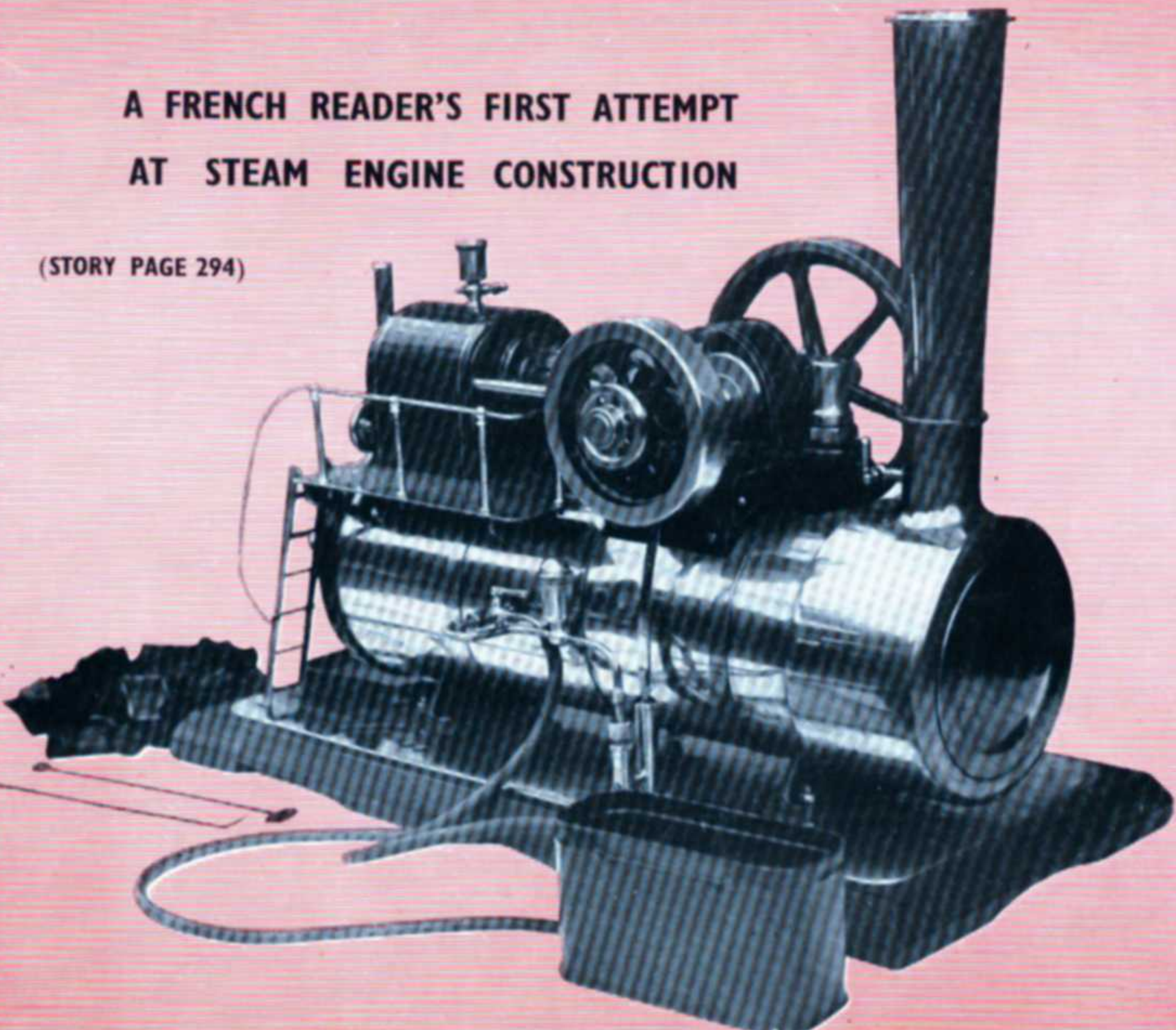
Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED

A FRENCH READER'S FIRST ATTEMPT AT STEAM ENGINE CONSTRUCTION

(STORY PAGE 294)



ONE SHILLING 6 MARCH 1958 VOL 118 NO 2963

CONTENTS

NEXT WEEK

The last of the grasshoppers

An historic snuffbox

Piston valves

Portuguese caravels

ONE SHILLING

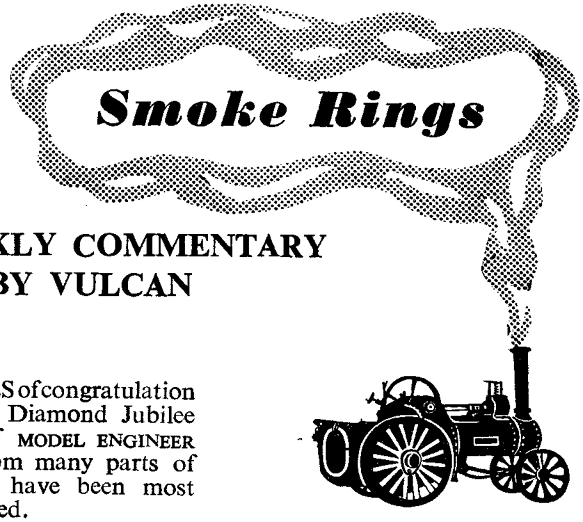
6 MARCH 1958

VOL. 118 No 2963

Published every Thursday Subscription 65s (USA and Canada $9.25), post free

The Editor is pleased to consider contributions for publication in MODEL ENGINEER. Manuscripts should be accompanied by photographs and/or drawings and should have a stamped addressed envelope for their return if unsuitable. None of the contents of MODEL ENGINEER may be reproduced without written permission. All correspondence should be addressed to the Editor, Model Engineer, 19-20 Noel Street, London W1.

Smoke Rings



A WEEKLY COMMENTARY BY VULCAN

MESSAGES of congratulation on the Diamond Jubilee Year of MODEL ENGINEER have arrived from many parts of the world and have been most gratefully received.

Most if not all of them have been acknowledged but if any reader has not had a reply please accept our apologies, and also thanks for writing. It is pleasant to know that our efforts are appreciated and to hear of the goodwill which exists towards the important milestone in the life of the journal.

Many distinguished figures in the world of engineering and industry—as well as some in the wider sense—have written most interesting messages and many will be published in the special Diamond Jubilee Issue on May 1.

We are always glad to hear from readers and I hope they will continue to let us have their views on the Jubilee as well as on many other subjects.

Sensitivity

JUST how much can a model engineer, accustomed to working to fine tolerances, develop the sense of touch ?

I ask this question after chatting with an acquaintance, a well-known professional model maker. He claims that his sensitive fingers can determine differences as little as one thou, and one of his senior craftsmen told me that he selects the correct size drill as often as not by touch as by observation. Differences of 1/64 in. can be distinguished quite easily in drill sizes, he maintains.

I have not yet put this to the test —although it seems a relatively easy matter on which to conduct a scientific investigation—but I would like to hear the views of readers.

I am not suggesting that my professional friends employ their sensitivity of touch in preference to the use of instruments, but where critical accuracy is not essential it seems to save them a great deal of time.

Incidentally, I was given a new version of the hackneyed story of the burglar who sandpapers his fingerprints. This is done, said my acquaintance, not primarily to destroy the minute valleys and hills which form the fingerprint pattern but to increase the sense of touch so that the tiny movements of the tumblers in a safe lock can be felt through the handle !

Don't keep it dark

FROM June 1 any live steamer who causes dark smoke—as dark or darker than shade two on the Ringelmann chart—to be emitted from the chimney of his miniature locomotive will be committing an offence under the Clean Air Act and will be liable to a fine of £100.

An engineman who burns Welsh nuts or anthracite, or a mixture of both, should not fall foul of this new law, provided that he uses charcoal soaked in paraffin, or some similar fire lighter, and not housecoal, for the initial combustion.

It might be useful, however, to have a Ringelmann chart in the toolbox on fete days and when doing duty in the public park, for there is bound to be some officious busybody anxious to raise smoke even if the little engine isn't.

If the busybody gets too heated and begins to smoke himself, the Ringelmann chart can be applied smartly to the fevered brow, and should the hue be deeper than shade two the offender can be handed over to officialdom to be dealt with summarily.

Smoke Rings . . .

Mystery person

LIKE me, you fondly believe that there are only two people in charge of a steam locomotive—the driver and the fireman.

That's what I thought until I read a report in the *Manchester Guardian* on the subject of the automatic train control system which is to be installed on British Railways. To my astonishment I realised that the crews of British locomotives have been supplemented by a mysterious third person.

Writing of the fact that the driver can, to a degree, control the warning mechanism in his cab, the *Guardian* correspondent writes:

"At the same time a mechanism is started which would lead to a partial application of the brakes within ten or fifteen seconds, according to the length of the train. The engine driver can intercept this mechanism by throwing a witch in his cab."

I was amused, too, by the same correspondent's statement that cynics maintain that the device ensures nothing more than that driver is not dead—a fact which the fireman should have observed.

An article on automatic train control will appear in an early issue.

Train seats

I MAY be old fashioned but I still prefer compartment stock to centre gangway saloon coaches on heavy suburban lines, for it seems to me to possess several advantages.

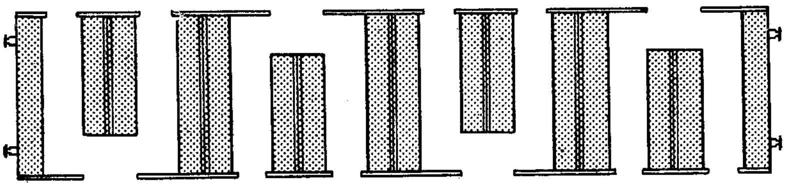
First, it is much more cosy in winter months; secondly, it is more easy for little friendly groups to travel together; thirdly, it provides, coach for coach, a much greater seating capacity.

The two advantages which saloon stock—nowadays almost always fitted with pneumatic sliding doors—can claim are its ability to carry a larger standing load and to permit much freer entry and egress.

But why not effect a compromise and gain the advantages of both systems? My sketch suggests an arrangement which, in the illustration shown, can seat 64 on a medium length coach and 80 on a longer type, with ample standing room.

There are only six single sliding doors each side, the same number as those in contemporary use, though they are usually arranged in pairs. An added advantage of this semi-compartment design is that non-smoking sections can be more uniformly distributed through the length of the train.

Well, what about it? Any bright ideas?



Diesel's 93 m.p.h.

AS the forerunner of 96 diesel-electric locomotives ordered for the Western Region of British Railways, the great green locomotive *Active* set off the other day from Paddington to "herald a new chapter in railway modernisation." On board for the run to Bristol and back were the Minister of Transport, the top brass of the British Transport Commission, some visitors from overseas and, of course, the Press.

Travelling down to Bristol at an average speed of about 57 m.p.h., *Active* arrived with three minutes to spare. She had reached 93 on a straight run and everybody felt that the new chapter had been opened—or heralded, if one can in some way "herald" a chapter.

It was, therefore, in the proudest confidence that she set off again for Paddington. But before she had gone far some imp, flying out of nowhere on a cloud of live steam, did his best to make BTC look silly. With a sad puff, one of the two 1,000 h.p. engines failed, outside Bristol. At Hullavington the train halted and the Olympians, having taken counsel of one another and of the gods, elected to continue on a single engine.

Nothing further happened. After missing two scheduled stops—Didcot and Reading—*Active* drew into Paddington 19 minutes late.

Advantage

Nevertheless, she made the journey and, all things considered, made it well—for who will quibble over 19 lost minutes on a pretty long run in winter? One of the advantages of the new type of locomotive, said the Western area chairman, was that it could be kept running in such circumstances as those of an engine failure.

In time, *Active* will be joined by 62 other locomotives, five of 2,000 h.p. and the rest of 1,000, from the North British Locomotive Company of Glasgow. Another 33, all of 2,000 h.p., have been ordered from the Swindon Works of Western Region, making 96 in all; and we must add 34 of the larger type for which, I understand, orders have not yet been placed.

Eventually the new locomotives will replace steam on the whole of the Western Region between Newton Abbot and Penzance.

Cover picture

A model semi-portable overtype steam engine built by M. Pierre Rabier, of France. Edgar T. Westbury writes about it on pages 294 and 295.

Major T. L. Wall

I WAS sorry to hear of the death of Major T. L. Wall, which occurred early in February. My first knowledge of him was when I saw the photographs of his magnificent model of HMS *Portland* in MODEL ENGINEER during 1946 and read his articles on its building. My reaction was that here was someone worth knowing.

In 1947 when I met him at the ME Exhibition my impression was confirmed. His vigorous personality and his forthright manner marked him out as someone to be reckoned with. He had a hatred of shoddy work and easy methods. He simply had to have things done properly regardless of the labour involved.

In ship modelling his aim was perfection, and although his background and Army training may have precluded his becoming a super-craftsman, his determination overcame all difficulties and his work will rank very high. He once told me his great regret was that he had parted with his masterpiece, HMS *Portland.* He spent so much time in building the model that by the time it was finished he was tired of seeing it around, and just at that time an American came along and persuaded him to sell it.

Major Wall was working on a model of the destroyer HMS *Kelly* when he died. As an illustration of his keen, enterprising mind he had made the hull in fibre-glass. Although we saw little of him except at the annual Exhibition, which he never missed, his occasional letters and articles always brought a breath of fresh air into the office.

Following his introductory discussion on the early clippers, the author goes on to describe how to carve the hull of the actual model

CUTTY SARK

By Edward Bowness

Cutty Sark, in common with all true clipper ships, would be described as a fine-lined ship, being finely tapered toward each end so that she can be driven through the water with the minimum of effort.

This is indicated by the waterlines in the waterlines plan. The easy curves of the buttock lines in the profile also indicate this fineness. In a ship with full lines the buttock lines would be flatter amidships and would curve up more abruptly at each end.

To illustrate the essential difference between the clipper ship and the later sailing ships, which were designed for carrying capacity rather than for speed, I have given (Fig. 2) the corresponding lines plan for the four-mast barque *Archibald Russell.* On comparing these lines with those of the *Cutty Sark* (Fig. 1) the difference will be at once apparent.

In the body plan the midship section of the clipper is seen to be somewhat rounded in general form and the floors or bottom of the ship slope upward at a considerable angle whereas the carrier is box-like in section with almost flat floors. The clipper hull is more comfortable in a seaway and heels over easily to the best angle for sailing. The carrier, on the other hand, is stiff and heavy to drive.

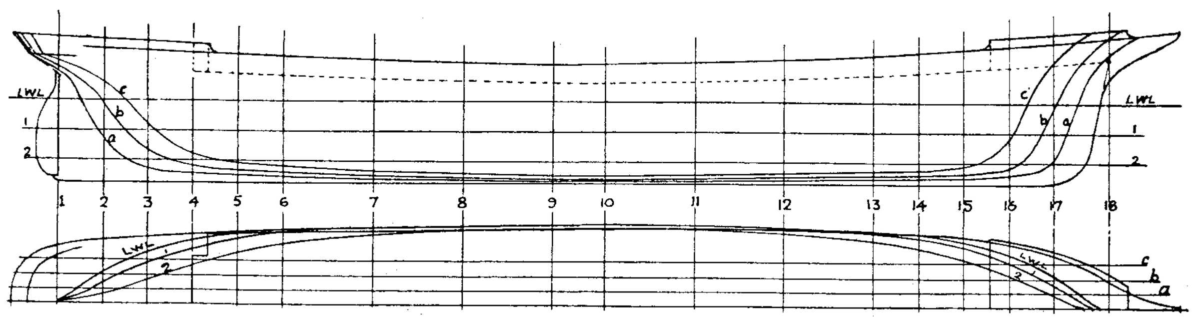


Fig. 2: Lines of the four-mast barque ARCHIBALD RUSSELL

The competition of the steamer forced the designers of the later sailing ships to increase their carrying capacity, and the box-like section with the fuller ends was the natural result.

The difference in the waterlines and buttock lines between the two types has already been referred to. An interesting point is that the sheer line of the clippers was much flatter than that of the carriers, probably a legacy from the East Indiamen and the earlier ships which had very little sheer.

A proper appreciation of these points will be of considerable assistance to the modeller, especially if he is new to shipmodelling, and will enable him to produce a model which will at once stand out as a real clipper. In many pictures the clipper is represented as being a curly, flamboyant type of vessel; in fact, she was the embodiment of classical severity—a feature often seen in the design of modern high-speed aircraft.

Starting the model

In making the model, the first requirement is a block of wood 15 in. long by 2½ in. square. This allows a little for finishing, but to begin with the block should not be less than this, and wood with a close grain but soft enough to carve easily should be selected.

Yellow pine is ideal but in these days is rather difficult to obtain. But a good piece of lime, cedar, or American white wood would be suitable.

Plane the block of wood smooth all over and true to the dimensions given. Then draw on each side the outline of the profile of the hull (Fig. 3).

In this connection it will be remembered that the registered length of the ship was given as 212.5 ft. This is the length between perpendiculars, or, to quote Lloyd's Register Book for 1934: "Length = length from fore side to stem to the after side of sternpost on the range of the upper deck beams."

For the overall length a further 7.5 ft must be added aft for the counter and forward 13 ft must be added for the knee of the head and the figurehead. This gives an overall length of 233 ft or for the model $14\frac{9}{16}$ in. This will be made clear on reference to the profile plan (Fig. 1).

From time to time there have been certain changes in the method of measuring the registered length of a ship, but I think the rule I have used will give a reasonably accurate result.

The depth is also rather complicated, the moulded depth not being the same as the registered depth. These depths are, however, more concerned with cargo capacity and have little to do with the dimensions required by the modeller.

Before drawing the profile on the sides of the block the positions of the sections or stations should be drawn in and connected by lines across the upper and lower surfaces of the block as a check on their positions. The line for the keel should coincide with the lower surface, and the shape of the sheer line is drawn through a series of points marked off at each station, the heights being scaled, *not* copied, from the profile plan, and a smooth curve drawn between them (Fig. 1).

The outline at the stern should

include the rudder as, at the small scale of this model, it is advisable to make the rudder solid with the hull, indicating the hinged joint by means of grooves—as will be explained at the appropriate time. This outline, as also that of the stem, should be taken from the full-size outlines (Fig. 1).

To do this, copy them carefully on a sheet of tracing paper, using a fairly soft pencil. The station lines, 9½ and 10 for the stem and 0 and ½ for the stern, should be included in the tracing. Lay the tracing face downward on the wood with the station lines in their correct positions and go over the outline with the pencil. The original pencil marks will be transferred to the wood and can be strengthened if necessary.

Then apply the tracing to the opposite side of the wood, which will then be in contact with the new pencil lines, and go over the lines with the pencil once again. The lines will again be transferred to the wood, but this time from the opposite side of the paper. This method of transferring outlines to wood is easier to perform than to explain, and will frequently be found very convenient.

The recess for the main deck should be shown, its length being indicated by dotted lines on the profile and on the waterlines plan.

The three rails around the ship, indicated by the three sets of double lines in the profile, call for some explanation for the beginner. The lower pair shows the sheer line, which is a moulding just above the level of the main deck and runs around the ship from the figurehead around the counter and back to the figurehead.

The middle pair is the main rail which also extends from the figurehead around the ship and back again. The poop deck and the fo'c'sle head are located on the level of the underside of the main rail.

The upper pair of lines shows the topgallant rail, which is on the top of the 15 in. high topgallant bulwark, and runs from the knightheads at the heel of the jib-boom, around the ship and back again. All three rails are continuous, being carried around the ship without a break.

Preliminary shaping

The block of wood should now be cut to the outline drawn, cutting squarely across from one side to the other. Keep the cut just, but only just, outside the line to allow for finishing. Owing to the sheer and the portion cut away for the main deck there is a generous amount to be removed from the top.

To minimise the labour and to avoid a split running along and spoiling the block a series of sawcuts should be made across the top almost down to the sheer line, after which the wood between the sawcuts can be removed by a flat chisel of suitable width and cutting across the block (Fig. 3).

In cutting out the profile of the ship the poop should be left the full height of the topgallant rail as it is more convenient to cut it down to the correct level at a later stage. The fo'c'sle head should be left at the height of the main rail except toward its forward end where it should be carried up to the height of the projection for the knightheads.

The main deck should be cut down to within $\frac{1}{16}$ in. of the sheer line, this being an allowance for the camber of the deck. To produce this camber the deck should be cut away on each side, curving down to the level of the sheer line. The block should now look like Fig. 4.

A line should next be drawn along the centre of the upper andl ower surfaces of the block and the station lines on the sides connected across to replace the lines cut away. Now draw the outline of the hull on the upper and lower surfaces of the block, noting that it is the plan at the widest part which must be drawn. At the ends of the ship this width is at rail level, but amidships it is the width at waterline 1.

The widths for the plan should be drawn to scale—not copied—from the waterlines plan at each station, and a smooth curve drawn through the points. When cutting away the unwanted wood, 1/32 in. or so should be left for finishing—a more generous allowance than was made when cutting the profile. The station lines should now be drawn on each side connecting those already on the top and bottom surfaces. Number each station.

Carving the hull

I come now to the final shaping of the hull. For this, templates must be prepared, showing the half section at each station. These may be made of 1/32 in. three ply, of thin plastic

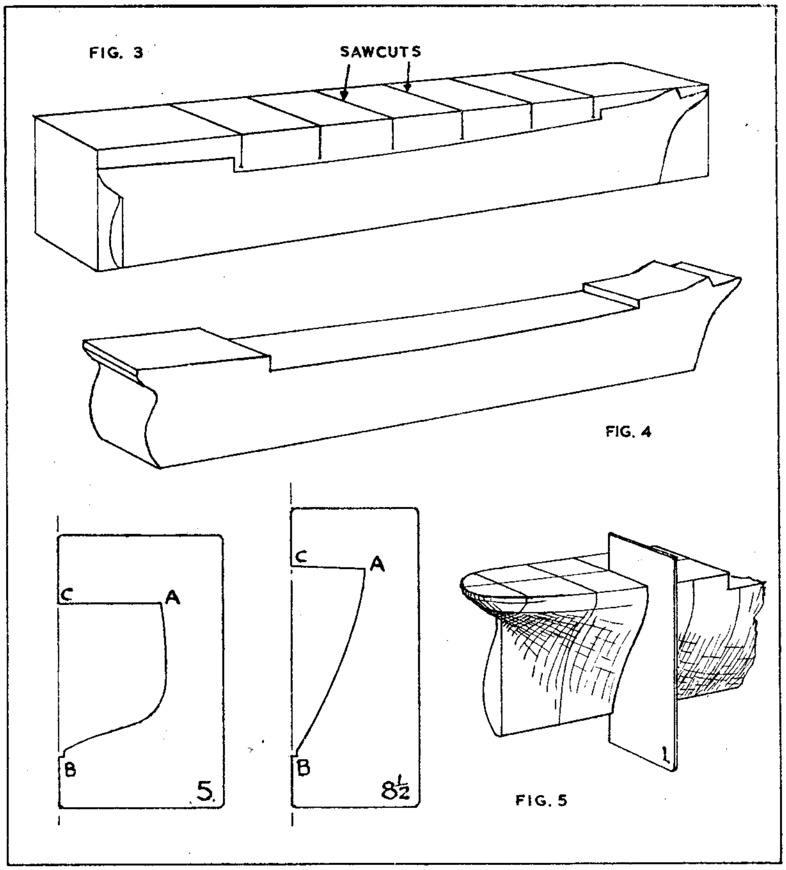
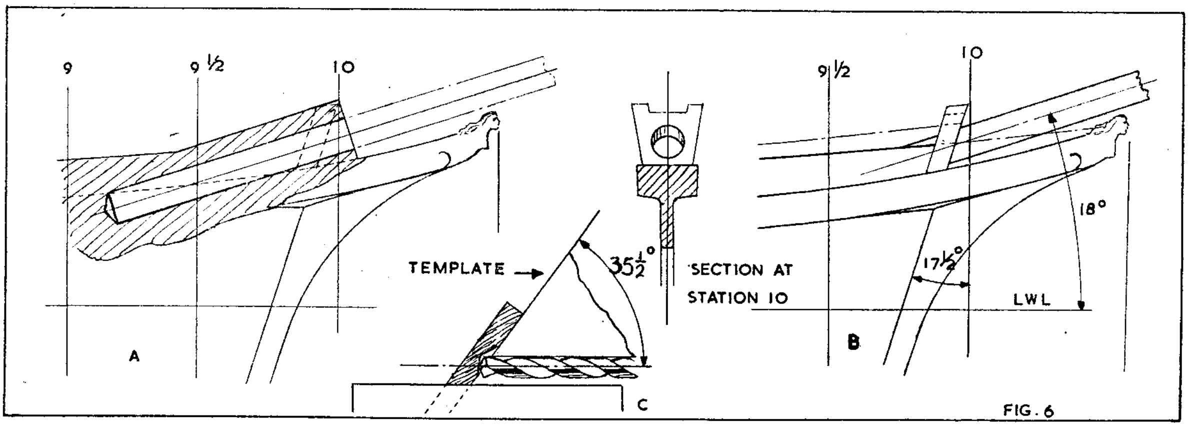


Fig. 3: Block with sawcuts for shaping; Fig. 4: Block shaped to the outline of the profile; Fig. 5: Shape and use of templates



sheet or stiff card of good quality—not strawboard. Fig. 5 shows the general form of the templates and also shows them in use. Point *A* must be positioned very accurately as to both its height above *B* and its distance from *C*. The shape from *A* to *B* must be copied with great care from the corresponding curve in the body plan, as on this depends the symmetry of the final form.

As the carving of the hull proceeds the templates should be applied more frequently to avoid cutting too much away at any point. The stations are spaced more closely toward each end to give better control. The wide space between buttock line *A* and the angles at the forefoot and at the heel of the sternpost show how gradual is the slope between them and how thin the hull is at these points. This is an important feature of the clipper hull form.

There is very little flare at the bows, but under the counter there is quite a hollow, sloping down toward the keel, though it has filled up considerably by the time it reaches station ½. The hollow section between the bilges and the keel will be noted, also that it diminishes as one moves fore and aft.

In the profile the line $\frac{1}{16}$ in. forward of the sternpost and ⅛ in. aft of the stem indicates the end of the planking. It will not be perceptible in the carving as the ends of the planks are faired away flush with the stern and sternpost, as will be seen in the waterlines plan. A faint score may be added to indicate this line if desired.

As the form approaches completion a straight-edge or batten, or both, should be used to check the flow of the surface horizontally from one station to the next. It is possible to have the shape correct at the stations and bulging or hollow between them. The essential feature is that the curves should be smooth throughout, especially in a horizontal direction.

Fig. 6, **A**: *Bow shaped for drilling the hole for the bowsprit;* **B**: *Bow with the bowsprit and knightheads in place;* C: *Method of drilling knightheads for the bowsprit*

Care must be taken not to cut away the keel. To ensure this it should be left a little full until the final finishing touches. Some builders prefer to make the keel separate and of somewhat harder wood, but this involves making a very fine joint where the keel meets the stem and sternpost, or making the keel, stem and sternpost in one piece, which is even more troublesome.

I consider that making the whole thing in one piece produces a better result if sufficient care is taken in the carving. The edge of the template through *B* and *C* should line up accurately with the centreline drawn on the block to ensure that the deck rails run smoothly along the ship. Similarly, the height of *A* above *B* should be worked to accurately to ensure a smooth sweeping curve for the sheer line.

Modelling the bow

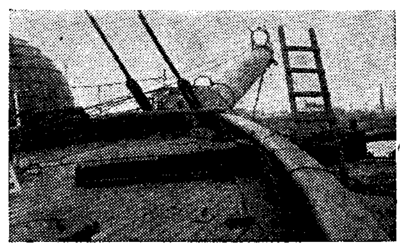
The carving of the hull at the bow is somewhat complicated. On each side where the sheerline runs into the figurehead a second moulding will be seen about ⅛ in. below it, extending aft almost to station 9. On the ship herself the space between these two mouldings, known as the cheeks, is filled in with the trail boards which carry the gilded decoration.

In carving the hull this should be left solid, and the space below it forward of the line at the end of the planking should be cut down to the thickness of the stem or, to give it its correct name, the knee of the head. But be careful not to lose the upward sweep of the curve leading to the figurehead.

The forward end of the fo'c'sle head should be left at the height of the knighthead, as already mentioned, and with its forward face cut down at right angles until it meets the sheerline (Fig. 6A). This is to facilitate the drilling of the hole for the bowsprit.

The portion below the sheerline which represents the trail board follows, in plan, the curve marked "sheer line" in the waterlines plan (Fig. 1) with its outer surface practically vertical. The side of the hull below the trail board follows the run of the planking as shown by the dotted line in the same drawing. Above the trail board it flares outward almost to the line marked "rail" in the plan.

After this flare has been carved to

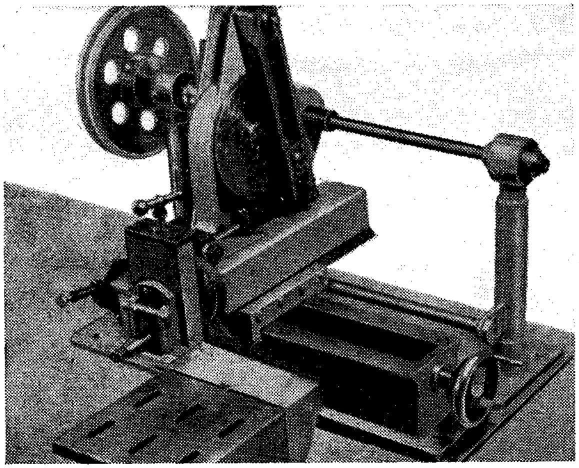


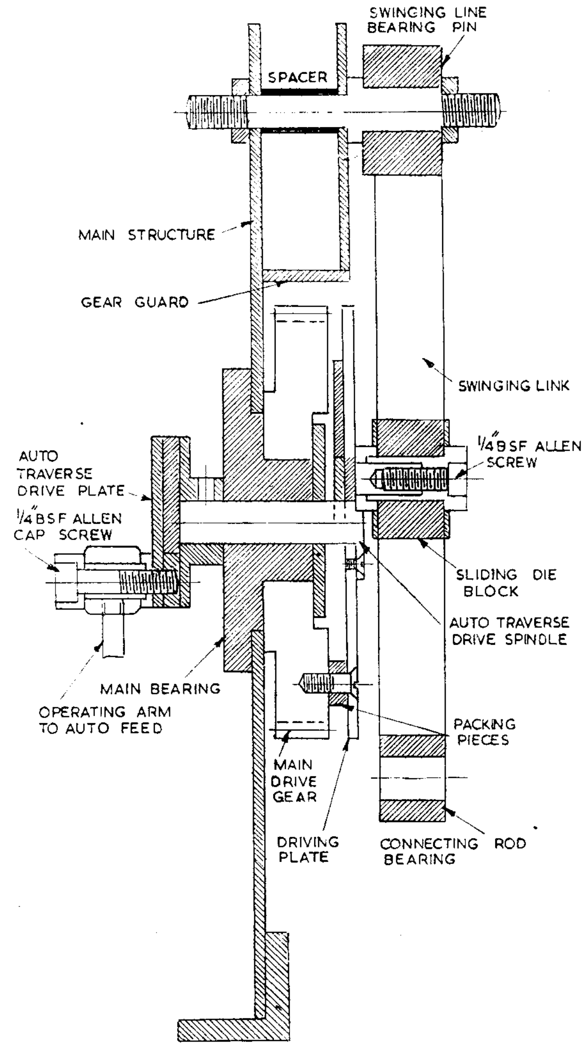
The fo'c'sle head and bowsprit

the approximate shape it must be cut back above the sheerline for almost $\frac{1}{16}$ in. to receive the bulwark which will be fitted later. The hole for the bowsprit, which is 5/32 in. dia., should be drilled 1¼ in. deep from the face left on the block. The fo'c'sle head should then be cut to the correct level and the front face cut down to the sheerline at the angle shown in Fig. 6**B** to receive the piece of wood which represents the knightheads.

Levelling the fo'c'sle head will cut into the hole for the bowsprit, but this is as it should be as on the ship the upper surface of the bowsprit is seen on the deck just aft of the knightheads as is shown in my picture.

● *To be continued*





MOTORISING A PERFECTO HAND SHAPER

... as carried out by W. H. PERRETT

A FEW years ago I bought from the Perfecto Engineering Company a set of part-machined castings of their 5 in. shaping machine. This firm had kindly machined the bed and the ram as this, with only a 3½ in. lathe at my disposal, was beyond me.

I quickly determined to install some sort of motor power. This, I might add, was before the Perfecto company produced a power edition. However, I felt I could only be fully satisfied if it were to operate on similar lines to the larger machines, i.e. automatic traverse, adjustment of stroke, both in length and position, and quick return. The result is illustrated; after much use—some of it rather heavy work—the machine is still showing no sign of distress.

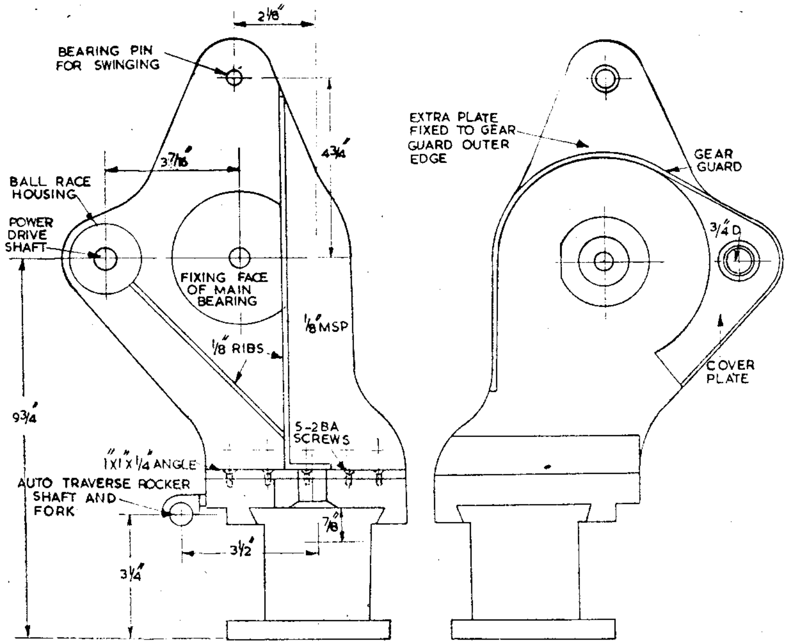
Now for the general outline of construction, as applied to this particular machine:

A pair of matching reduction gears were first obtained. The size of these was ⅝ in. wide with a pitch diameter of 4⅞ in. and 2 in. The larger had a bore of 1⅜ in., the other ⅞ in. And it is around these gears that the whole idea was worked out; the position of the various centres is shown in Fig. 2.

To carry this main structure a piece of 1 in. × 1 in. × ¼ in. steel angle was screwed to the saddle of the shaper by five 2 BA screws, the upper surface of the saddle having previously been machined dead flat. The inner face of the angle (nearest the ram) was kept approximately ⅛ in. from the edge of the V along which the ram works, to give clearance, and also kept exactly parallel to line of ram. For appearance' sake the angle was filed on its lower edges to the shape of the saddle.

The main structure was made out of ⅛ in. mild steel, with two stiffeners sifbronze welded on the outer side, the lower end of which is angled (see drawing). This angled piece rests on the position which normally would be taken by the hand operating lever.

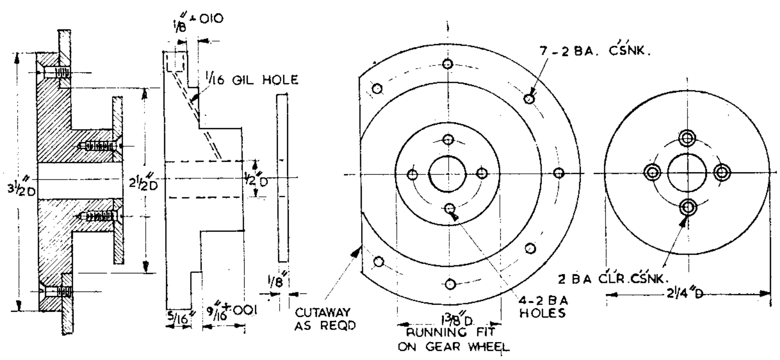
When finally erected, the angle is bolted to this arm, via the pivot hole. On the inner side of the structure a wheel guard, which follows the shape of the two gear wheels, was Sifbronzed on, as was also an extra piece (the same shape of the structure) fitted on the outer side and above the wheel guard. All this was made of ⅛ in. mild steel, and was found to be very rigid. This was now fitted to the angle previously fixed to the saddle,



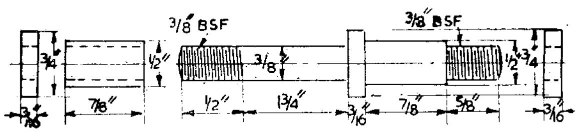
Figs 2 and 3: General details of the main structure as viewed from the front and inside

by another five 2 BA screws, and by means of packing between the hand-operating lever pivot bracket and the outer angle at the base of the stiffener, the main structure can be checked to 90 deg. to the saddle surface.

A piece of cast iron was next obtained from which the main bearing for the larger wheel was turned (Fig. 4). It was turned to the sizes shown for my wheels, and very important was the boring of the $\frac{1}{2}$ in. hole through the centre, at the same setting as the $1\frac{3}{8}$ in. dia., so that they were concentric with each other.



Above, Fig. 4: The main bearing and keep-plate



Right, Fig. 5: Swinging link bearing pin, spacing tube and washers

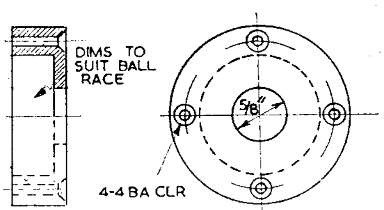


Fig. 6: The thrust bearing housing

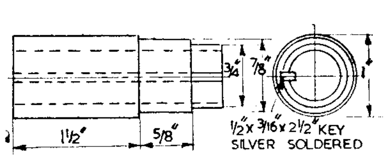


Fig. 7: The small gear centre

This $\frac{1}{2}$ in. hole was for the self-act spindle. I must point out here that the $\frac{9}{16}$ in. width at the $1\frac{3}{8}$ in. dia. is the width of the bore of my gear wheel, and this measurement should only be 0.001 in. over the length of the bore of the wheel in use, as with a keep-plate on the end it would add to the rigidness of the wheel.

A $\frac{1}{16}$ in. oil hole is drilled in this bearing to supply oil to both the inner and outer bearing surfaces. In all possible cases I fitted on this machine a cycle-type flush oil cap.

This bearing had to be cut away on the outer flange and slightly on the inner face, to clear the stiffener when fitted through a hole cut in the main structure. Seven 2 BA screws were used for fixing, these being tapped into the $\frac{1}{8}$ in. plate.

A spindle to carry the upper end of the swinging link was next made—from mild steel. Two washers and a spacing piece had also to be made with this item. To fit the spindle two $\frac{3}{8}$ in. holes were drilled in the apex of the main structure, at the centre previously marked, these being through the two thicknesses of metal.

Between the two thicknesses of metal the spacer was fitted and with a washer fitted over the end it was bolted up tight. Care was taken to ensure that this spindle was square in all directions with the main structure.

To take the main driving shaft through the structure a ball race of $\frac{5}{8}$ in. bore was used, and a housing was next constructed to carry this. The bore of this bearing should slide along a $\frac{5}{8}$ in. dia. mild steel shaft, and a $\frac{3}{4}$ in. clear hole was made through the main structure at the predetermined centre. With the ball race in place the housing was fitted concentric with this hole—on the outer side of the structure—using 4 BA screws, tapped into the $\frac{1}{8}$ in. plate.

For the smaller of the two gear wheels a centre was next made out of mild steel with a silver steel key fitted (Fig. 7).

With the larger gear on its centre a measurement was taken from the

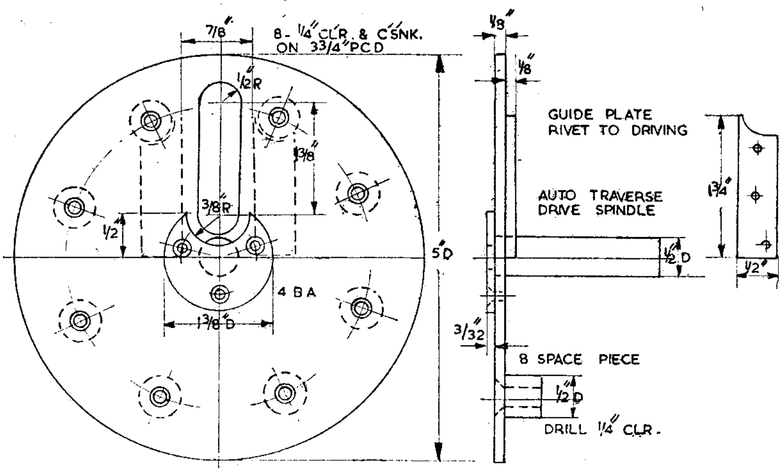
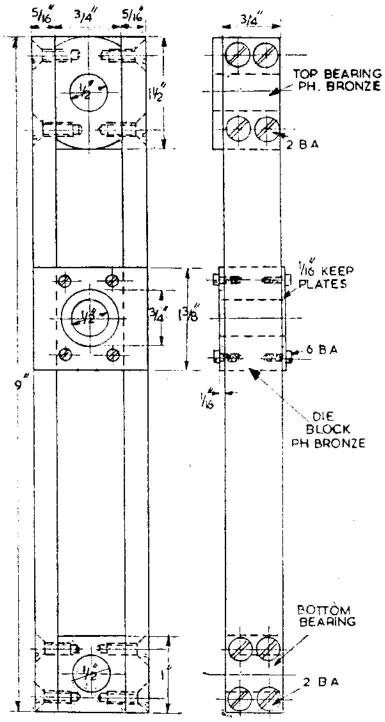
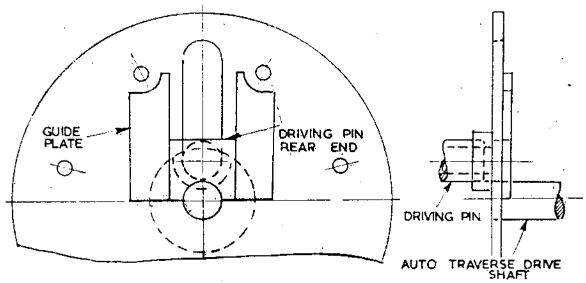


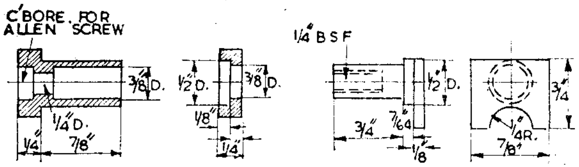
Fig. 8: The driving plate, auto traverse drive spindle, spacing pieces and guide plates for the driving pin



Right, Fig. 9: The swinging link



Left, Fig. 10: General detail of the drive pin fitting as seen from the rear and side of the drive plate



Part 3 **Part 2** **Part 1**

Left, Fig. 11: Details of the driving pin giving stroke adjustment

face of the ball race, via the $\frac{3}{4}$ in. hole, to the inner face of the gear wheel to determine the measurement not shown in the drawing.

While still in the lathe, I cut the way which was to take the key by means of a $\frac{1}{8}$ in. wide tool bit in a boring tool, racking the saddle back and forth.

This was cut to a depth of 3/32 in. and although it broke through the $\frac{3}{4}$ in. dia., this did no harm. A key, $2\frac{1}{2}$ in. long × $\frac{1}{8}$ in. × $\frac{3}{16}$ in. was then made and fitted, as was also the small gear. In my case I silver soldered both these items into position, although the gear could possibly have been a force fit.

The next job was the driving plate for the swinging link. This plate gives adjustment of the stroke and also carries the end of the automatic traverse spindle. Details of this can be seen in Fig. 8 and the cutaway section in Fig. 1 shows attachment to the main gear.

The m.s. plate was first cut out of a slightly larger piece of $\frac{1}{8}$ in. plate, by clamping to the faceplate with thick card packing between. A tool similar to a parting tool was used to cut the 5 in. dia. circle out of this plate.

After fixing again to the faceplate and setting to run true, the $\frac{1}{2}$ in. hole through the centre was drilled and bored true. At the same setting a p.d.c. of $3\frac{3}{4}$ in. was marked and divided into eight. The eight positions were drilled and countersunk to take $\frac{1}{4}$ in. BSF screws. Also in this plate a $\frac{1}{2}$ in. wide slot was made to take the driving pin (Figs 10 and 11).

To determine the length of the spacing pieces that were to be fitted between the gear and driving plate, it was decided at this stage to make the driving pin and dieblock. The dieblock was a piece of phosphor bronze, $1\frac{5}{8}$ in. long × $\frac{3}{4}$ in. wide × $\frac{3}{4}$ in. thick, and through the centre of the $\frac{3}{4}$ in. thickness a $\frac{1}{2}$ in. hole was reamed.

While working on the dieblock I also made the keep-plates of brass, these being opened out to $\frac{3}{4}$ in. in the centre. These plates ensure that the dieblock runs true with the link at all times and are fixed to the block with eight 6 BA cheesehead screws.

The driving pin was next made (Fig. 11). It is so made that by loosening a $\frac{1}{4}$ in. BSF Allen screw it can be positioned anywhere in the slot in the driving plate and give a variety of lengths of stroke. The $\frac{1}{4}$ in. radius cutaway shown on part 1 is to clear the auto traverse drive spindle and allow the very minimum of stroke, and it is shown in this position in Fig. 10.

To assemble this pin, part 1 is passed through the adjustment slot on the drive plate, followed by the placing of part 2. Then with the dieblock in position, part 3 is slipped over part 1 and into part 2. To complete assembly a $\frac{1}{4}$ in. Allen cap screw is fitted.

While this driving pin was in position the guide plates were fitted with $\frac{1}{8}$ in. rivets to the rear of the plate, these being to prevent the driving pin from turning when making adjustment.

To be continued

LAPPING EXTERNAL THREADS

WORKSHOP HINTS AND TIPS

By GEOMETER

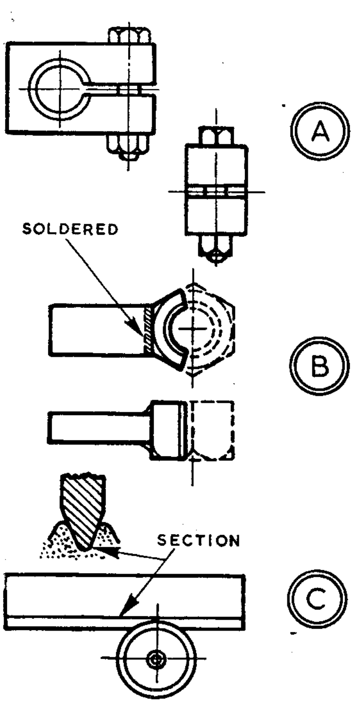
GIVEN acquaintance with the principles involved, the lapping of external threads of the V-type involves little more difficulty than the lapping of conventional bores, shafts, ends, edges and flat surfaces.

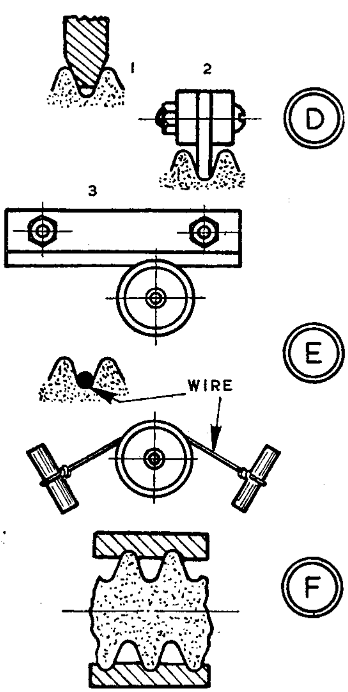
The lapping may be local to correct errors where there is a tight place on the thread, or it may be performed over the entire length to smooth the whole profile and bed it to a nut for this to work easily and without shake. Faults in any of the elements of the thread can be dealt with separately as required—on the top radius, the root radius, or the flanks.

In general, the lapping process can be applied where a shortish thread is just too tight for the mating part or where a long thread is not uniform throughout; where no die is available for correction or where time and trouble would be required to set up the part accurately in a lathe; where use of a die or lathe would not be appropriate because the thread is hard; and particularly where a thread needs to be well finished such as if it is on the feedscrew of a simple measuring device or tool.

When a tap corresponding to the pitch and diameter of the thread is available, it can be employed for a lap of the split-nut variety to correct and smooth the whole of a thread profile. A piece of brass or aluminium alloy is drilled and tapped, drilled for a bolt, then split, as at *A*.

Initially, if too tight, it can be opened with a wedge; or alternatively, it can be made longer, provided with a second bolt, and cut right through to clamp on—which, incidentally' simplifies cleaning. Use of the lap can be by hand or it can be held by hand while the part with the thread is rotated in the lathe—when it is advantageous if the lathe can be reversed. Cleaned of abrasive and applied dry, the lap finally serves as a very good gauge for checking uniformity of the thread, end to end.





A lap more speedy to use on work in the lathe can be made from a steel or brass nut with a good thread shape. A piece of material is soldered on for a handle, then the nut is cut through to leave rather less than half attached, as at *B*. This lap can be dropped on the thread where required, lifted off, applied again—and a " tight " area lapped down with the minimum of effort. It can also be started off the extreme running-on end of the thread for this to be lapped equally with portions further back.

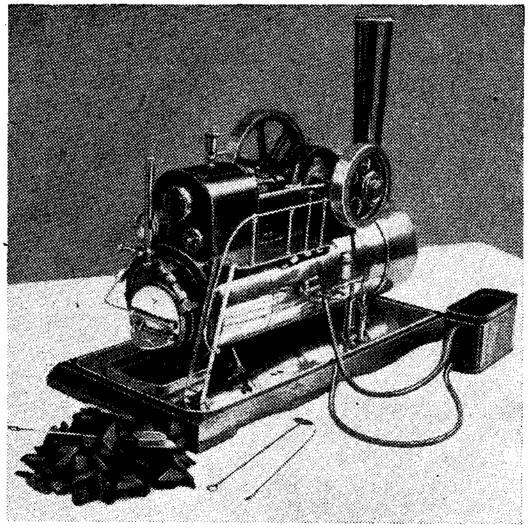
A lap of the same type, but engaging only a single " groove " of the thread, can be made from flat strip material filed approximately to thread angle and pressed on with both hands after the manner of a file, edgewise, and in line with the lead of the thread, as at *C*. Abrasive can be applied with a brush to the thread—and for the lap to run off the end of a right-hand one, the lathe must rotate backwards.

The same type of lap can be used for correcting the flanks of threads without touching the root radius, merely by ensuring the bottom is flattened, as at *D*1, where contact is on the sloping sides.

On the same principle, using a strip of suitable thickness material rounded at the edge, and bolted between two thicker pieces to provide stability, as at *D*2, the root radius only of a thread can be lapped, as at *D*3.

Another method of doing this is to draw a wire of appropriate diameter into the abrasive-brushed thread, as at *E*, the wire preferably having a handle each end for manipulation without danger to fingers.

For correcting the top diameter radius of a thread, laps can be blocks of lead into which the thread has been carefully forced in a vice, as at *F*. ■



A semi-portable overtype steam engine

An interesting model built by M. Pierre Rabier of Montbéliard, in eastern France, and described by EDGAR T. WESTBURY

AT last year's ME Exhibition I had the pleasure of meeting many new friends—not to mention even more numerous old ones !—from both Britain and overseas. Among them was the constructor of this engine.

M. Rabier does not claim that the engine is an exact replica of any particular prototype, but it is nevertheless a very handsome and practical working model. " Overtype " engines —together with their opposite numbers " undertypes "—were once fairly popular for low or moderate power industrial plants, though they are now obsolete.

M. Rabier states that it is his first attempt at steam engine construction; in the circumstances, readers will agree with me that it is a very praiseworthy effort.

The engine is of the single-cylinder double-acting type, with inside-admission piston valve, operated directly by a single fixed eccentric, no provision being made for reversing. It would, however, be a very simple matter to modify the design to incorporate either a slip eccentric or link motion, as there is plenty of space to accommodate either. Control is by a screw stop valve, though the drawings provide for fitting a bevel-geared governor of the leaf spring or Pickering type; exhaust is by a blast pipe in the chimney.

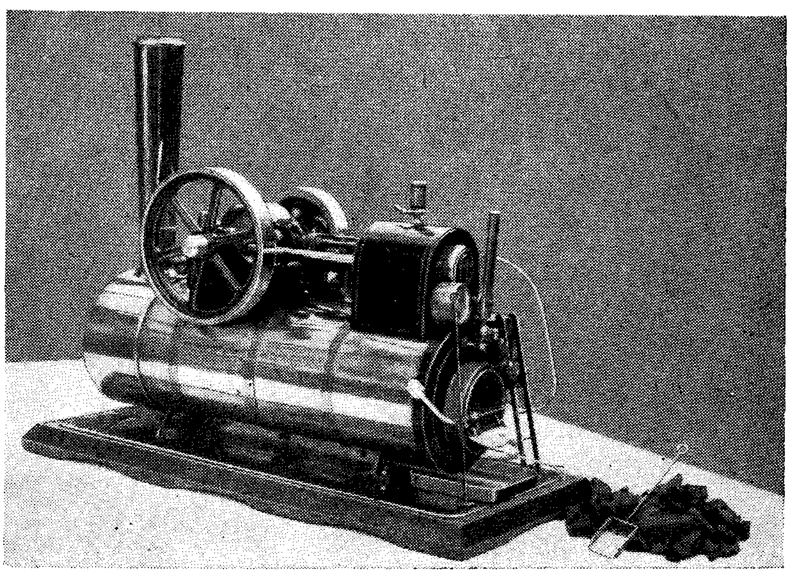
No castings are used in construction, most parts being fabricated by brazing or cut from the solid, including the spoked flywheel. A bored crosshead guide is fitted, and the cylinder assembly is enclosed in an arched sheet metal casing, which conceals the pipe work and enhances the neatness of the appearance.

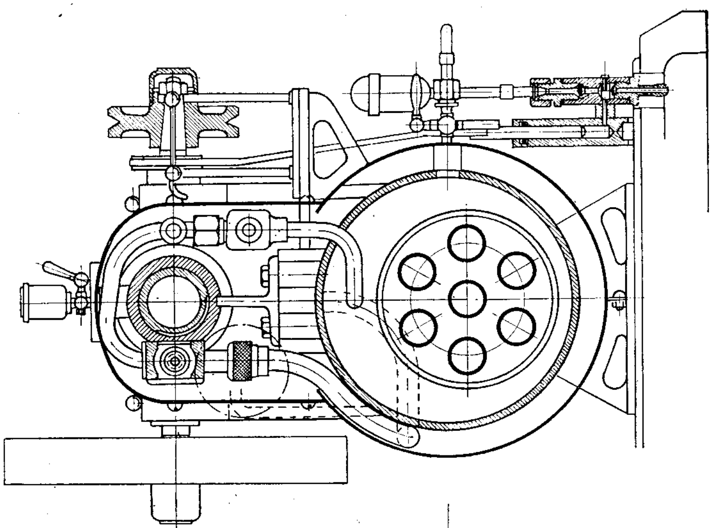
The boiler is of very unusual design and construction, comprising an outer shell of 4 in. dia. seamless steel tube, and an inner firebox of 3 in. steel tube, with seven copper fire tubes, 10 mm. i.d. by 12 mm. o.d., expanded into the tube plates with a specially made tool. This assembly is inserted in the outer shell from the firebox end, and secured at the smokebox end by a coned joint and ring nut, so that it is completely removable for cleaning and overhaul.

Boiler fittings include a pop safety-valve, whistle, and gauge glass, all home made, also pressure gauge, cocks, etc. Feedwater is supplied by a vertical feed pump located on the base at the side of the boiler, and driven by an eccentric on the engine shaft. No superheater is fitted. The boiler holds two pints of water at working level. It is heavily lagged on the outside, and enclosed in a brass wrapper sheet with cleading bands.

When built, the boiler was fired by means of a blowlamp, but while this was quite effective for producing the required amount of steam, it was noisy and difficult to control. Provision has now been made for firing with solid fuel, using charcoal or special coal, which is much more satisfactory because the induced blast in the chimney controls the rate of combustion in proportion to the load on the engine, and it is silent.

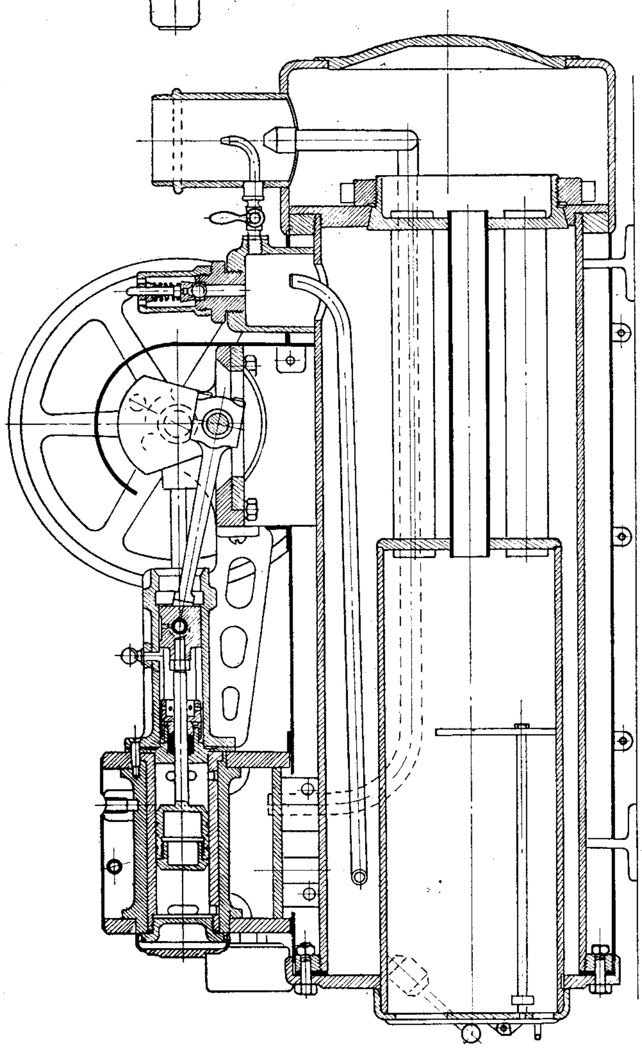
A live steam blower, controlled by

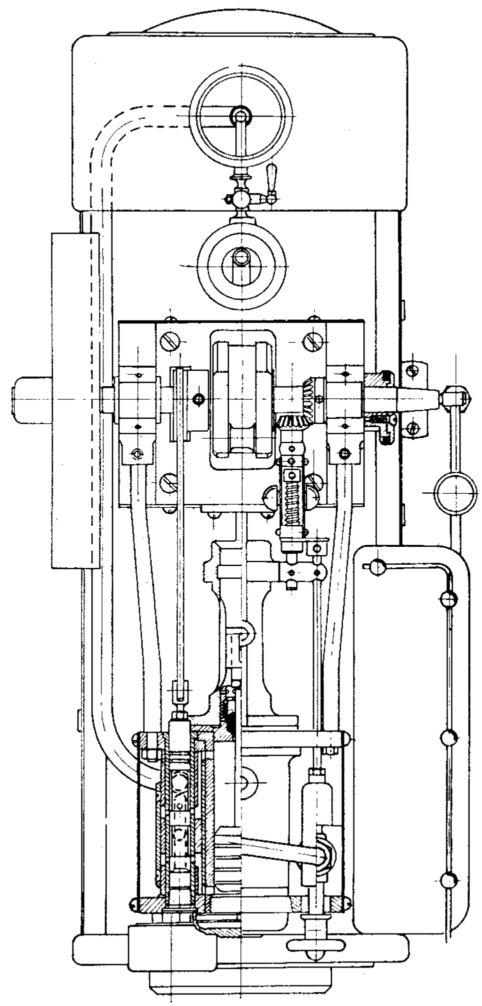




a cock in front of the steam dome, keeps the fire alive when the engine is idle. The fire grate is built up of steel bars, and occupies more than half the length of the firebox, a cross baffle being provided at the front end. A hinged firebox door is fitted, with a counterweight to hold it either in the open or closed position, and a hinged draught plate is fitted below the grate level.

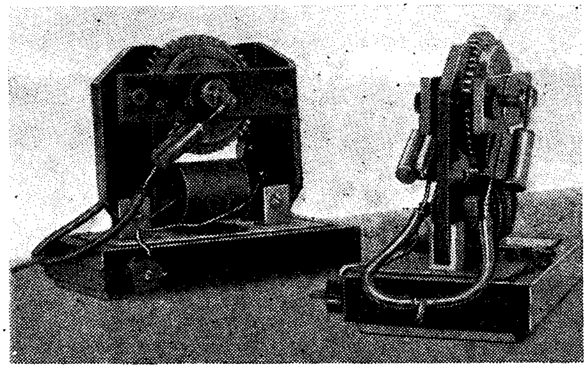
The finish is neatly carried out, the metal parts being polished—with the exception of the flywheel, firebox and cylinder casing, which are enamelled, and the latter is further embellished by lining; all the workmanship bears the characteristic French delicacy of touch and careful attention to detail. A polished wooden plinth, 8 in. wide × 19 in. long, forms the base, and the overall height, to the top of the chimney, is 15 in. ■





A silent AIR PUMP for an aquarium

By G. ESSEX



THIS unit was designed to give silent and efficient continual running, and as all vibrating type air pumps are noisy, I chose a rotary type pump.

I next decided on a synchronous type of motor with two cylinders at 180 deg. on the crank discs and to avoid expense I used materials at hand. This type of motor is only suitable for very light duties and must be carefully made—the rotor to be on ball races and balanced with the smallest clearance possible in the stator of which it runs.

This motor is not self-starting and is required to be rotated at a synchronous speed, but for the application this is immaterial.

I decided that the most suitable speed would be 120 r.p.m. for working pumps, so 50 teeth were cut on the rotor, which was machined to 3.2 in. dia. × $\frac{3}{8}$ in. thick. A suitable offcut of mild steel was machined in the chuck, then a light recess machined each side was bored $\frac{5}{16}$ in. in the centre and was finished out at about 3 deg. included taper to accommodate a spindle that would be machined to suit.

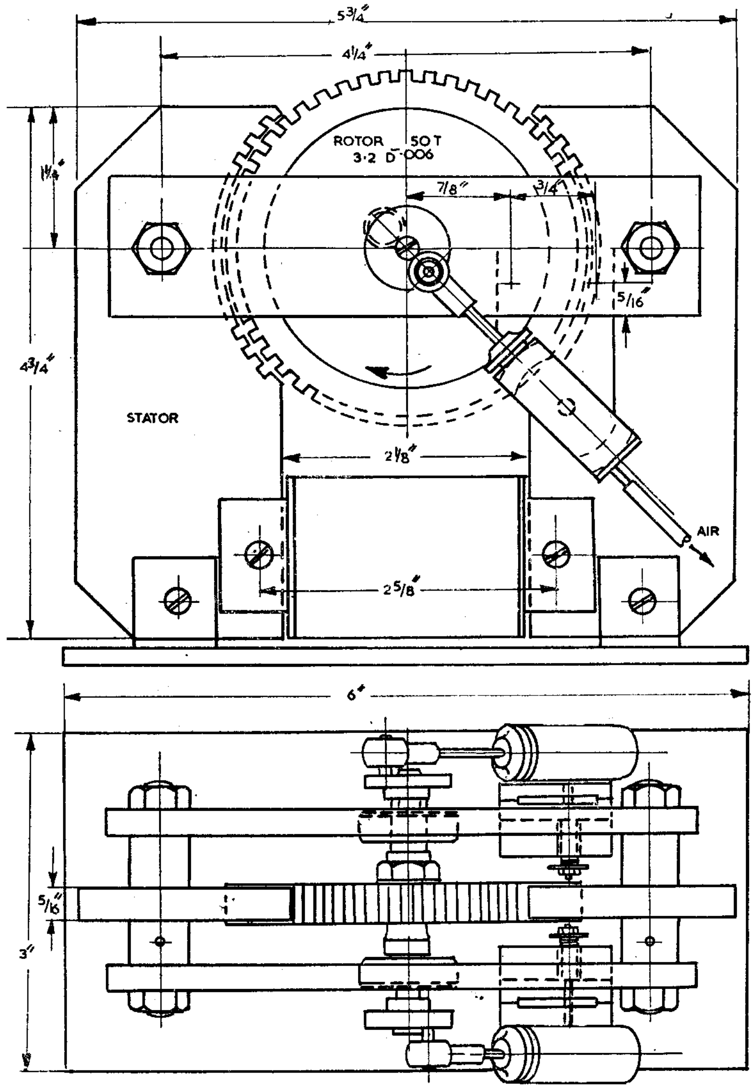
It was now fixed to an attachment which took lathe change gear wheels, so a 50 t. gear wheel was put on, using a milling cutter between centres. After this, all the teeth edges were trimmed by hand with a small flat file to make a small radius on them. The cutter being slightly over 0.1 in. in width, it produced the slots wider than the teeth on the 3.2 in. dia. rotor.

THE STATORS

I next dealt with the stators. The only material available was some wrought iron strip 5/32 in. thick. Of course, I was aware that these should be stampings for the purpose, but I went ahead with solid strip.

Four pieces $4\frac{3}{4}$ in. × $2\frac{7}{8}$ in. wide were cut and squared on all edges. From the top edges a mark was made $1\frac{1}{4}$ in. down; this was to be the centre of rotation for the rotor. After annealing, two pieces were riveted together thus making $\frac{5}{16}$ in. thick plates. Two holes were then drilled in each for bolting on to the faceplate.

Two holes were at the bottom at



$2\frac{5}{8}$ in. centres, and two more at the top corners which were afterwards cut off for appearance' sake. The two stators were now bolted on to a faceplate, side by side, with the centre $1\frac{1}{4}$ in. from the top running true.

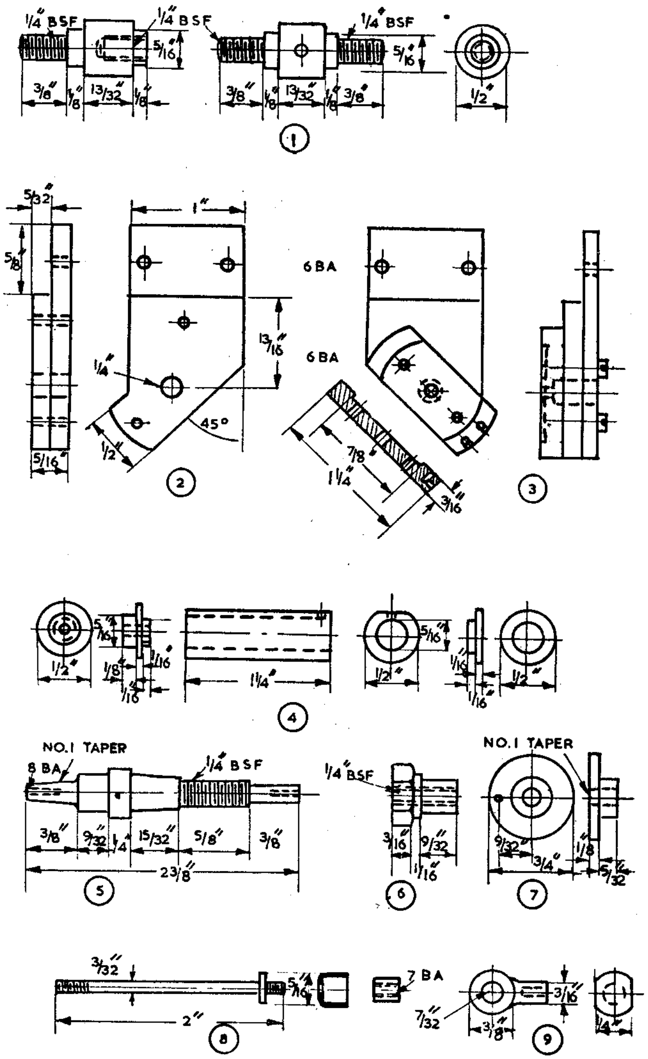
Using the 3.2 in. dia. rotor as a gauge, the centre was cut out. But before removing, a line was marked across by a screwcutting tool on the side where the pieces were at 90 deg. to the lathe bed, this being proved by half a revolution of the lathe spindle to check. Finally, a line was also marked round, intersecting the straight line at $4\frac{1}{4}$ in. centres.

After removing from the faceplate, a centre piece $2\frac{1}{8}$ in. was sawn away which means $1\frac{1}{16}$ in. off each piece, and after cleaning up, the slots were cut in.

Forming the teeth on the stators I found rather a tedious job by hand. However, this was done by drilling 3/32 in. holes round $\frac{1}{8}$ in. in from the edge and cutting out with a saw and keeping the frame as near as possible to the centre.

I cut and arranged the teeth 14 each side, but I do not think a slight variation to this matters much. What is important is that the same number of teeth should be maintained on each side, and they should match those on the rotor. This is the reason why the stators were machined out to rotor size.

It has been mentioned that a line was marked on the stators, with one radially when on the faceplate; where these intersect a small hole was drilled and opened up to $\frac{5}{16}$ in. at $4\frac{1}{4}$ in. centres.



These holes, of $\frac{5}{16}$ in. dia., were for fixing in a pair of pillars, preferably made in brass in two parts (Fig. 1). All threads were $\frac{1}{4}$ in. 26 t.p.i. (one male the other female) for fixing in stators. A tommy bar hole was drilled to tighten up, and it was also necessary to machine up the diameters at one setting on each pillar.

The side members, carried by pillars, were made up from flat brass $5\frac{1}{4}$ in. × $1\frac{1}{4}$ in. × $\frac{5}{16}$ in. material; these were cut off longer than neccessary to bolt on the faceplate, and were machined up, reversed and faced to $\frac{1}{4}$ in. thick, then cut to length.

These pieces were now scribed along the centre on the surface plate. A small hole was drilled in the centre with two holes at $2\frac{1}{8}$ in. radius from the centre; these were opened out by reamer to $\frac{5}{16}$ in. dia., making $4\frac{1}{4}$ in. centres to suit bolting on the pillars in the stator. The centre hole is also drilled and reamed $\frac{5}{16}$ in. dia.

BALL-RACE HOUSINGS

To machine the ball-race housings a scrap piece of steel was turned up to fit the mandrel, reduced to $\frac{5}{16}$ in. dia., long enough to protrude through the faceplate. When the side members were located on and fixed, the peg was removed.

The only ball races to hand were 22 mm. × 8 mm. × 7 mm. However, they were made to do; a recess was machined as deep as possible to take the races, this leaving about $\frac{1}{16}$ in. proud with a small clearance at the back when in position.

Two more holes were required in each of these parts to clear No 6 BA screws for the brackets to carry the cylinders, but these were left since it was necessary to mark these off with the brackets which are at 45 deg. from the spindle centre to the cylinder centres.

These cylinder brackets (Fig. 2) were made up in two parts and riveted together; the material at hand was 5/32 in. alum alloy plate. One each was required—r.h. and l.h.—to suit the cylinder positions.

CYLINDERS

The cylinders are of the single oscillating type (Fig. 4). They were made from two pieces of $\frac{1}{2}$ in. bronze carefully chucked up, drilled through and bored out to finish with a $\frac{5}{16}$ in. l.h. spiral reamer, facing the ends to $1\frac{1}{4}$ in. lengths.

Flats were now filed on each, keeping accurate with the bore, and about 1/32 in. was taken off for sweating on to the port faces. The port faces are four in number—two for the cylinders and two for screwing to the brackets by 6 BA screws all being the same except for the drilling (Fig. 3). They were made from hard brass strip $1\frac{1}{4}$ in. × $\frac{5}{16}$ in. thick. A suitable length was cut off and faced up, reversed over and machined to $\frac{3}{16}$ in. thick.

A line was marked on the centre down the piece, and four positions were marked with the centre punch at $\frac{1}{2}$ in. centres, then sawn up and filed to size. This was now put in a position on the faceplate with a centre running true. A recess was turned in about 1/32 in. deep at $\frac{7}{16}$ in. radius, carefully centred and drilled and tapped No 7 BA, this being for a 3/32 in. stud screwed each end and $\frac{7}{8}$ in. long.

This was repeated by moving the material along to another centre, the two others being drilled 3/32 in. for a close fit for the studs to turn in. After these operations the four pieces were sawn and filed up to $\frac{1}{2}$ in. wide and a radius put on the ends. No ports were put in at this stage.

The two port faces, tapped No 7 BA in the centre, were sweated to the flats made on the cylinders by keeping in alignment on the surface plate. The cylinder ends were just turned parts, one to solder on the other having a 3/32 in. clearance hole for the piston which was a push fit. A small oil hole was also drilled.

Before making the spindle for the rotor, the two crank discs were made (Fig. 7). These were in mild steel, drilled 5/32 in. and reamed No 1 taper pin reamer to the large end and finally finished on a stub mandrel. This was necessary to be true to run on the rotor spindle.

SPINDLE

The spindle (Fig. 5) was made from a piece of $\frac{3}{8}$ in. mild steel. It was centred, faced off each end to $2\frac{3}{8}$ in. long, and drilled and tapped No 8 BA for screws to retain the crank discs. The centres were put in the lathe and the mandrel end was cleaned up to make sure of true running. The spindle was turned No 1 taper at the end, checked with the crank disc, so as not to go quite down on the spindle end.

A portion was now reduced to $\frac{1}{4}$ in., screwcut and finished with a die; also the taper was now turned to suit the rotor, adjustment being made so that the rotor taper was in a central position on the spindle.

I now made a special nut (Fig. 6) to lock the rotor to the shaft. The plain portion was turned to fit the ball race tight, and the spindle was reversed to deal with the taper on the other end. The metal left on the spindle up to the rotor was cleaned up, and the rotor was finally lightly touched up for any inaccuracy. The rotor diameter of 3 ft 2 in. was reduced by 0.006 for the stator radial clearance of 0.003 in.

In assembling the stator the pillars were fixed in the $4\frac{1}{4}$ in. centre holes, and a temporary bar with holes at $2\frac{5}{8}$ in. were bolted to the holes at the bottom, but not tight. A side member, to carry the rotor with the ball race, is added with a strip of 0.003 shim steel each side of the rotor for centring, and the other side is added.

Next, $\frac{1}{4}$ in. BSF nuts, thinned down, were used for fixing, and when the shims are removed the rotor should spin freely. The crank discs were drilled for 3/32 in. $\times$ $\frac{1}{2}$ in. silver steel and pressed in, as the stroke of piston at $\frac{9}{16}$ in. was found best in experiments. Cranks were now fixed with No 8 BA screws with large thin heads, and found to be secure enough for the purpose.

Two holes were now required in each side member, 6 BA clear for the cylinder bracket fixing. These brackets were marked off when at 45 deg. from the rotor spindle centre to centre of the cylinders, where the stud goes through the port block secured to the brackets.

The port blocks on the brackets and those sweated on the cylinders were faced by rubbing with fine glass-paper on an accurate surface. The 3/32 in. studs were screwed in and then checked with those on the brackets by marking as these faces had to be perfect when together, with no slop in the stud holes.

The port holes in the cylinders were drilled No 50 in the centre of the port block, 3/32 in. from the end and straight through both walls of the cylinder; these enabled the ports on the brackets to be accurately located by the drill. This hole was then filled up by the stud of a No 8 screw, and all internal burrs were cleaned up.

Pistons were of the cup leather type; 3/32 in. dia. pistons were screwed each end No 7 BA, and a small disc of metal screwed on, faced up in position, on which to secure the washers, with a round piece to form a nut and fill up most of the space caused by the cup washers (Fig. 8).

PLUNGER

The so-called big end (Fig. 9) is turned up from mild steel with flats filed on each side and drilled 7/32 in. for the bronze bush with a 3/32 in. hole to suit the crankpin. Leather cup washers were made by soaking in water some $\frac{3}{4}$ in. dia. thin leather, then pressing in $\frac{5}{16}$ in. dia. reamed holes in a scrap of material $\frac{1}{4}$ in. thick with a short plunger turned to a diameter, less two thicknesses of the material, and allowed to thoroughly dry out.

The short plunger must have a radius on the end; also the $\frac{5}{16}$ in. hole in the block must have the sharp edge removed. It is most important that the plunger must be pushed in straight.

When the piston is made up and assembled it is necessary to soak the washers in castor oil. When the cylinders are assembled with the piston on the crankpin, the assembly is set to 90 deg. to the rotor spindle, relative to a centre line on the port block. This port can then be marked by a No 50 drill into the port face on the bracket. Turning the crankpin round 180 deg., this operation was repeated.

As the motor runs in a clockwise direction (see general drawing), the bottom port becomes the delivery side, so this is drilled and tapped for a piece of $\frac{1}{8}$ in. tube for the rubber connection on the end thickness of port block—to run the No 50 drill into. The other port was drilled straight through the bracket for the air inlet.

The hole in the cylinder for locating the ports was filled up, and after removing any burrs the cylinder end was soldered on. The ports could then be adjusted by enlarging slightly. The port faces were finally bedded together and light springs and washers fitted to keep the cylinder port face to the other with a tight No 7 BA nut.

As to the coil, I was fortunate in having some scrap transformers. One had 1 in. wide stampings so I was able to make a core up to 1 in. square $\times$ $3\frac{5}{8}$ in. long, and I drilled these at $2\frac{5}{8}$ in. centres to suit the holes in the stator for bolting on.

The coil was 2 in. long $\times$ $1\frac{1}{2}$ in. square, and two attempts were made to wind it. It was too awkward or clumsy, possibly owing to the winding being square; I could do no better by hand winding.

On stripping the wire from the transformer, the last coil appeared in good condition, but on testing it was found faulty.

On examination I found the fault in the third layer of the winding. The three layers were removed and on testing again all was satisfactory. The stampings I made up 1 in. square were insulated and the coil put on and placed in position on the stator; this appeared to run the motor all right and was left to run a few hours, and no rise in temperature was shown.

In view of this trial, two outside layers of winding were removed. Again, all was found satisfactory on test, the coil showing a slight rise in temperature after hours of running.

The motor now runs about two months non stop—when it becomes necessary to clean out the aquarium in addition to supplying the aeration block, it also acts as a filter.

The motor was mounted on a wood base and finally given a coat of matt black paint. ▣

This free advice service is open to all readers. Queries must be of a practical nature on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling cannot be given: stamped addressed envelope with each query. Mark envelope clearly "Query," Model Engineer, 19-20 Noel Street, London W1.

READERS' QUERIES

DO NOT FORGET THE QUERY COUPON ON THE LAST PAGE OF THIS ISSUE

Turntable design

I wish to index a rotating turntable having four, six or eight stations—each station on the table coming to rest for a brief period of approximately three or four seconds—while a short operation is performed on individual workpieces placed on each station.

I once saw a similar arrangement, the table stopping and starting by a "dwell" mechanism, as the motor was continuously running at a constant speed. This action was achieved, I believe, with a Geneva motion. Could you give me details of this mechanism or recommend a publication which deals with it fully? Would it be possible to gear such a motion by chain and sprocket, thereby enabling a four-station motion to operate eight stations?—M.H.E., Birmingham.

▲ *There are several forms of intermittent motion devices which would serve the purpose you require, but the Geneva motion or Maltese cross is one of the most efficient of them, and a diagram which explains it is reproduced.*

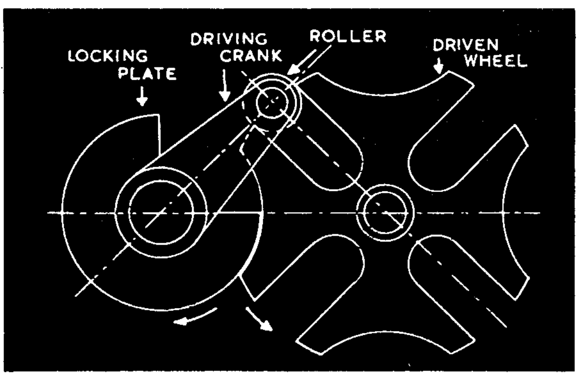


Diagram illustrating the Geneva or Maltese cross mechanism to produce positive intermittent motion

It will be seen that the driving crank carries a roller at its extremity which enters a slot in the driven wheels and causes it to turn through 90 deg. At the end of this motion, the locking plate on the driving shaft locks the driven wheels positively to hold it stationary until the driving crank has made another three-quarters of a revolution, so that the roller enters the next slot. This, of course, gives a four station movement.

It is not desirable to use gearing or chain and sprocket to increase the number of stations, but it is possible, by modifying the driven wheel so as to provide the requisite number of slots and locking faces, to operate as many stations as are required.

For maximum efficiency of the mechanism it is important that the roller should enter the slot tangentially. Otherwise shock and noise will be caused.

Rainhill loco

I am building a model of your *Rocket*-type locomotive *Rainhill.* The regulator is a cam-operated pin regulator, but I can find no instructions for building this type of regulator.

There appears to be no method of cylinder lubrication shown on my drawings and I was thinking of fitting a small lubricator as described for *Zoe.* I was going to fit this under the footplate and drive it from the rear axle, but I find this is impossible owing to the closeness of the boiler. —F.B., Newport, Isle of Wight.

▲ *No lubrication was fitted to the original* ROCKET. *The fireman had to dismount periodically and do what was necessary with an oilcan.*

If you wish your model to be a successful working one, the smallest size LBSC mechanical lubricator is recommended. This can be fitted practically anywhere you can find room for it. Likewise the drive can be taken from any reciprocating part, the travel being adjusted by means of the point of attachment to the driving arm.

The regulator may be the normal pin-valve type which is just a glorified screw-down steam valve, or a disc type, as described in the "Live Steam Book."

LBSC boiler

I would appreciate the following information:

In what issues of ME was LBSC's "Quick Steaming Boiler" described?

LBSC recommends a mixture of anthracite and Welsh steam coal as being most suitable for locomotives. In what proportions should these coals be mixed? And what amounts would you suggest I import? I expect to use these for a 7¼ in. gauge *Tich.* The locomotive would be steamed for about an hour or two during week ends.—W.F.W., Miami Beach, Florida.

▲ *The quick-steaming stationary boiler was described in* MODEL ENGINEER *of 27 April 1950.*

Anthracite and Welsh steam coal may be mixed in almost any proportions, but about 50/50 gives good results.

If you are unable to obtain a type of anthracite in the USA (it is a hard, high-carbon smokeless fuel) write to Charrington Gardner Locket and Co. Ltd, Tower House, Trinity Square, London EC3. You would require at least 2 cwt.

A two-start worm

The steerage of the Allchin ME traction engine calls for a two-start worm of 5/32 in. pitch and $\frac{5}{16}$ in. lead on a 20 t. worm wheel.

Can you tell me:

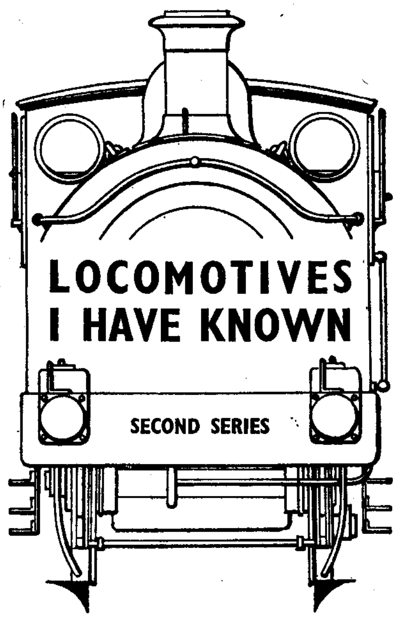
1 What gear train to set up to cut the worm on an ML7 lathe, using the standard set of gears?

2 How to calculate the gear ratio required?—K.G.B., Wolverhampton.

▲ *1 The gear train for cutting this on an ML7 lathe or any other lathe, using an 8 t.p.i. leadscrew, is to use a 50 t. wheel on the mandrel or cluster spindle and a 20 t. gear on the leadscrew. Alternatively, use any other gears which give the same combination.*

2 The method of calculating the gear ratio is as follows:

Assuming the mandrel and leadscrew to run at 1 : 1 ratio, the result will be 8 t.p.i. If the mandrel runs at twice the speed of the leadscrew, the result will be 16 t.p.i. To cut $\frac{5}{16}$ t.p.i., therefore, the leadscrew must be geared to run at five times this ratio—in other words, at a ratio of 5 : 2.



By J. N. MASKELYNE

GWR No 7007 G

. . . one of the fa

FEW locomotive designs have created so much interest, or led to so much discussion, as the Great Western Castles have done. These engines built up a reputation for power and speed that placed them second to none of their size, and they have held it ever since.

The design, by C. B. Collett, was prepared in 1922, and the first engine, No 4073 *Caerphilly Castle*, was completed in August, 1923. She was not quite what had been intended because Collett's original conception for this enlarged Star class had been a 4-6-0 incorporating a Star chassis, slightly strengthened, and a standard No 7 boiler.

The then chief engineer, however, turned down this design on the grounds that it would have been too heavy to run over many routes on the GWR main line. Regretfully, therefore, a new boiler had to be designed for the new engines; it became standard No 8, and was a veritable triumph of compromise.

In size, it came about midway between the standard No 1 and standard No 7 boilers, having a larger barrel than the former but the same size of firebox as the latter.

Between August 1923 and August 1950, 155 of these fine engines were built, including 30 for British Railways. Add 15 of the Star class and one Pacific (*The Great Bear*) all rebuilt as Castles, and the total for the class was 171—it is worth noting that their building was spread over exactly 27 years.

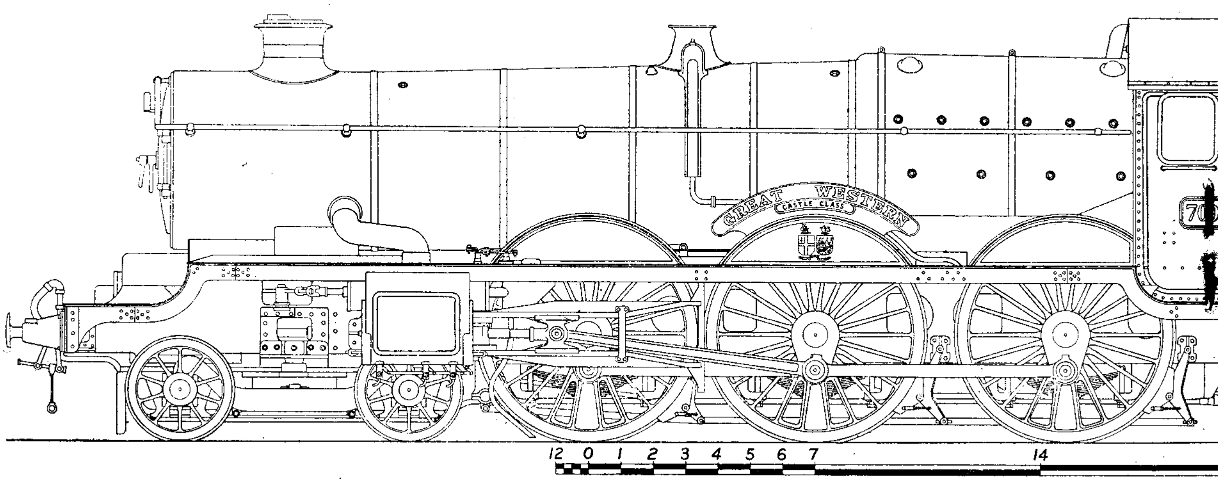
The last one built for the old Great Western Railway company was No 7007, originally *Ogmore Castle*, built July 1946, and rechristened *Great Western* in January 1948. She is the subject of my drawing, which shows her as running for a few months, in 1948, until the unfamiliar legend on the tender was replaced by the British Railways emblem—though the old Great Western crest is retained on this engine's second driving-wheel splasher. She was actually the last express passenger engine built for the GWR.

The Castles, being among the best known and most popular of modern steam locomotives, require little description from me; their performances, too, have been constantly described in railway and engineering periodicals ever since the first engines of the class were introduced.

I had my first sight of one when 4073 *Caerphilly Castle* stood end-to-end with the LNER Pacific, 4472, at the British Empire Exhibition at Wembley, in 1924; I have been an ardent admirer of both engines ever since, but the Castle won my heart—and she retains it ! In view of the inside story of their design, these engines are probably the most remarkable steam locomotives ever built.

In technical details certain alterations and improvements have been made from time to time as necessary, so as to keep the engines well abreast of traffic requirements. But never could the Castles be regarded as big engines, which makes their success all the more creditable. The following dimensions apply to the latest developments in this class.

Cylinders (four) 16 in. dia., 26 in. stroke and fitted with 8 in. piston valves operated by the Churchward-Walschaerts valve gear. As in all GWR four-cylinder engines, the inside cylinders are placed well forward and drive the leading coupled axle, while the outside cylinders are set back and drive the second coupled axle.



The wheel diameters are: bogie, 3 ft 2 in. and coupled 6 ft 8½ in.; the wheelbase is 7 ft plus 5 ft 6 in. plus 7 ft plus 7 ft 9 in., totalling 27 ft 3 in.

The boiler is pitched 8 ft 8½ in. above rail level; the barrel is 14 ft 10 in. long and its outside diameter is 5 ft $1\frac{15}{16}$ in. at the front, widening to 5 ft 9 in. at the back. There are 170 tubes of 2 in. dia., giving 1,799.5 sq. ft of heating surface, to which the firebox adds 163.5 sq. ft, making the total evaporative heating surface 1,963 sq. ft.

Superheater flues of 5⅛ in. dia. number 21, housing 84 elements of 1 in. dia.; these add 302 sq. ft. of superheating surface. However, at the

REAT WESTERN

mous Castle class

time of writing, a variation of this boiler, incorporating a 112-element superheater, is coming into use; it reduces the number of 2 in. tubes to 138, with 1,670.1 sq. ft of heating surface, the firebox to 163.32 sq. ft., and it increases the 5⅛ in. flues to 28 and the superheating surface to 393.2 sq. ft. The grate area for both boilers is 29.36 sq. ft.

The valve travel and events are similar to those of the Stars [article 44, first series], and the Castles repeat the main performance characteristics of the Stars, but have a greater reserve of power. They are noticeably free from slipping when starting on a dry rail, while their ability to accelerate rapidly often provokes comment.

The Castles have been subjected to various trials and tests in which they have always shown up well.

As early as 1924 No 4074 *Caldicot Castle* was put through some systematic trials between Swindon and Plymouth, on trains to which the dynamometer car was attached; she produced results the like of which had not been seen before.

The exchange trails between No 4079 *Pendennis Castle* and the LNER Pacific No 4474, in 1925, are well known, while in 1926 No 5000 *Launceston Castle* on loan to the LMSR for trials between Euston and Carlisle, astonished everyone concerned with her performances.

There can be little doubt that the results of all these tests had a very considerable influence upon locomotive design outside the GWR. At last locomotive engineers had begun to realise and appreciate what was the significance of the revolutionary ideas of G. J. Churchward and his successors.

Gresley made some basic changes in the detail design of his LNER Pacifics, Maunsell was openly copying Swindon practice in some of his designs for the Southern, and when in 1932 the LMSR company wanted a new chief mechanical engineer, they chose Stanier, a Swindon man, pupil of Churchward and chief assistant to the designer of the Castles.

The advantages derived from long-travel valves had been known for some 70 years before Churchward began his systematic study of valves and valve events. But it was Churchward who seems to have been the first to realise that a long valve-travel alone was not enough.

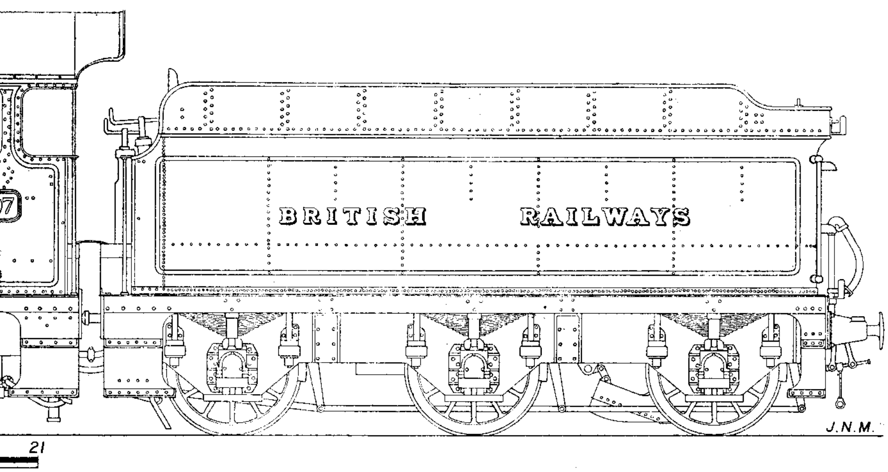
Other factors, such as the sizes of steam pipes, ports and passages, and the internal streamlining of exhaust ways, all play an important part in obtaining maximum efficiency from an engine. The Castles incorporate all these features in addition to a boiler that produces the necessary steam to meet almost any requirement and still leave some in reserve.

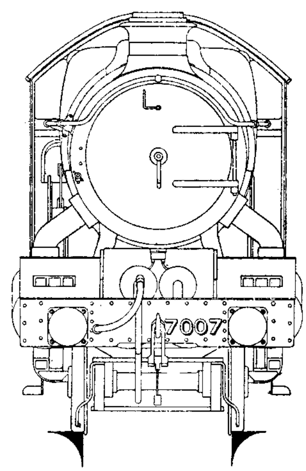
In working trim, a Castle weighs 80 tons 18 cwt, 20 tons 17 cwt resting on the bogie, 19 tons 15 cwt on the leading coupled axle, while the middle coupled and trailing axles carry 19 tons 18 cwt each. It will be noted that the weight on the three coupled axles is almost exactly equally distributed. The weight of the 4,000-gallon tender is 46 tons 14 cwt, so the total weight of engine and tender is 147 tons 12 cwt.

The speed of the Castles is well known; it was demonstrated in no uncertain fashion by several of the class in pre-war days when taking it in turns to work the Cheltenham Flyer on its 67 minute schedule for the 77¼ mile non-stop sprint from Swindon to London. *Tregenna Castle's* time of 56 min. 47 sec. made on 6 June 1932 still stands as *the* record, though it was but a few seconds better than a number of other runs made on this train.

On the present-day high-speed train, the Bristolian, 100 m.p.h. has been exceeded on a number of occasions with Castles.

Great Western was the name of the first express passenger engine built at Swindon in April 1846; it was, therefore, the most suitable name to bestow upon the last express passenger engine built for the old Great Western Railway, at the same place, in July 1946, just a 100 years later. No 7007 carries it with distinction. She is one of the best of a fine class. ▣





STEAM MICE

LBSC reviews the possibilities of $1\frac{1}{4}$ in. gauge and offers a few hints to enthusiasts with limited facilities and track space

AMONG my recently-scrapped files of correspondence were many queries relating to $1\frac{1}{4}$ in. or O-gauge, ranging from folk who had elaborate electrically-driven outfits and wanted to build a powerful and efficient steam locomotive, to the laddie who had a Hornby clockwork set and wanted a "real engine that would puff and whistle."

At the time of writing I'm getting out the first drawings for my next serial, a 5 in. gauge Great Western pannier tank engine, but as these are not quite ready, I thought that a few comments and suggestions regarding $1\frac{1}{4}$ in. gauge locomotives might be found useful by good folk like those mentioned above.

Although personally I would never put down a $1\frac{1}{4}$ in. gauge line, there are circumstances which prevent the adoption of anything larger. You couldn't run a $3\frac{1}{2}$ in. gauge *Britannia* in a council flat, and it would be unpleasant even to run a *Tich* indoors (it *has* been done !) but room can usually be found for a portable $1\frac{1}{4}$ in. gauge line, and it is surprising what a kick a real enthusiast can get even from a spirit-fired 0-4-0. Let us consider what *has* been done and what *could* be done.

Although I haven't any particular liking for what I call "watchmaking jobs," I have built a few wee steam locomotives, ranging from a Hudson type 4-6-4 of the New York Central Railroad, to a little 0-4-0 with a pot boiler and single-action oscillating cylinders, a present for a kiddy.

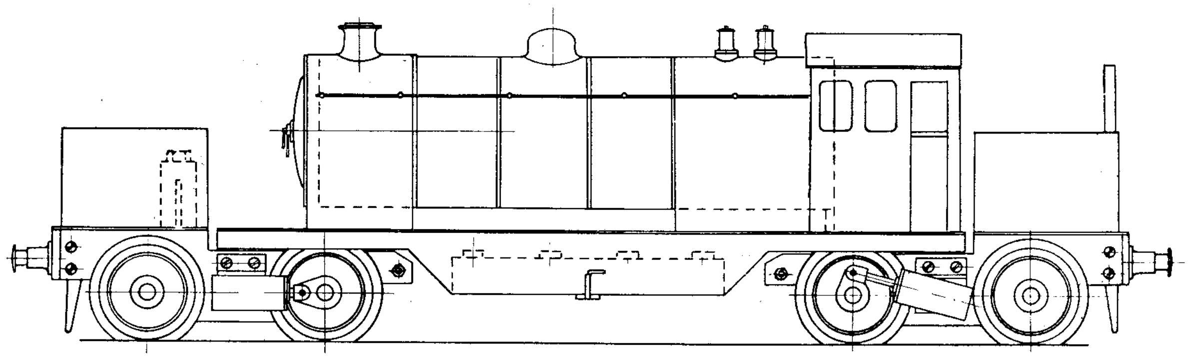
One of the earliest of the more elaborate ones was *Sir Morris de Cowley*. This came about because it was stated that a coal-fired steam locomotive to haul a living load on a gauge O track was impossible. Well, it might be impossible for a live mouse to pull a wheelbarrow with a human being in it, but I knew jolly well that I could build a steam "mouse" that could pull a $3\frac{1}{2}$ in. or 5 in. gauge flat car with a human being riding on it, and promptly did it !

It so happened that I got her in running order just at the time that the Model Railway Club was holding an exhibition at the Kingsway Hall, and although she had only been in steam twice, I took her along just to take a rise out of the firm of Messrs I. Knowitall and Co. With a drawbar consisting of a piece of string attached to the corner of a 5 in. gauge car, she first pulled a small child about three, then a boy of eleven, and then an eleven-stone adult, to the amazement and delight of the spectators, several of whom had a ride behind her. I still have her and she is still in working order.

She is really a Southern *King Arthur* (4-6-0) with a trailing pony truck and a larger boiler. George Kennion (late of Kingsland Road) had some blueprints made, and supplied castings and material. I believe both are still available from other advertisers, and anyone wishing for a really powerful $1\frac{1}{4}$ in. gauge coal-fired locomotive could build a duplicate quite easily.

She needs a curve of 4 ft radius to run at a good speed, and wouldn't worry about a 25-coach train. The name, by the way, was a "skit" on the full-size engines which bore the names of the Knights of the Round Table (it should be Turn Table for a locomotive !) and the ubiquitous Morris Cowley car.

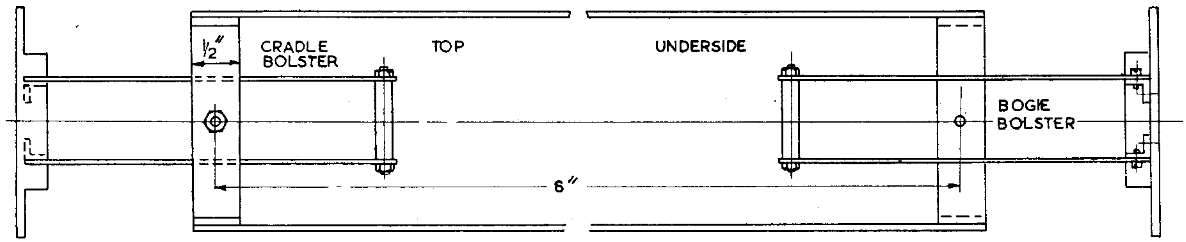
The NYC Hudson had the same size cylinders, coupled wheels and bogie truck, but the valve-gear was Walschaerts, and the boiler was of the watertube type. The four-wheel trailing truck had cast frames and unequal-size wheels, like the full-size engines. With only four wicks burning in the firebox, she could pull ten coaches nonstop for over 30 minutes.



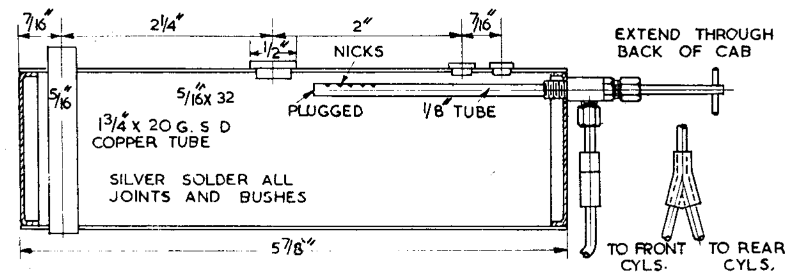
Some difference !

A correspondent sent me a tale of woe about two $1\frac{1}{4}$ in. gauge locomotives which were specially made by a commercial firm, and cost a tidy sum; but neither would, in locomotive-shed lingo, "pull a sprat off a grid-iron." The firm assured the purchaser that their performance, about three laps of his track with three or four light tin coaches, was the most that could be expected from O-gauge steam locomotives. He asked my opinion. I asked him to send the worst one along for inspection, and he did so.

It was a 4-4-0 like the Midland compounds, with a very-much-over-scale watertube boiler, cylinders about $\frac{1}{4}$ in. × $\frac{1}{2}$ in. with pinhole ports, and loose-eccentric valve gear. As the valves had no lead and admitted steam full stroke, with a corresponding late exhaust opening, the poor performance was explained, and the indifferent workmanship in the cylinders added to the inefficiency. Just to find out what the engine could be made to do, I offered to put her right, and it is hardly necessary to



PLAN OF FRAME ASSEMBLY



BOILER

add that the offer was accepted with great alacrity and profuse thanks.

I rebored the cylinders as big as the castings would allow, a bare 11/32 in., opened the ports and made new valves. The valve gear was altered and set to cut off at 60 per cent. I didn't alter the boiler, nor the spirit lamp, but arranged the chimney liner and blast nozzle to get maximum draught. When I tested her on a portable 8 ft circle, she hauled an improvised flat car with a 4 in. lathe chuck on it for about 15 min. nonstop without losing pressure. I thought that was good enough, so I returned her to her owner.

Two days after, I received a letter saying that he was in the seventh heaven of delight; the engine had pulled 16 Bassett-Lowke coaches for just over 20 min. without a stop, and just before the boiler ran dry, she had started blowing off and nearly run off the road with increased speed.

Pulled 27 coaches

He concluded (exactly what I had expected !): " Please would you possibly be able to do the other one ? " I said O.K. shoot her along, which he promptly did. This one was an LNER 4-6-2, and after receiving a dose of the same medicine, she hauled a 27-coach train for nearly half-an-hour. Shades of Sir Nigel Gresley !

The choicest bit about the whole business was that when the firm heard of it, and their representative had seen both engines doing the job, they wanted to borrow them for demonstrating what their engines could do, at a club exhibition ! It just shows what can be done when cylinders and motion are arranged to *use* steam instead of wasting it.

One of the tank engines that I built was a narrow-gauge 0-4-0, after the style of *Tich*. I called her *Small Bass* because she was very similar to the little brewery shunters which once were familiar around the malt-and-hops town of Burton-on-Trent. Having a very short wheelbase, she could easily negotiate the curves of a child's clockwork toy railway; and anybody who wanted to build a replica for a young hopeful calling for a locomotive " that could whistle and puff," could use the *Tich* drawings and work to half the given sizes.

The frames should be spaced $\frac{13}{16}$ in. apart, plain bushes used for bearings, and the boiler could either be a plain pot $1\frac{1}{2}$ in. dia. or a watertube type with a $1\frac{3}{4}$ in. dia. shell and a $1\frac{1}{4}$ in. inner barrel.

Dummy tanks

A more elaborate looking job was *Mollyette*, though she was actually simpler, being an inside cylinder 0-6-0 LMS class 3 tank engine. She had a single inside cylinder with loose-eccentric valve gear, and a plain pot boiler $1\frac{1}{4}$ in. dia. The side tanks (dummy) both hid the flames of the two-wick spirit-lamp and shielded them from side draughts which might have prevented free steaming.

Anybody wishing to duplicate her could use the *Rose* drawings, working to half the given measurements, with six-coupled wheels $1\frac{1}{8}$ in. dia. and width of frames as above. She could be made to represent any of the old pre-grouping railways by making the cab, tanks, etc., to the appropriate outline; they all had engines of this type.

I always have to smile when I recall the very enthusiastic and optimistic schoolboy who wrote requesting instructions for building a 4-8-2 + 2-8-4 Beyer-Garratt locomotive for his O-gauge outfit. He had no lathe, very few tools, and the usual amount of pocket-money. I hadn't the heart to discourage him, so I replied very seriously that it would take more time than I could spare to get out drawings and instructions, but it was a difficult job that I wouldn't care to undertake, even with my fully-equipped workshop.

I received a rather cheeky response, saying that my reluctance to tackle such a job only made him determined to do it, and he would manage without my help. So I wished him luck, saying that when he had it ready for steam, I hoped he would bring it along and test it on my line. That was over 30 years ago—and it hasn't arrived yet !

However, it occurred to me that a simple Beyer-Garratt would be a bit of a novelty on a Hornby or similar line, so I've made a few drawings showing how one could be built. No fully-detailed instructions are needed, and the construction can be followed by the illustrations plus a few words of explanation.

Cradle and boiler

The job consists of a central cradle supporting a plain pot boiler, the spirit lamp being located between the sides of the cradle. Each end is carried by a four-wheel bogie, identical in construction, the inner wheels of which are driven by a pair of oscillating cylinders. The exhaust from the front pair can go up the chimney, and from the back pair through a pipe at the cab end of the engine. Both bogies are centrally pivoted, side play being unnecessary as there is no fixed wheelbase.

All the frames are made from 18-gauge steel. Two pieces $8\frac{1}{2}$ in. × $\frac{3}{4}$ in. are needed for the cradle, the ends of which are joined by bolsters made from $\frac{1}{2}$ in. strip, with each end bent up for riveting to the cradle sides. Drill a $\frac{3}{16}$ in. hole in the middle of each for the bogie pin.

Cut the side frames to outline, and connect them at the outer ends by the buffer-beams, made from angle as shown. The frames may be brazed into the slots if desired. At the inner ends they are secured by tie-rods turned from $\frac{3}{16}$ in. round steel, reduced at the ends to 3/32 in. screwed and nutted. In the middle of each, fit a bolster made from $\frac{1}{2}$ in. × $\frac{1}{4}$ in. brass bar. The screws holding this go through the $\frac{9}{16}$ in. lengths of $\frac{1}{4}$ in. × $\frac{1}{16}$ in. angle which support the port blocks (see cross section). The bogie pinhole in the middle is tapped 6 BA and the pin is turned from $\frac{3}{16}$ in. round steel.

The bushes for the axles are turned from $\frac{3}{8}$ in. bronze or gunmetal rod to a tight fit in the $\frac{1}{4}$ in. holes in the frames, and reamed 5/32 in. Flanges are outside and $\frac{1}{16}$ in. thick. The wheels are turned to dimensions shown; the same castings can be used for both driving and carrying, if the crank boss is turned away on the latter.

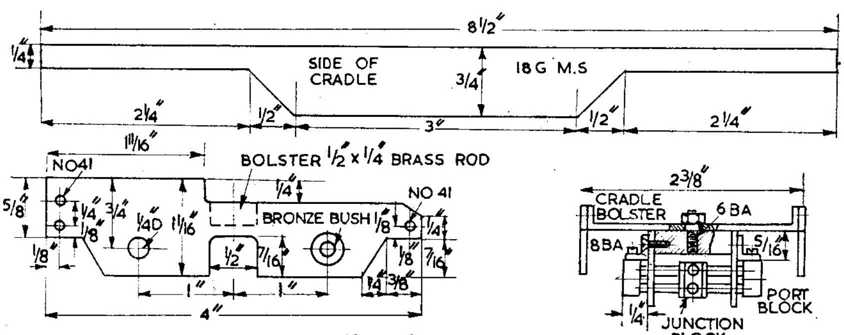
The crankpins are made from 3/32 in. silver steel, pressed in, and should project $\frac{3}{8}$ in. The axles are plain, made from $1\frac{5}{8}$ in. lengths of 5/32 in. silver steel. Press one wheel on, poke the axle through the bushes, then press on the other with the crankpins exactly opposite. Distance between flange backs is $1\frac{1}{16}$ in.

The cylinders are made from pieces of $\frac{3}{8}$ in. brass treblet tube a bare $\frac{7}{8}$ in. long. One end is plugged with a disc of 18-gauge brass and soldered. The other end has a push-in cover turned from $\frac{3}{8}$ in. rod. As the cylinders are single-acting, all that is needed is a tight push fit, the covers only acting as guides for the piston rods. The piston is turned to a close sliding fit from $\frac{3}{8}$ in. bronze or gunmetal, grooved as shown, and furnished with a 3/32 in. rustless steel piston-rod. Pack with graphited yarn. Each rod has a big-end made from $\frac{1}{8}$ in. brass screwed on to the reduced and threaded end of the rod. They may be soldered as an extra precaution.

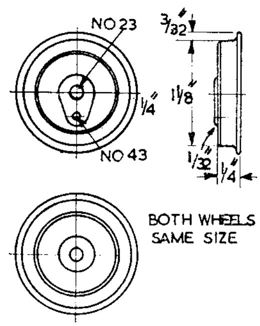
The trunnion blocks are made from $\frac{3}{8}$ in. × $\frac{1}{4}$ in. brass rod, filed to section shown, and soldered to the cylinders. The trunnions are $\frac{11}{16}$ in. lengths of 3/32 in. silver steel screwed into the blocks. The port blocks are made from $\frac{3}{8}$ in. × $\frac{3}{16}$ in. brass rod, drilled and recessed as shown. They are connected by $\frac{1}{8}$ in. pipes with a junction block in the middle, as shown in the plan and cross sections. The assembly can be made up by silver soldering, but don't silver solder the end disc and trunnion-block to the cylinders, or the thin tube will be softened and distorted. Soft solder is plenty strong enough for this job.

When erecting, attach the cylinders to the port blocks and put the assembly in the gap in the bogie frames, with one crankpin on back centre. The location is correct when the big-end is just clear of the cylinder cover, as shown on the front bogie in the general arrangement drawing. The port blocks are attached to the angles by two screws as shown. Take care to keep them clear of the steam pipes and trunnions.

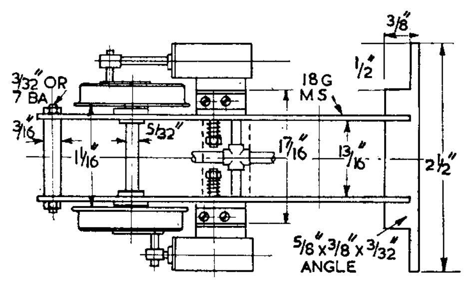
● *Continued on page 312*



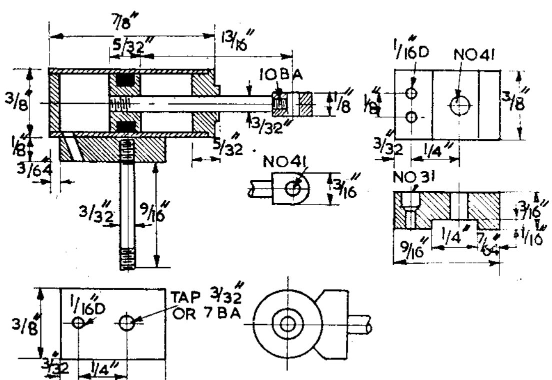
DETAILS OF FRAME



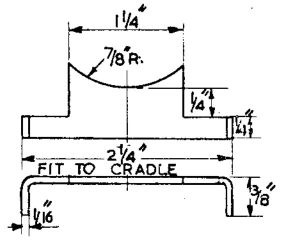
DRIVING AND CARRYING WHEELS



PLAN OF DRIVING GEAR

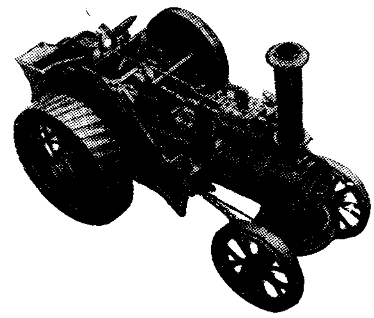


CYLINDER AND PORT BLOCK



BOILER SUPPORT

The MODEL ENGINEER
TRACTION ENGINE



The sheaves, flywheel and the valve gear are among the items ERNEST A. STEEL discusses in his fifth article

Continued from 20 February 1958, pages 228 to 230

If it is decided to include the slide valve eccentric sheaves as part of the body of the shaft, then it will be necessary to make a pair of end centring discs. The centres of the two sheaves are then marked off on the discs as it is hardly practicable to drill and provide sufficient countersinking for such a small shaft.

This done, the discs are mounted on the ends of the shaft (Fig. 1) and rotated until the centres are in alignment and secured for turning, say, the *forward* eccentric sheave. This is best achieved by scribing the surface of the shaft at this point and then marking the discs accordingly so that the two lines coincide.

Having machined the forward sheave, release the clamping screws and rotate the end discs until they line up for the corresponding *backward* sheave. It is most important to note that the position of this latter sheave is *not* diametrically opposite the forward one. In setting up the two discs for turning the sheaves it is also essential to check that the shaft —although under the circumstances is itself being rotated eccentrically—is turning truly parallel about the lathe centres from one end to the other.

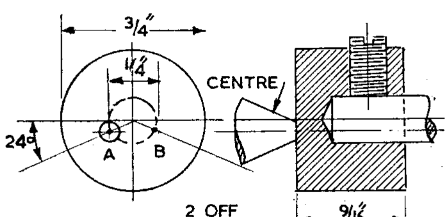


Fig. 1: Centring attachment for turning the eccentric sheaves

Details of the pair of separate sheaves are also shown in Fig. 3. The throw of the sheave is ⅛ in., thus giving the valve a maximum travel of ¼ in. Each sheave is set 114 deg. to the crankshaft or offset 0.05 in. from the centre as shown. This last dimension is equal to the normal lap of the valve.

Other features of the design are the miniature keyways (for the flywheel, gears and pump sheave) and the assembly of the shaft in its axleboxes of which more will be said later.

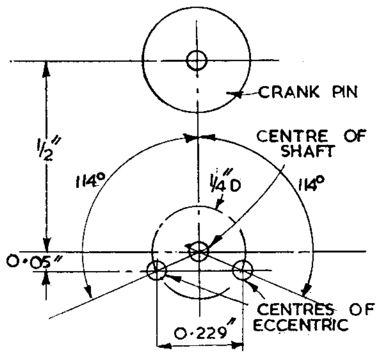


Fig. 2: Setting out the centres for turning the crankshaft

The keys are made of 5/64 in. square mild steel and should be made to fit the ways as in real practice, and the ends of the keyways are drilled 5/64 in. to provide the usual rounding off, followed by shaping the slots in the lathe with a narrow parting tool.

Sheaves, gears and flywheel should be made a good driving fit on the shaft and then secured with suitably hardened setscrews. The screws should be of a type in which the heads are flush with the surface of the part concerned and of a size so that they are not readily noticed.

THE FLYWHEEL

It has been said that the spoked flywheel is the best looking, but that it demands a well-made pattern. It is for this reason that an alternative design was included in the original drawings (Fig. 4).

In preparing the new drawing I have made the proportions of the flywheel—and particularly the spokes —to conform as closely as possible with those of the full-size Paxman engine. From the point of view of the foundry a heavier pattern flywheel would, perhaps, be desirable.

The centring of the hub must be checked against the portions of the rim remaining unmachined as any error will show up as eccentric running of the latter, although the outer face has been turned true. Minor faults in the casting can sometimes be removed by a little judicious filing of the surplus metal.

Note that the rim and the hub are left machine bright. If it is intended to drive a belt off the flywheel then the surface of the rim must be crowned slightly.

STEAM TRACTION ON THE FARM

British engineers were pioneers in the development of mechanical power for hauling the plough—an implement that has a history which goes back to the days of ancient Egypt. Plough shares of wrought iron were used by the Romans and Persians, but it was not until the latter part of the eighteenth century that a process of hardening shares of cast iron was discovered.

In 1803 Ransome patented a process by which the underside of the share was chilled, so that, with the wearing away of the top side of comparatively soft metal, the chilled edge maintained its sharpness.

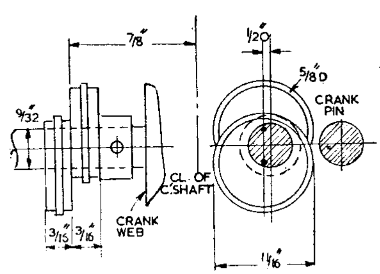


Fig. 3: The valve gear eccentric sheave

In 1812 the famous Cornish engineer Trevithick stated that: "It is my opinion that every part of agriculture might be performed by steam, viz., in carrying manure for the land, ploughing, harrowing, sowing, reaping, threshing and grinding."

The haulage of a plough across a field was demonstrated by J. T. Osborne in 1848. The demonstration took place near Stratford in Essex, a steam-driven windlass being employed to drive an endless rope to which the plough was attached.

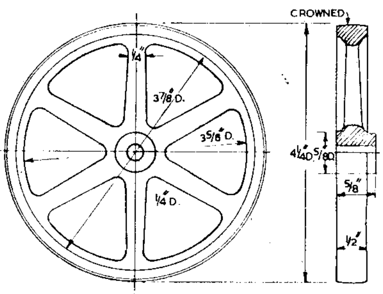


Fig. 4: The flywheel

At the Carlisle Show of the Royal Agricultural Society seven years later John Fowler, of Leeds, demonstrated in a practical way how the steam engine could best be used on the farm. Fowler's first practical steam ploughing equipment was demonstrated at the society's show at Chelmsford in 1856. In this system, popularly known as the "roundabout," the engine was fitted with a pair of winding drums; the rope from one drum was connected to the plough while the rope from the second drum was attached to a snatch block placed in a corner of the field and then on to an anchorage on a side of the field away from the engine.

By 1862, however, Fowler had introduced his double-engine system whereby the engines alternately pulled the plough first one way and then the other across the field. Ropes up to nearly three quarters of a mile in length were sometimes employed for this purpose.

In the later stages of development J. and H. McLaren, of Leeds, also played an important part.

As late as 1926 Fowler standard compound engines were being employed for double-engine ploughing and hauling ten-furrow ploughs. But it was about this time that the system of direct ploughing was being developed as a result of the advent of the petrol-paraffin 20-30 h.p. farm tractor of improved design.

As early as 1841 several firms were engaged upon the problem of a serviceable portable steam engine for the farm. It was to Messrs Ransome, of Ipswich, that credit was given for its introduction. At the Royal Agricultural Society's meeting at Liverpool that year it was reported: "To Messrs Ransome, of Ipswich, the society is indebted for what may be termed the great novelty of the meeting. We believe this is the first attempt to render steam power portable."

VALVE GEAR DETAILS

The setting out of the valve gear (Fig. 5) indicates the positions of the eccentrics relative to the crankpin. Here, then, is a complete piece of mechanism to link the slide valve to the crankshaft through the agency of valve rods, expansion link and eccentric rods. In addition, a simple lever system enables the driver to control the mechanism at will.

The two halves of the eccentric strap, being cast in one piece, have, therefore, to be parted, the faces machined flat, drilled and bolted together. The sides are also machine finished in the four-jaw chuck, but this work might well be done by hand at the bench.

With the two parts assembled, the next operation is to bore out to $\frac{5}{8}$ in. dia. and finish off so that the eccentric strap is a good running fit on its sheave without there being any noticeable radial play. The groove can be made no more than 0.005 in. larger in diameter and the same in width to ensure some measure of freedom axially. The side of one strap will be sliding over the side of the other so that they should be kept well greased.

The eccentric rod is shown screwed to the strap, but there is no reason why the parts should not be cast in one piece. Of course, a casting is not entirely essential as a piece of flat brass or gunmetal (cast) bar $\frac{3}{16}$ in. thick × $1\frac{1}{4}$ in. wide might well be substituted. The rods can be made

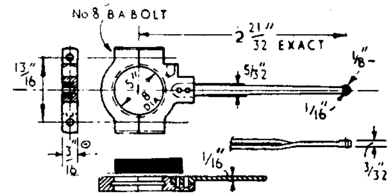


Fig. 6: The eccentric strap and rod

from $\frac{3}{16}$ in. square mild steel filed to shape, and then slightly cranked right and left hand to bring them in line with the expansion link.

The expansion link is made up from two pieces of bright mild steel flat $\frac{1}{16}$ in. × $\frac{3}{4}$ in.—preferably material known as "square-edge" which is one of the free-cutting steel to BSS 970.

Having treated the surface of one plate with marking-off fluid, the outline of the link is set out from the drawing (Fig. 7). This is a job—in view of its size—better suited for the work bench and vice. All radii are scribed off from a common centre which coincides with the centre of

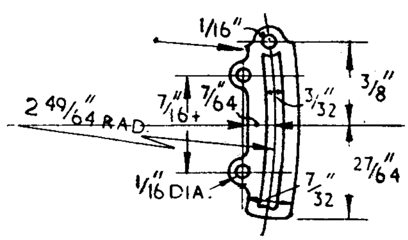


Fig. 7: The expansion link

the crankshaft plus the small fraction equal to the lap which, in this case, is 0.05 in.

On completion, the two links are separated by 3/32 in. to allow for the insertion of the diepin. The diepin must be a good sliding fit in the curved slots so it is important for the two plates to be in alignment.

Between the link and the slide valve spindle a special sliding rod has been introduced, mainly for the purpose of maintaining the diepin on the centre line of the valve motion otherwise it would receive no support except that of the valve gland.

The rod is made of $\frac{5}{16}$ in. × $\frac{1}{4}$ in. carbon key steel, stocks of which are held by steel stockholders. One end is coupled to the valve rod and the slot is provided to allow for adjustment of the slide valve. Then, after setting the vlave, they are locked together.

I have modified the other end of the rod connected to the expansion link.

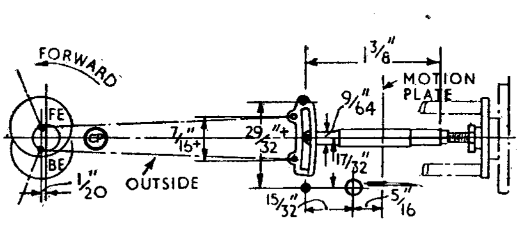


Fig. 5: Setting out the valve gear

In the original design a round die-pin, integral with the main rod, is shown. In its place I have shown a form of miniature die block with parallel sides to work in the slots of the curved expansion link.

The small block is now made detachable so that it can be replaced when worn. Care should be taken in hardening and tempering of this small part.

The flanged motion plate casting (Fig. 10) supporting the slide bars is bolted down to the top of the boiler. The base is machined in the same

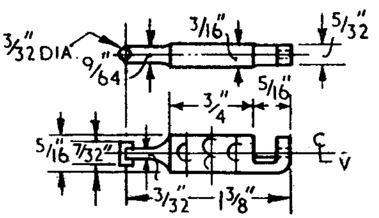


Fig. 8: *The valve slide rod*

way as that of the cylinder block. (This design provides for the fitting of the two slide bars, but an alternative arrangement of tubular type as fitted in full-size practice will be considered later.)

Incorporated in the casting is the extended guide for the valve rod and two lugs for the transverse reversing spindle. In order to align and mark off on the surface plate all the machined surfaces, it is a good plan to mount the casting on a segment of round bar with a flat base. The two parallel ways can be machined flat

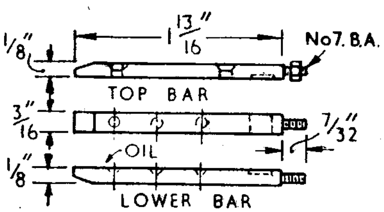
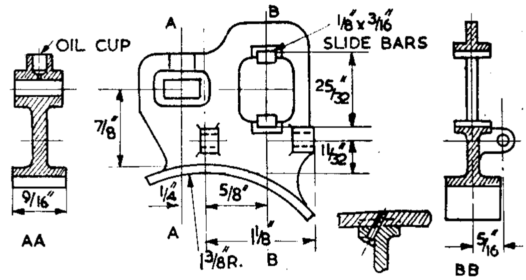


Fig. 10: *The slide bars*

in the lathe with a $\frac{3}{16}$ in. square broaching tool. If the hole in the guide lug has not been cored this will have to be drilled.

There is a tendency to take for granted readily available castings. But the constructor may, in point of fact, be remote from the facilities such as a foundry can provide, so that a pattern would be useless to him.

Fig. 9: The slide bar bracket



I suggest, therefore, that the brass motion plate could very well be fabricated in sheet brass and bar assembled together with screws and then brazed or soldered. The saddle piece is made of $\frac{1}{8}$ in. × $\frac{9}{16}$ in. or $\frac{5}{8}$ in. flat brass bent round the $2\frac{3}{4}$ in. round, and the vertical plate from a piece of 2 in. square material which is shaped, as shown, to receive lugs for the two slide bars and valve rod, respectively.

The lugs for the slide bars are made from $\frac{1}{8}$ in. × $\frac{5}{16}$ in. × $\frac{3}{8}$ in. flat bar and the one for the valve rod from $\frac{3}{8}$ in. × $\frac{5}{8}$ in. × $\frac{1}{2}$ in. flat bar. The small lugs for the transverse shaft are screwed to the plate and soldered. These are made from $\frac{1}{4}$ in. square material $\frac{3}{8}$ in. long.

Assembling the cylinder

Provide also for the oil cup which is made from a piece 9/32 in. dia. × 5/32 in. long. The slide bars are secured to the plate with 8 BA screws.

The slide bars are cut from stock $\frac{1}{8}$ in. × $\frac{3}{16}$ in. material and, according to my current stock list, $\frac{1}{8}$ in. × $\frac{1}{4}$ in. square-edged bright finished carbon steel is readily available. At this stage the complete cylinder and motion plate can be assembled in their respective positions on a temporary baseplate.

Having fitted the bars in their guide channels and wedged them tightly in position, they can then be offered up to the cylinder rear cover for marking off. A random length of piston rod should be assembled with its piston for lining-up purposes.

A modification to the design of crosshead is indicated in Fig. 11. I have now made this in two parts—one part dowelled and soldered to the other. A piece of $\frac{5}{8}$ in. × $\frac{3}{16}$ in. × $\frac{9}{16}$ in. brass or gunmetal is hollowed out 13/32 in. × $\frac{3}{16}$ in. in cross-section to form a rectangular tube and which is then filed to the required shape.

The boss is made of selected material and fitted in the tube. For this small model the outer end of the piston rod is cut off to the gauge length, stepped down to a little under $\frac{1}{8}$ in. dia. and screwed No 6 BA.

● *To be continued*

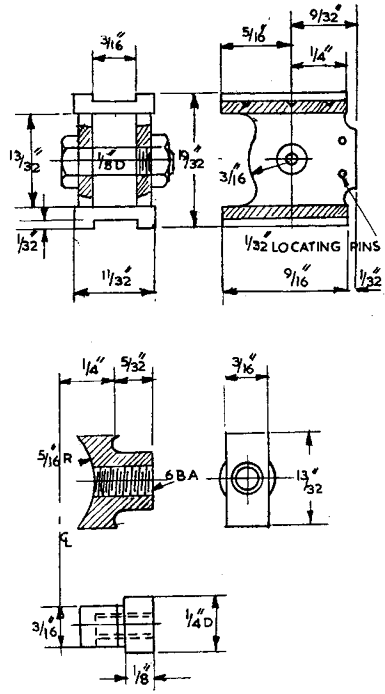


Fig. 11: *The crosshead details*

A FOLDING MACHINE

In this fifth and concluding article EXACTUS discusses the folder details and final assembly

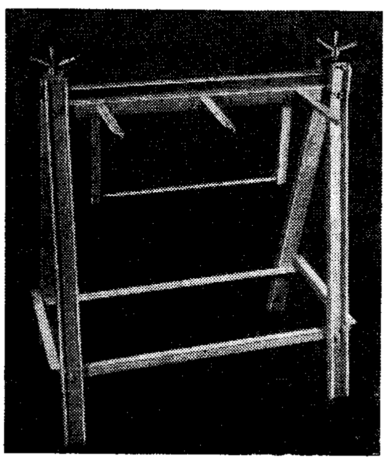
THE folder is constructed from a piece of angle iron with a hinge pin at each end secured by countersunk screws. And for the handle two pieces of angle with a length of suitable bar are required.

The size of angle iron required for the folder is 1½ in. × 1½ in. × ¼ in. 25½ in. long. Make sure the ends are square, and file a radius on the inside corners of the angle to allow the hinge pins to butt up close to the angle.

The only machining job is the drilling of the holes, so mark off all the hole positions, as dimensioned in the drawing, ready for drilling. Drill the three holes at each end for attaching the hinge pins—two in one side and one in the other, 17/64 in.—but *don't* countersink them at this stage.

The corresponding holes in the little blocks on the hinge pins are spotted through from the angle, and the greater the depth of metal left to guide the drill the better. Drill the remaining four holes with the same drill.

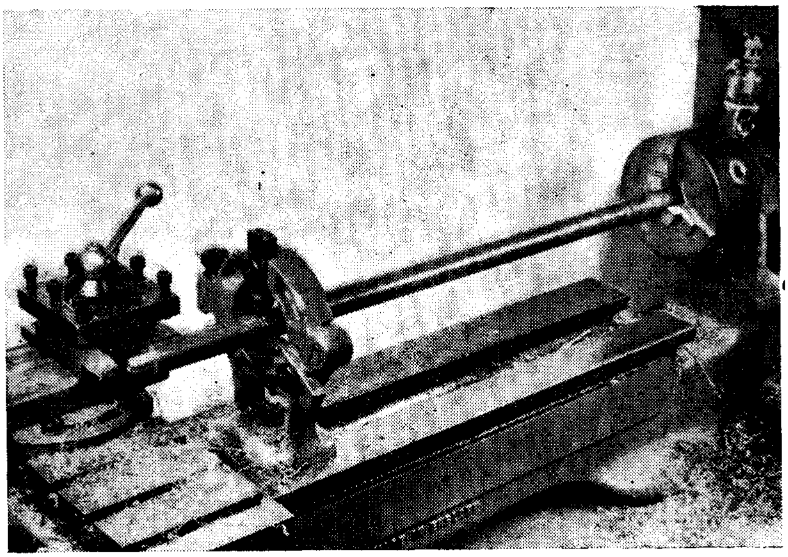
There is no need to countersink these holes on their own; wait until the others are ready and then do them all together. If your drill has a stop like our Fobco you will find that once the first hole is correct for depth the others only take a matter of minutes.



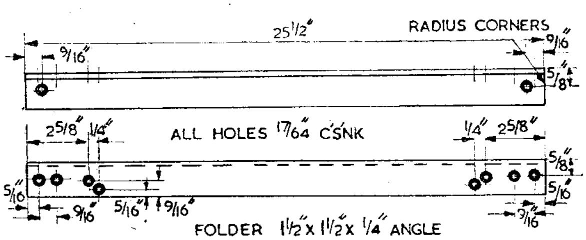
The hinge pin is made from 1 in. square bright mild steel—two pieces not less than 1¾ in. length being required. First of all square one end with the sides (this can be done either with a file or in the four-jaw) and when the end is square, mark off the position of the hinge pin by scribing a line $\frac{5}{16}$ in. in from any one side and then intersect this line $\frac{5}{16}$ in., from any side that is right angles to it (see drawing).

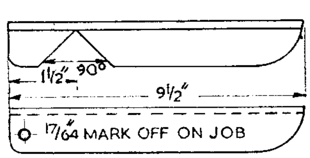
Where the lines cross make a small mark with a centre punch; a little extra care should be exercised in doing this because if the centre pop is not exactly right it will mean that the pins will be working eccentric to each other.

Mark both pieces off the same—there is no need to worry about a left and right hand yet—and set one of the blocks up in the four-jaw with the centre pop facing outwards, adjusting the jaws of the chuck until the centre pop is running true. If you have a centre finder this will be of great assistance. (A hardened centre in the tailstock can also be used as an aid in checking the centre pop for running true.)

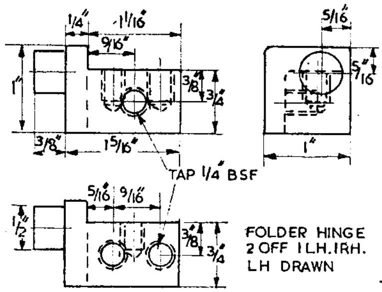


Above, Fig. 18: Turning the ends of the handle with the aid of a fixed steady



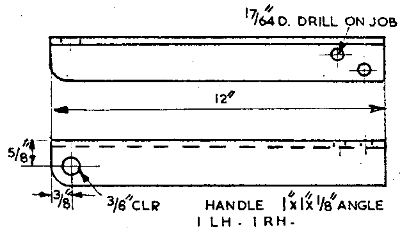


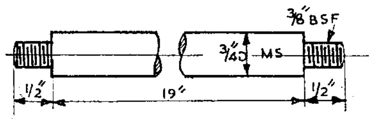
SUPPORT BRACKET
3 OFF. 1" x 1" x 1/8" ANGLE



When you are ready for turning, run the lathe at its slowest speed without back gear. Check your tool for height and see that it has a good cutting edge, then turn the pin to its finished size—½ in. dia., ⅜ in. long.

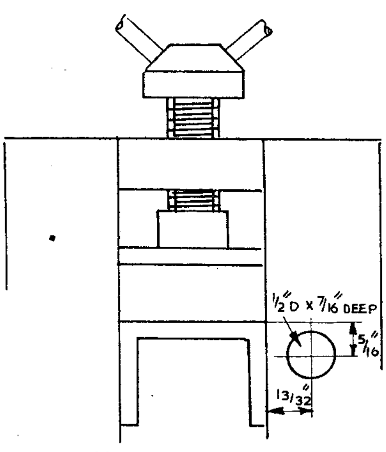
After both pieces have been turned the next step is to cut away sufficient metal so that the block can fit into





the angle. Take care when marking out the part to be cut away that you do one left hand and the other right hand.

The part to be cut away can be done on a milling machine, but it doesn't take very long to hacksaw for those who have no choice. I did mine by this method, making the cut



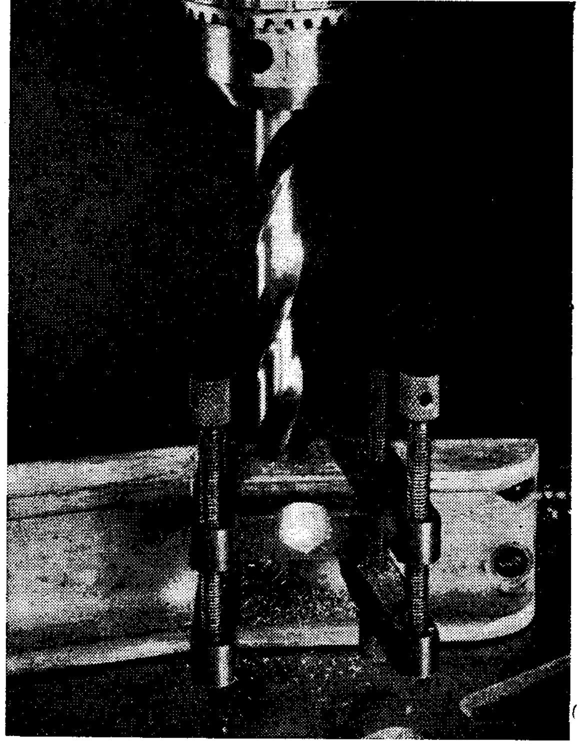


Fig. 19: *Drilling the hole for the hinge pin*

on the side of the scribed line. When the cut was finished I was still able to see the line. The small amount left is removed with a file until the cutaway is just ¼ in. deep.

To enable it to fit properly in the angle the top corner must be radius or the corner just filed away—whichever you prefer.

When the block fits snugly into the angle hold it in position with a clamp and spot the position of the two holes first, using the 17/64 in. drill.

Take the drill just sufficiently deep to start the tapping drill and remove the block from the angle to drill, and use a No 5 drill for tapping the holes out ¼ in. BSF.

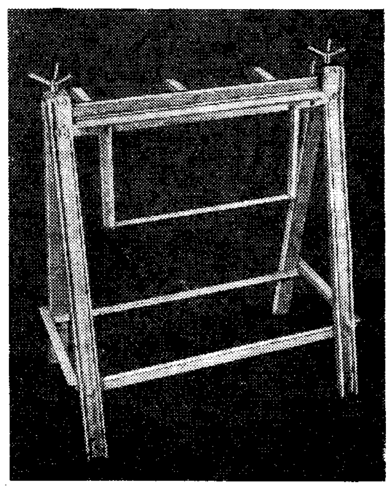
When spotting the position of the one remaining hole use the tapped holes for holding the block against the angle, and on completion of all the holes countersink the 17/64 in. holes in the angle iron.

The handle to operate the folder is made up from two pieces of 1 in. × 1 in. × ⅛ in. angle iron 12 in. long, and a piece of ¾ in. dia. bright mild steel 20 in. long. This is quite a straightforward job, and I think I need only say that a fixed steady is required to turn the ends of the ¾ in. rod (Fig. 18).

All that is required now to make the machine operational are the two holes for the hinge pins to swing in. Mark them off, as shown in the drawing, ready for drilling. It will be seen that the ½ in. hole to be drilled will foul the side of the angle as it breaks through.

To prevent accidents or broken drills, fit a piece of metal close into the two faces on the underside and clamp securely. In Fig. 19 the second hole is being drilled, and the cut-out made by the drill when doing the first hole can be seen. This method is, in effect, like drilling a piece of solid material.

Take the drill to a depth of 7/16 in.



When both legs have been drilled assemble the machine ready for working. To support a large piece of sheet metal while folding, make three brackets from 1 in. × 1 in. × ⅛ in. angle, braze the corners where they are bent at right angles, and, finally, bolt on to the bed of the machine with ¼ in. bolts.

POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

MACHINING CYLINDERS

SIR,—Mr Steel's current articles are most interesting. It is a brave and energetic man who ventures with technical articles in ME, supported by full working drawings. I offer a possible alternative to the method given of machining the somewhat awkwardly designed cylinder block. No criticism is intended, but it is desirable to avoid *filing* a $1\frac{3}{8}$ in. radius curved seating $2\frac{1}{4}$ in. × $1\frac{7}{8}$ in. !

Chuck in the four-jaw, and bore cylinder. Face the cylinder end as far outwards as possible, without running into projections at base, (boring tool). This should be the guide-bar end of the cylinder.

Turn the stub mandrel in the three-jaw, push on the cylinder and face opposite end as above.

Drill the stub-mandrel first used and mount it on the faceplate by bolt through the faceplate slot, with a true packing piece, so that the mandrel projects parallel to the lathe bed.

Push on the cylinder, and locate the mandrel to give correct radius of the curved saddle ($1\frac{3}{8}$ in. radius, $\frac{5}{8}$ in. offset). Machine the curved saddle with normal boring tool.

Remount the same mandrel on the angle-plate on the faceplate, push on the cylinder to present upper or regulator face outwards. (Stops on faceplate will prevent turning round.) Machine the regulator face.

Adapt the mandrel to mount on the vertical slide T-slot. Mount the cylinder to present valve chest face to chuck. End mill the valve face, first checking top is parallel to lathe bed.

Small areas at the cylinder ends not reached by facing operations can be end milled with a similar set-up to that just described. The precision of these end milled pieces is *not* vital, as cylinder covers seat on the faced part.

The advantages are: no specially made curved jig; no hand filing (some job !); precise accuracy of *faced* ends, as opposed to end milling on curved jig and the difficulty of lining up the bore accurately.

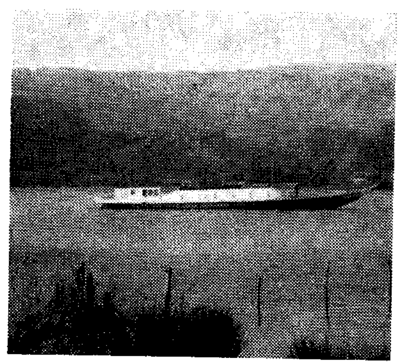
Incidentally, I obtained three of the ME traction engine flywheel castings recently, requiring one for a stationary engine. To reduce the massive casting to the correct thin rim and spokes required entailed 22 hours work; the original weight of 23 oz. being reduced to 12 oz.!

King's Lynn. A. BEAUMONT.

CONISTON'S GONDOLA

SIR,—I took my photograph of the sometime steam yacht *Gondola* at her Water Park mooring on January 4 after Mr Beddoe's tracing was published. So far as her hull and main cabin are concerned she is externally unaltered, her double snake figurehead and the scroll work around the words "*Cavendo tutus*" (the motto of the Cavendish for whom she was built) are there, and she still carries three flagstaff masts though the angle of her foremast has been modified.

The rather unfortunate after deck-house was added when she became a houseboat, and she is now painted in different colours. Although the vessel is called the *Gondola* there is no real connection in any particular with the design of the typical flat-bottomed Venetian original. Her design is peculiarly pleasing and graceful and her main cabin, divided into first and second class saloons when she was run by the railway company, had an elegance, charm and lightness which could almost be described as Regency.



The GONDOLA *in her modified form as a houseboat. See Janet B. Gnosspelius' letter*

When she was in the service of the railway company she used to be taken out of the water for painting every winter on the slipway beside the Waterhead Pier. She was hauled out on a cradle by man power with a winch, and I think I am right in saying that before she left the water her pig iron ballast was taken out to lighten her. (The same slipway is used by *Bluebird* when she visits Coniston.)

JANET B. GNOSSPELIUS.

One of the pictures of the GONDOLA *in the January 30 issue was sent by Dudley N. Wright. The word "been" in his letter should, of course, have read "seen."*—EDITOR.

BANDSAW BREAKAGE

SIR,—Concerning K.R.D.T.'s trouble [Readers' Queries, December 26], could not this grief stem from the blades being too thick in relation to the size of the wheels over which they run ?

The simple relation between curvature of a bent strip and the stress due to its having been bent elastically is simply $\frac{f}{y} = \frac{E}{R}$ where f = stress in p.s.i., y = the *half* thickness of the band (inches), R = the radius of curvature of the mid-thickness of the band (inches) and E = 30,000,000 for steel.

First suppose the band to be endless, to have no teeth and its section $\frac{1}{4}$ in. × 0.020 in. Then the stress in such a band wrapped around the 3.5 in. radius pulley mentioned is:

$$f = \frac{Ey}{R} = \frac{30{,}000{,}000 \times 0.01}{3.51} =$$

85,500 p.s.i. (approx.).

Next, the notch effect of the teeth is to increase the stress appreciably, depending upon the sharpness of the corners at the junctions of teeth to the blade strip. This effect can easily increase the local stress at the roots of the teeth by at least 50 per cent—which makes our numerical example subject to at least 128,000 p.s.i. in these places.

The effect of direct tension in the blade, due to cutting, is negligible in comparison.

Wood bandsaw blades may be of about Rockwell C.48 hardness, corresponding to an ultimate tensile strength in the neighbourhood of 225,000 p.s.i., and their carbon content run around 0.80 per cent.

In this condition the safe endurance limit of such material, about

0.020 in. thick, for single direction bending (not reverse bending) approximates 135,000 p.s.i.

But the silver soldering process, even if done at minimum temperatures, corresponds to tempering at about 1,200 deg. F. This will soften the hardened and tempered blade from Rc.48 to about Rc.32 hardness, reducing the strength at and near the joint to about 150,000 p.s.i. ultimate.

For such an ultimate strength the endurance limit goes down to say 85,000 p.s.i., which is way below the stress due to bending around the wheels.

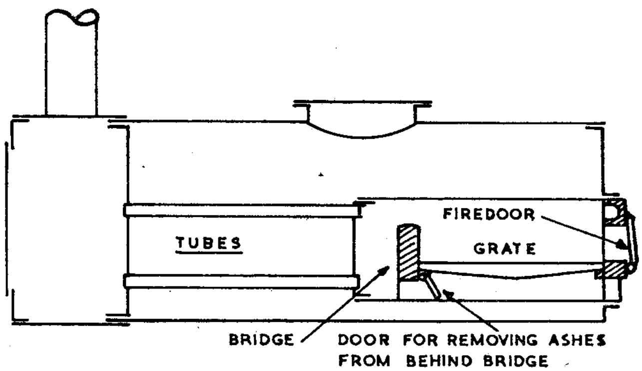
The numbers here given are reasonably close to the facts. Why doesn't K.R.D.T. measure some full-sized machines in local pattern shops, if such exist, and find their relationship between blade thickness and pulley size?

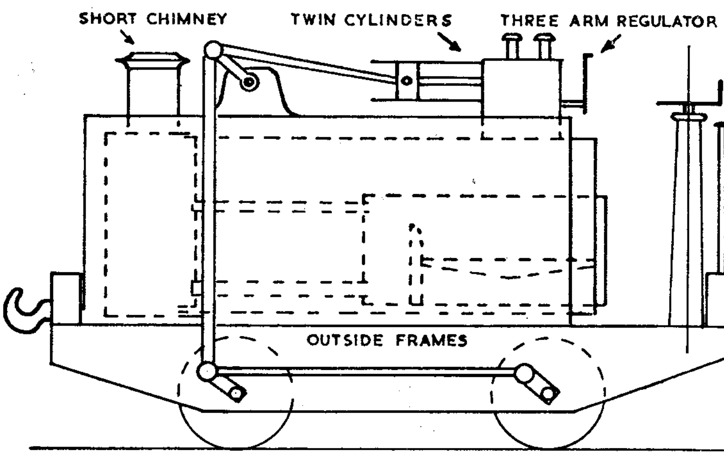
The first equation, solved for f is: $f = \frac{30,000,000 \times y}{R}$ and by using the y and R values measured from *successful* machines, the successful values of f may be determined. Then selecting like materials (but not necessarily thicknesses) and methods of joining, he can establish proper wheel sizes for his own machine.

I assume his band joints are properly scarfed, the blade held straight and under pressure when being joined, and the thickness at joints the same as elsewhere along the band.

Substitution of rubber for leather facing of the wheels may enable some stress reduction as the joint traverses the wheel should the joint thickness be slightly excessive—provided the rubber can yield a little more than does the leather.

R. V. HUTCHINSON.





Top: " Methanides " idea of what he believes KATIE'S *boiler to be like and (above) his sketch of a Guinness locomotive*

VALVE GEARS

SIR,—May I express my appreciation of LBSC's recent article on the Deeley and Churchward valve gears, also his notes on the Heywood gear in a later issue.

Your contributor's simply worded descriptions of these lesser-known valve gears are most valuable to those of your readers who, like myself, are not qualified engineers and who find the usual highly technical articles on such subjects too involved to follow.

Harpenden, Herts. J. M. ORMISTON.

FORGOTTEN LINE

SIR,—I was very intrigued to read " A Forgotten Light Railway " by LBSC [February 6]. May I stick my neck out and suggest that LBSCs diagram of *Katie's* boiler is not correct.

The firebox in this type of boiler usually extends halfway along the barrel, sometimes more, and the firebars do not go up to the tubeplate but finish on a " firebridge," as in a Lancashire boiler. There is a space between the bridge and the tubeplate and the tube bank occupies the whole of the tubeplate. My sketch shows this.

The firm of Beyer Peacock and Co. used to have a similar engine in 18 in. gauge on yard and shop duties. This engine was named *Dot* and had a saddle tank. When *Dot* was retired she went to the estate of one of the firm's directors at Disley, Cheshire, and for all I know may be still there.

The Guinness brewery in Dublin also use some engines with this type of boiler, but these are side tank types. The cylinders and motion are mounted very conveniently for maintenance on top of the boiler, the drive being taken from the crankshaft via vertical coupling rods to the leading crankpins thence by horizontal rods to the trailing crankpins.

I regret that I cannot give any vital statistics of these unorthodox engines, but interested readers may be able to learn more from Messrs Beyer Peacock and Co., Manchester, or from Arthur Guinness and Co., Dublin.

I enclose a sketch of the boiler as used on *Dot* and the Guinness engines, also a rough sketch of the Guinness engines. I hope the foregoing will interest readers.

METHANIDES.

SIR,—I have the complete description of this light railway in a book printed for private circulation. It contains sections on the following: objects of the 15 in. gauge; construction of the Duffield Bank Line; details of Eaton Hall line; locomotives, wagons and cars; the Duffield Bank

POSTBAG . . .

workshops; and narrow-gauge railways.

There are photographs of *Effie* (No 1). *Ella* (2), *Muriel* (3) and *Katie* (4).

The book, published in 1898 by Bemrose and Sons, is titled *Minimum Gauge Railways* and was written by Sir Arthur Percival Heywood.

Weston-s-Mare. A. J. BENDALL.

SIR,—Regarding LBSC's interesting articles on valve gears on narrow gauge locomotives, further information together with many photographs of both the Duke of Westminster's and Sir Percival Heywood's lines is given in a German published book *Lilliputbahnen*. This book is a short history of narrow gauge lines from 15 in. downwards.

Ilford, Essex. R. CHESTER.

SIR,—I have noted with interest LBSC's article " A Forgotten Light Railway [February 6] and his notes that follow a description of the Eaton Hall Light Railway. For many years it has been a hobby of mine to collect historical data relating to railways in general and miniature railways in particular.

Reference is made to the 15 in. gauge Duffield Bank Railway owned by Sir Arthur P. Heywood. This railway, about a mile long, was laid down in 1874. I have in my possession a number of photographs which were taken in the early eighties, and, judging by the extent of the layout, it can claim to be the first 15 in. railway system to be built in England.

In 1894 Sir Arthur opened his railway for public inspection, and it was on this occasion that the Hon. Cecil Parker visited Duffield Bank to discuss the laying down of a line at Eaton Hall for the Duke of Westminster. Sir Arthur was asked to inspect the proposed route and subsequently was given a free hand in regard to the design and construction of the line.

With reference to the 15 in. gauge 0-4-0 locomotive *Katie*, I think LBSC will agree that her boiler as sketched on p. 177 would be difficult to stoke and that the tubes would soon get choked with fuel. His diagram is not quite correct. The normal type of fire bridge was fitted clear of the tubeplate to allow the incandescent gases to be distributed among the tubes.

The Ravenglass and Eskdale Railway was re-opened as a 15 in. gauge line early in 1915 and at a time when Mr Greenly had entered government service. He had prior to the war carried out locomotive trials at Eaton Hall and of course had seen *Katie* at work. In one of his books he writes: " The first of the Heywood engines was, perhaps, the least satisfactory of the genus and is well-remembered for its vagaries by both passengers and staff of the later war (1914-18) period." By that time the engine was working on the Ravenglass line.

Little Giant was the first of its class and was built by Bassett-Lowke to Mr Greenly's design in 1904. Full particulars of tests carried out with this locomotive at Eaton Hall were published in the *Railway Magazine* for September 1905 (I believe an account also appeared in the ME about the same time). I have by me a photograph of the 15 in. gauge 4-4-2 locomotive *Green Dragon* with its bogie tender. This engine, fitted with Stephenson link motion, was awarded the gold medal and diploma of merit at the Model Engineer Exhibition of 1909.

Reverting to *Katie* once more, I would say that LBSC's drawing is a fair representation of the engine (p. 176) except that all the various rods were more robust than those shown !

In conclusion I would like to add that Sir Percival certainly showed his ingenuity in extending the valve gear to the rear ! There was not, of course, anywhere else to locate it. If he had attempted to employ the orthodox Joy gear, the bottom anchor link would have fouled the track.

Aylesbury, Bucks. E. A. STEEL.

STEAM MICE . . .

Continued from page 304

Boiler and connections

The boiler is just a 5⅞ in. length of 1¾ in. × 20-gauge seamless copper tube with flanged ends, bushes and uptake tube being silver soldered in. Each end is supported by a chock made from 16-gauge steel, the ends being bent at right angles and riveted to the cradle sides. The smokebox wrapper can be made of thin tin, with a dummy front and door. The bottom edges of the wrapper can be bent outwards and attached to the running-boards (when fitted later) by two $\frac{1}{16}$ in. screws at each side. The boiler merely rests in the chocks, the cab prevents it from lifting at the back, and the smokebox wrapper at the front.

The regulator is just one of my standard-type screw-down valves with a piece of ⅛ in. tube attached (see section). Just below the steam pipe union, a Y-piece is fitted, and the two pipes from this are led to the front and rear cross pipes. The front one goes under the boiler for its full length, the other one goes halfway, then turns back for attachment to the rear cross pipe. Note carefully—the front steam pipe is soldered into the upper hole in the junction block; the rear pipe into the lower. If this isn't done, the engine will try to go both ways at once ! No reversing gear is provided, as it isn't necessary on a small continuous oval or similar portable track such as a Hornby.

A ⅛ in. pipe is soldered into the other hole in the junction block, and the front one is led to the chimney uptake. The back one is turned straight up at the rear of the bunker. A lubricator made from a ¾ in. length of ⅜ in. tube is attached to a piece of ⅛ in. pipe, which is bent to a curve and soldered into a No 31 hole drilled in the junction block opposite the steam pipe. These lubricators move with the bogies, as the bottoms of tank and bunker are left open. The length of the steam pipes makes them flexible enough to allow for the movement of the bogies.

The spirit lamp, shown dotted in the general arrangement, is made of tin and fits between the sides of the cradle. It is inserted from underneath and supported by a turn-clip at each side, working in a short piece of tube soldered to the side of the cradle. If the base of the lamp tank is made to project a full $\frac{1}{16}$ in. beyond the sides of the tank, it will bear against the bottom edges of the cradle, and won't tip up. A stop can be fitted at each end to prevent end movement.

Superstructure, running-boards, fittings and trimmings can be added to individual fancy, and need no detailing out. The four cylinders won't, of course, keep " in step " when running, and the beats will all be mixed up, just as in full-size, but that won't interfere with the power and speed of the engine when doing its job.

She should run about half-an-hour with one filling of the boiler, which will make plenty of steam for the four cylinders. She will look pretty quaint when taking the curves of the average tinplate track, as the boiler will appear to have completely " run off the line " ! ▣

A ship modeller's diary

By Jason

A NUMBER of correspondents in Postbag recently have made reference to the gondola on Lake Coniston.

At first I thought that "gondola" was the name of the vessel, for as someone wrote a few centuries ago: "What's in a name?" But a reader from Barrow-in-Furness alludes to *the only powered gondola on any water in Britain*—hence the heading: "What is a gondola?"

Surely, the gondolas, propelled by a single oar, are peculiar to the Venetian canals. The methods employed were well known to the windjammer apprentices on the west coast of South America half a century ago. The Venetian gondolier faces the bow, his oar well on the quarter. Even right aft, the oar would tend to push the hand off were it not for the steadying and rectifying effect of the oar blade through the water during its return to the forward position.

It is in this manner that the North American Indian when paddling aft, keeps his canoe on course.

New chairman

THAMES SHIPLOVERS' new chairman is Sir Harold Danckwerts. He has travelled more than most and is an experienced modeller. He will be ably assisted by Mr F. H. E. Phillips as deputy chairman.

The outgoing chairman received a gift of jewellery from the president of the society, Commander Alan Villiers. Following the presentation Commander Villiers addressed members on *Mayflower II*. This was illustrated by an excellent two-reel film of the building, launching, sailing and US reception of the ship.

One thing that amazed his listeners—as it did Villiers himself—was that the spritsail tack did not need to be held down when sailing. The film showed this clearly.

There was much to be learned about sailing this ship, a ship with gear from another century. But that Commander Villiers was the right man for the job of master was ably demonstrated by the way in which he overcame the difficulties of slack lower rigging, of tiny upper spars, of stripping down to courses—17th century fashion instead of down to lower topsails 19th century fashion—whenever a blow came on, and of using bonnets and drabblers.

More research work

AN interesting letter from Mr H. H. Nicholls helps along the *Atlanta* search. Mr Nicholls suggests that the model might be one of the relief vessels used by Trinity House. He mentions a special article from *Cassells Family Magazine* (1881) with which is reproduced an illustration of such a vessel going to a lightship. He also mentions a two-volume collection of pictures by the photographer Stretton (1875)—now at the Maritime Museum—which includes a photograph of Calcutta showing a vessel almost identical to *Atlanta*.

This rather suggests that *Atlanta*, or a sister, may have gone to the Hooghly River to do that work, for which she was eminently suitable. Thank you, Mr Nicholls.

Manchester's exhibition

THE Northern Association of Model Engineers hold their three-day exhibition from March 28 to 30 at the Corn and Produce Exchange, Manchester. There are six classes for ship modellers.

This year sees a concerted effort by the metropolitan societies under the chairmanship of Mr W. Gay to achieve two things: 1, to show their models, and 2, to hold a national convention of ship modellers.

Mr Gay assures me that a score or more models have been promised, but most of these will be on loan and not for competition. This is because many modellers will be unable to spend four days in Manchester. Usually they travel north Friday night with their models, display them Saturday morning and meet in the afternoon, returning to London late Saturday night.

Some modellers, however, will be there for the whole period and, consequently, will be able to look after a few models for competition purposes. Write to Mr Gay, 351 Kingshill Avenue, Hayes, Middlesex, or Mr C. Middleton, 31 Kenyon Lane, Middleton, Manchester.

Open boats display

THE stand of the Royal Navy at this year's Boat Show had a fine little exhibition of no less than 13 of George Draper's open service boats covering a period of several centuries. These were constructed in the Draper technique at ¼ in. to 1 ft which this modeller has so successfully pioneered during the post-war years.

Needless to say such an accurate worker has had much co-operation from the Admiralty. There were gigs, galleys, cutters, whalers and pinnaces from the 17th century to the present day. Some of them were models of boats which took part in the first world war. It is, indeed, pleasing to see that others are following in Mr Draper's footsteps.

It is more pleasing still to record his statement: "My followers are ahead of me."

Sir Harold Danckwerts