock, it is not practicable to use the simple method of ensuring their correct location recommended in the previous article, as the former ports do not lead directly into the cylinder but communicate with oblique ports drilled from the cylinder ends. It could, perhaps, be done by drilling straight-through holes and plugging them up afterwards, but there might be some risk of leakage with relatively inaccessible plugs.

The method of port formation recommended by Muncaster, however,

is ingenious, and with careful measurement and marking out should give very satisfactory results. In this case, the cylinder ports are located by measurement, and an annular groove is formed in the fixed portblock, *B*, concentric with the pivot pin, and at the same radius as the two cylinder ports (Fig. 9).

At the top and bottom positions the groove is blocked or "stopped off" by fitting plugs, which are faced off flush with the face of the block; and at right angles to these positions, holes are drilled in the groove to communicate with the inlet and exit pipes, one of each thus serving for the two ends of the cylinder.

It will be seen that when the engine is assembled with the cylinder in contact with the block, and the piston on dead centre, both cylinder ports will be blanked off by the stop pegs; but when the crank is turned to swing the cylinder to its extreme angular position (indicated by the line, *ab*) the top cylinder port will be placed, via the annular groove, in communication with the right-hand horizontal passage, and the lower port with the left-hand passage.

At the other extreme end of the swing, the communications will be reversed; thus the conditions are established for admitting steam to

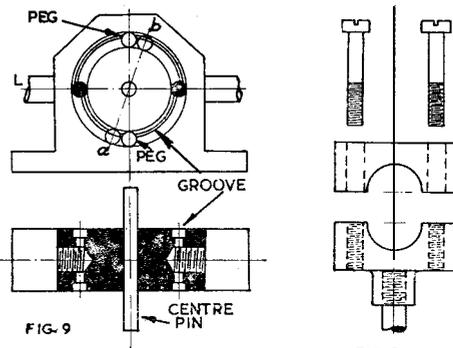


FIG. 9

FIG. 8

each end of the cylinder in turn and releasing it to exhaust, on alternate strokes of the piston. As in the case of the single-acting engine, optimum timing is obtained when the "stop" of the groove lines up exactly with the cylinder port at dead centre and is exactly the same width as the port.

The ports in the cylinder and the oblique drilled passages should be 1/8 in. dia., and the entry at the mouth of the cylinder in each case should be unobstructed, which calls for chamfering the edge of the cylinder and the spigot of the cover at this point. The portfaces should be carefully lapped and may with advantage be relieved in the centre as recommended for the previous engine. Thin paper gaskets should be fitted to the covers to ensure steam-tight joints.

### A TWIN-CYLINDER ENGINE

The design of this engine may be adapted to form a twin or "double" engine by simple modifications and additions to the components. The base will, of course, have to be enlarged, and a third bearing support fitted to take a two-throw crank, with the crankpins located at 90 deg. as shown in the general arrangement drawing, Fig. 10, of a complete double-cylinder engine with vertical boiler, in elevation.

The drawing shows a modified form of bearing support, but most components are identical with those of the single engine. A double-sided portblock is fitted between the two cylinders with *both* its faces grooved and ported as shown in Fig. 9.

This drawing is admittedly somewhat sketchy and lacking in detail but it should be readily understood if considered in conjunction with the drawing of the single-cylinder arrangement (see Fig. 7).

Some further details of the twin-engined plant will be given in the next instalment.

● To be continued.