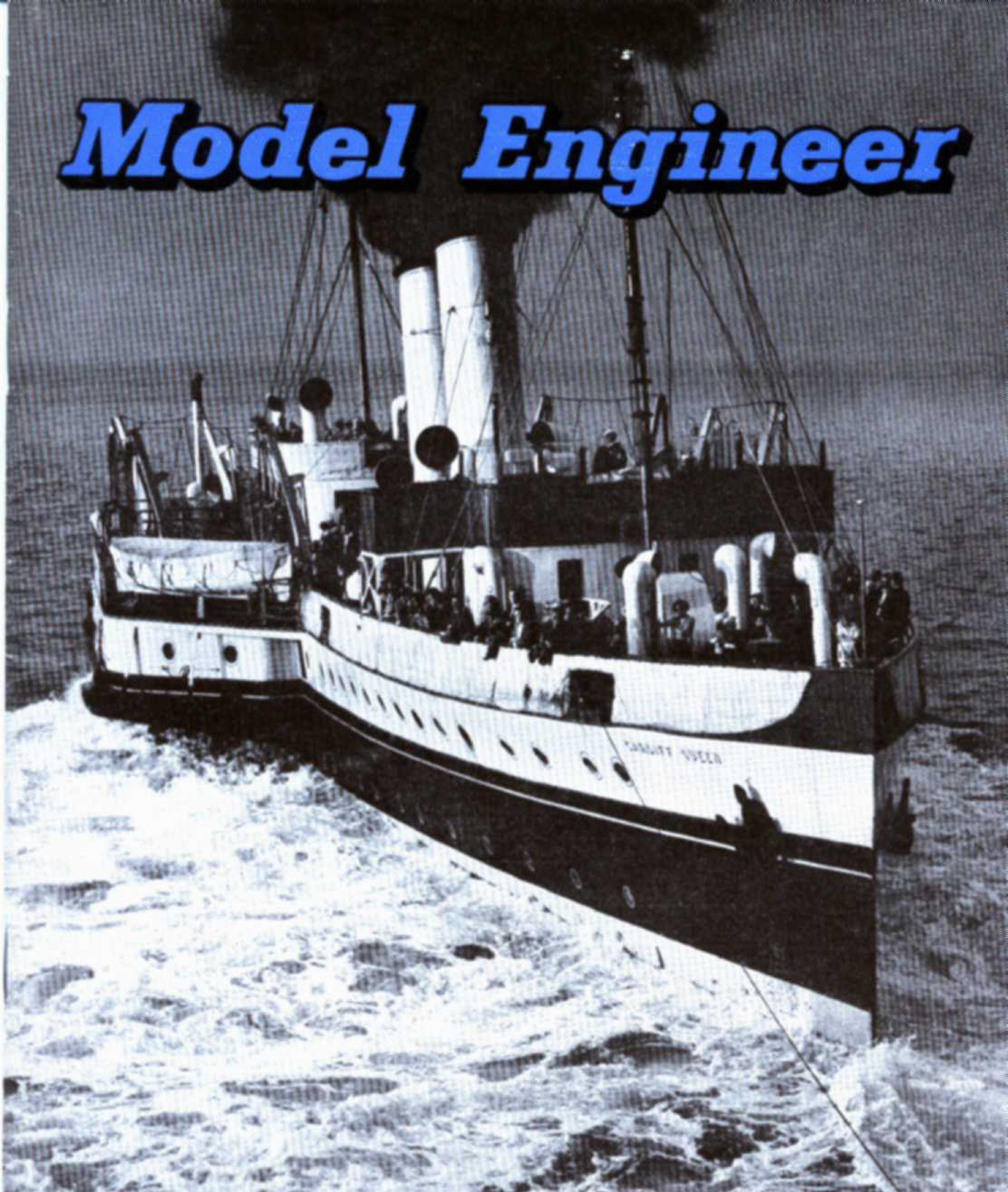
Model Engineer



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Contents

Cover picture

Paddle steamer CARDIFF QUEEN, *owned by P. and A. Campbell Limited, backing away from the pier at Ilfracombe in September 1960. Picture by G. F. Heiron*

Next week

Donald Truelove wanted a lantern clock of the early eighteenth century. As he was unable to get one, he made a copy—and now he tells ME readers about it. In the same issue George R. Clapp reports a Steam Pageant in New York State, and A. W. Neal writes of some electric motors

Smoke Rings A weekly commentary by VULCAN

"PERHAPS," I wrote on February 28, " when the technique of producing nuclear energy is more advanced, a pint-sized reactor will be designed to raise steam much more economically than with the present methods. We may yet—who knows?—find the steam-driven car rivalling the petrol engine."

Mr Norman Gardner of Acocks Green, Birmingham, has now sent me a quotation from *Angelo's Moon* (Bodley Head), a science-fiction story by Alec Brown. While Angelo is travelling in a strange kind of car, he asks his guide what power the vehicle uses.

" Steam," the guide replies.

" Do you mean heated water-vapour? "

" Of course."

" But that was abandoned long before the old world ended."

The guide then explains that steam-power was merely shelved—never abandoned. " A vested interest, as they called it, in internal-combustion engines, plus the desire of every Tom, Dick and Harry to have his own self-propelled carriage, for a time made it uneconomical to build steam-cars. Even so, in the middle of the twentieth century, steam-cars built 25 years earlier were still powerful, more economical, and smoother-running than the finest petrol-driven vehicles. We—after the Great Cataclysm—decided we could afford nothing else but steam-cars."

There are many readers who would like to see the steam car return and flourish—but not at the price of a Great Cataclysm.

More withdrawals

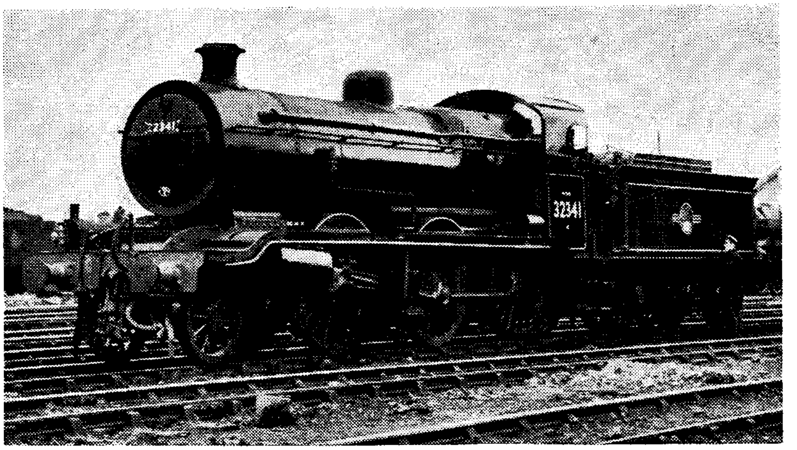
IN January the last of both the Southern Schools class and the ex-Brighton Moguls was withdrawn from service.

The Schools class was one of the most successful and one of the best-known express passenger engines constructed for the former Southern Railway. Forty were built altogether. The first, No 900 *Eton,* appeared from Eastleigh Works in 1930. A further nine were completed in 1930, and the remaining 30 in 1932-1935. All were named after public schools.

A parallel boiler with round-topped firebox was adopted by Maunsell for the Schools class. Heating surface was 1,766 sq. ft, plus 283 sq. ft for the superheater. Grate area was 28.3 sq. ft and working pressure 220 p.s.i.

Each of the three cylinders, which were $16\frac{1}{2}$ in. × 26 in. stroke, had independent sets of Walschaerts valve gear.

At 85 per cent of the boiler pressure, the tractive effort of the Schools amounted to 25,130 lb., the highest of any 4-4-0 engine in Europe.



These will be seen no more. No 32341, *a Mogul of the Brighton K class, was photographed by Brian Western in* 1961. *The V class* 4-4-0 *is No* 30929 MALVERN, *hauling a Charing Cross train at Tonbridge, Kent, in July* 1959

Back to the
TOURBILLON

"Anyone who has a watch that he would normally swear by may be surprised if he wears it on the other wrist for a day or two," says W. G. HUDSON. Here he describes how he used an old idea and brought it into the light of modern knowledge

Despite the accuracy with which watch parts are produced, the assembled watch composed of standard parts will show considerable errors in rate when it is checked against a standard in various positions.

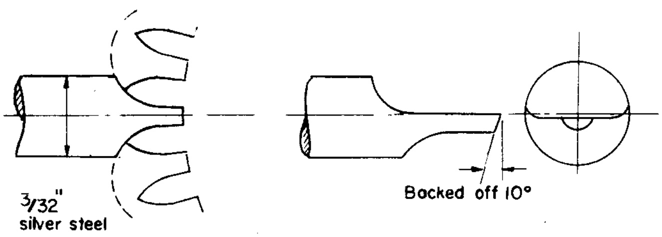
Gravity acting upon a slight heavy spot in the balance rim with the watch in a vertical position will cause a gaining rate in one position, and in the opposite position will cause a loss; this effect can be reversed, depending on the total arc of vibration of the balance. The eccentric development of the balance spring causes errors in positions, and a couple takes place, making variations of balance arc give rise to variations in rate.

Some watches are marked "adjusted." This means that the watch, after assembly, has been passed to the factory adjuster, a highly skilled watchmaker who trims one error to counteract another, bringing the ill effects to a minimum. Anyone who has a watch that he would normally swear by may be surprised if he wears it on the other wrist for a day or so. Reversing the normal wearing position creates havoc with the normal rate.

TOURBILLON WATCH, Tour-bil-yon (Horol). A watch fitted with a revolving carriage which carries the balance and escapement round the fourth wheel, for the purpose of eliminating the positional errors.—Chambers's Technical Dictionary

The existence of these errors has been known for years, and it is unfortunate that very few watchmakers know what causes them, let alone the cure. As the average person is content with a rate close enough to meal times, the need does not arise for adjusting—only for regulation to his wearing conditions.

In an effort to overcome the errors Abraham Louis Bréguet (1747-1823) a famous French watchmaker, mounted the escapement on to a cage or carriage which revolved round a fourth wheel fixed to the plate. Bonniksen later made a more robust arrangement which ran on a large brass bearing in the front plate revolving once in 52½ minutes compared with a minute in the Bréguet device. This was quite fast enough to cancel most errors, and the system proved a success. Very few such watches have survived.



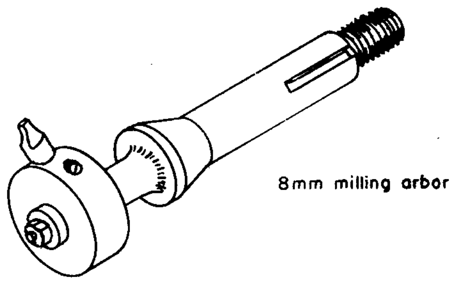


Fig. 1

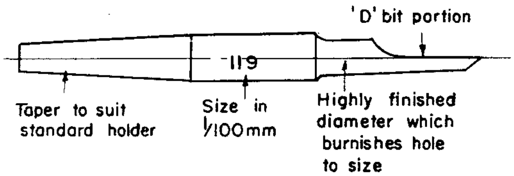


Fig. 2

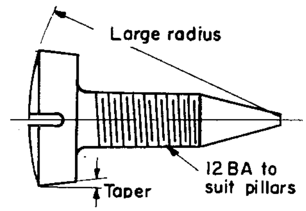


Fig. 5

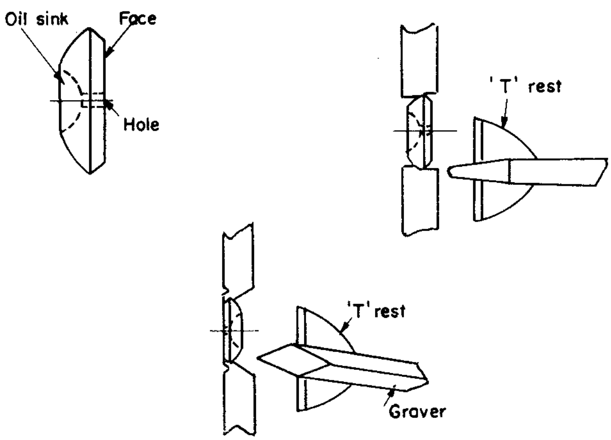


Fig. 3

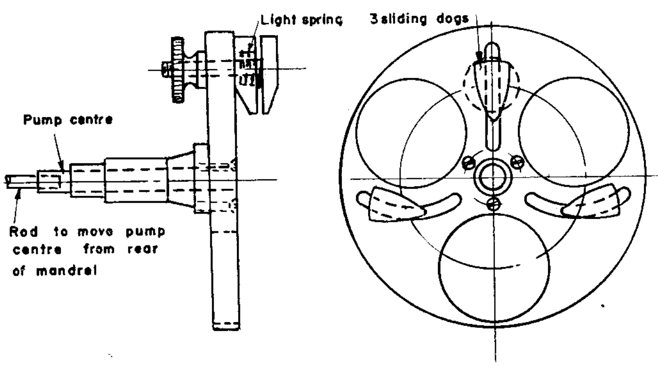


Fig. 4

Some years ago I became obsessed with the idea of taking a tourbillon and adjusting it, in the light of modern knowledge, to find if the rate would be an improvement on a first-class adjusted watch with fixed escapement of modern design.

Advertising in the national Press brought no result, and I decided to make a tourbillon. I discovered at the drawing board that the total height over the plates would have to be 11 mm. There would be casing problems. A case-maker friend in Clerkenwell sent me three old cases and I used one of them, thus setting the plate diameters and height.

Having drawn the movement five times the size, I began work on the carriage. I had decided to revolve it ten times an hour round a stationary third wheel, the fourth wheel and pinion revolving within the carriage and driving the escape wheel pallet (lever) and balance. Wheels of 120, 90, 80, 75 and 64 had to be cut, and as I could not get a division plate I had to make it. Using a small punch, I pierced a strip of $\frac{3}{8}$ in. steel from a packing case with equally spaced holes, and made a simple die taking up a pin through the first hole while the second was pierced—and so on until 121 holes were ready.

A disc of 1 in. plywood was screwed to the lathe faceplate and recessed to take a 7 in. brass disc, which was to be the finished index plate. The outside diameter of the wood disc was turned down until the metal strip, which was soldered with the two end holes exactly coincident, would pass on to it tightly. It was then used as an index. I drilled the division plate from a high-grade head mounted on the topslide, using a short spade drill to obviate whip.

The strip was then cut down to 91 holes in length, the wooden disc was turned down as before, and the process was repeated. While 429 holes of 0.75 mm. dia. may sound rather frightening with a high-speed head and only a shallow depth, the setting-up became the longer part of the process. After removing burrs round the drilled holes with blue-stone, I gave the plate a circular grain by revolving it in the lathe while I held the wet stone against it. A flanged bush was then made, fixed to the index plate with 8 BA countersunk screws, and bored to fit the 8 mm. Boley and Lienen headstock spindle. It was secured by a grub screw entering the keyway which serves the rear cone bearing.

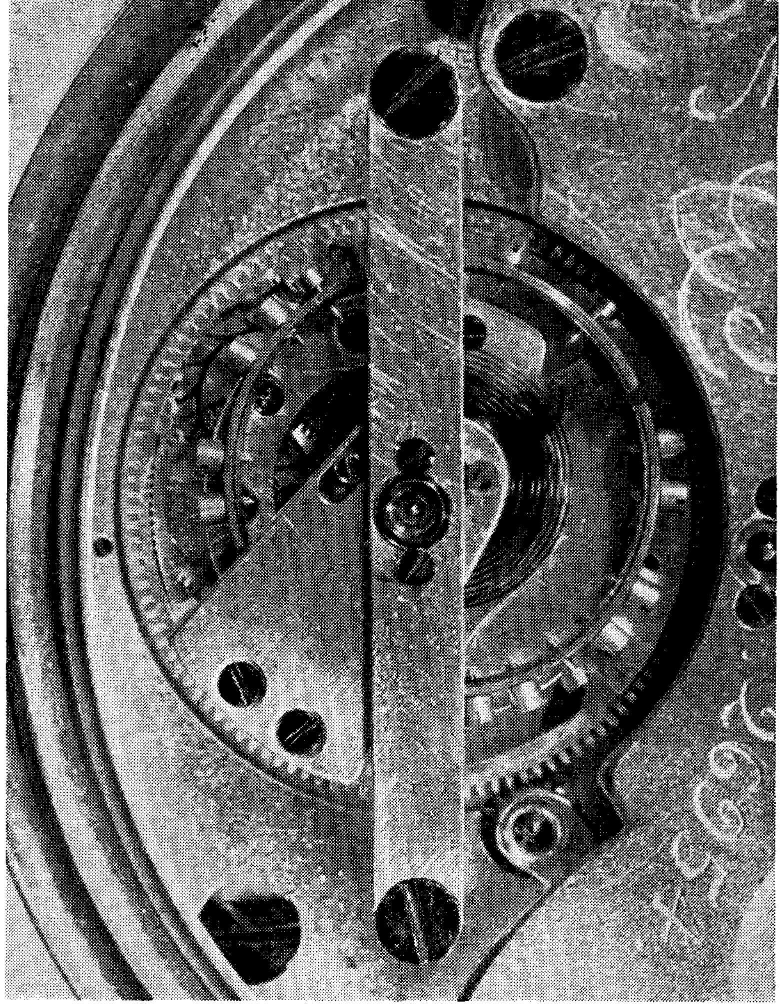
I made a cutter by turning a piece of $\frac{3}{32}$ in. silver steel to the form of a tooth space, half cut away with the tip backed off. It was hardened and tempered to straw and was mounted in a brass disc on a milling arbor (Sketch 1). After turning the carriage blank to size (it is no use leaving overplus on a part like this), I set it up true on a shellac chuck, and made a start on cutting 120 teeth.

Everything went well until I cut the last space and found that the collet holding the shellac chuck had turned slightly, causing 119½ teeth to be cut; not a very good beginning. I turned off the teeth and turned a spigot on the edge and face of the carriage. Then I made a brass ring with a spigot to suit cut teeth (with the draw bar well tightened) and secured the work to the carriage with three screws (size not listed on BA chart).

This mistake proved valuable later when the carriage was assembled and had to be poised. Pieces could be cut out by removing the rim from both pieces with a fine metal piercing saw, as will be seen in the photograph of the dismantled watch.

The bridge carrying the top pivots of the lever, escape and fourth wheels I screwed and steady-pinned (dowelled) to the carriage. I nailed the hole centres with the depth tool. Then I mounted the bridge in a mandrel head and drilled, bored and sized it with a jewel reamer—a reamer with a form like a D-bit—sizing the hole to 1/100 mm. smaller than the outside diameter of the jewel, which was then pressed in as a normal bush.

Jewels are supplied in a guaranteed size range. A packet marked 12/120 would contain holes measuring 0.12 mm. i.d. and 1.20 mm. o.d. The reamer used to fit this size to a plate would be 1.19 the size marked



on the shank (see Sketch 2). By using this method and reaming through both plates, I knew that the pinions were certain to be upright. They are not upright in a factory-made watch where the plates are produced separately.

Holes were drilled and reamed for the pillars to carry the top plate and carriage bridge, again through both plates held together. Rod brass was drilled through, tapped 12 BA—blacksmith size—placed on a screwed arbor between centres, and turned to finish size. I made sure of a push-fit in the front plate and a slide-fit for easy removal of the top plate.

The fittings were then pressed into the front plate, and a ½ mm. drill was put down, half in the plate and half in the pillar, well up into the boss. I fitted a pin to prevent turning. In cheaper hand-made watches, pillars were riveted in and it was difficult to remove broken screws from the blind hole. A new pillar can be made with the other method if the worst has to be faced.

I marked out the front plate for jewel centres, again with the depth tool, mounted it in the mandrel head, turned the sinks (recesses) and set the jewelling. The jewelling carrying the gear train was not of the press-in sort, but of the rub-in. I chose this kind for the more visible holes as I wanted the finished watch to look "Old English." The section of the hole is shown in Sketch 3.

The hole is bored through the plate about 2/10 mm. smaller than the outside diameter of the jewel. Then, with a tool formed to the same shape as the back of the stone, the hole in the plate is bored out until the flat face of the stone will pass just below the face of the brass plate.

With a highly polished ball-ended tool, the sharp edge of the bore is burnished over on to the jewel. The brass is turned back to the jewel face, and a V-groove is turned round it to finish. This should be clear from Sketch 3.

The jewel is held on to a piece of brass wire by shellac while you are trying in the bored hole, which you remove from the hole by boiling the part in methylated spirit.

● *Continued on page* 360

 Continued from December 20, 1962, page 795 By JOSEPH MARTIN

Man with a model: the new Merrimac is born

EARLY on a March afternoon, a hundred and one years ago, the crews of the Union fleet in Hampton Road, Virginia, saw an extraordinary vessel bearing upstream towards them. She resembled no other craft which had ever floated on water, except perhaps Noah's Ark; and even there the similarity was slight.

Her history was as odd as her appearance. In December 1855 the United States Navy commissioned a powerful new frigate, to be named the *Merrimac*. When she left the Boston Navy Yard, she was a handsome creation in seasoned live-oak, 275 ft long, and equipped to use both wind and steam. Her crew found her fast and handy under sail, but her chief engineer, Alban C. Stimers, complained that her steam power was inadequate for her 3,500 tons. She voyaged to the West Indies and around the Horn to the Pacific, and in 1860 was sent to Gosport Navy Yard in Virginia for repairs to her engines. With Virginia threatening to secede from the Union, the repair work became urgent: if it were not completed quickly, the proud *Merrimac* would pass into the hands of the South.

While Commodore McCauley and his engineers were still busy in the yard, a Southern railwayman, William Mahone, president of the Norfolk and Petersburg Railroad, decided to try a stratagem of such simplicity that it might have been borrowed from a tale for tiny-tots. According to the best-known version of a story that had become an American legend, he gathered together a crowd of civilians, loaded them on to his trains, and told them to whoop and cheer. The trains shuttled in and out of Norfolk Station with the engine whistles playing a joyful fantasia and the passengers yelling like Red Indians.

Wrecking the yard

Hearing the din, McCauley thought that thousands of Southern troops were on the way. He could not hold the yard against them, and he had been ordered by Washington not to provoke the Virginians. While he pondered, Captain Hiram Paulding arrived in the Federal steam sloop *Pawnee* with orders to destroy all public property that could not be removed, and if need be to abandon the yard.

Toiling fast, the wrecking crews sank or partly destroyed eight vessels: the *Pennsylvania, Delaware* and *Columbus,* aged ships of the line, the frigates *Columbia* and *Raritan,* the sloops-of-war *Germantown* and *Plymouth,* and the brig *Dolphin.* Finally, a party from the sailing sloop *Cumberland* opened the sea valves of the *Merrimac.* As the stately vessel sank, flames from the Navy workshops and offices reached her masts; the yard had been deliberately turned into an inferno.

Yet the plan to destroy everything fell short of success. The Southerners arrived a little too soon. After the Federal men had departed in haste, the Confederates extinguished the fires, together with the fuse of a bomb intended to blow up the dry dock.

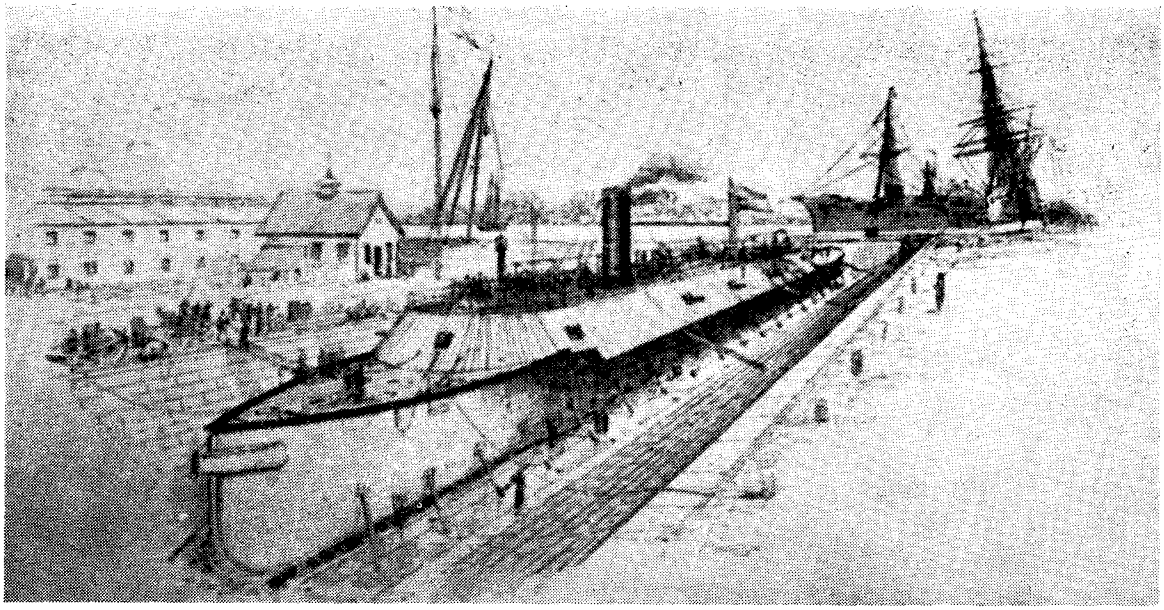
In one raid, completed without the firing of a shot, the South had gained, besides a first-class yard, a great quantity of supplies and arms including 1,185 cannon. Not least among their prizes was the *Merrimac.* She was only an ugly hulk when they eventually raised her, but her engines could be made to work again. Anything that could be driven on water was a godsend to the South. The Confederate Navy in 1861 was almost comic in its insufficiency: a few small vessels such as revenue cutters and lighthouse tenders, together with one capture—the side-wheeler *Fulton,* which had served for 30 years.

But the secretary of the Confederate Navy was a man of ideas. Stephen Russell Mallory, an amiable lawyer from Florida, had kept an eye on the experiments which France and Britain had been undertaking with armoured ships. The conception was far from new. Many centuries earlier the Greeks had used lead plates and the Norsemen sheets of iron and bronze. In America during the War of 1812 John Stevens, the Hoboken prophet of steam, had devised a plan for a round floating battery armoured with plate and equipped with steam-driven propellers which would make it revolve, guns and all. But nothing had come of this idea, or of the patent taken out in 1814 by Thomas Gregg of Pennsylvania for a steam-driven, shot-proof floating battery with sides built at an angle to defeat enemy fire.

Although the Americans had designed ships as adventurously as they had sailed them, they hesitated to introduce armour. The British Navy, 30 years after the launching of an iron merchant ship, had built some iron frigates, only to find that the holes made in them by shot could not be plugged by a wooden stopper, or indeed by any serviceable kind of bung. These vessels of 1845 had been hastily withdrawn from the Navy List, and for the following 15 years the use of iron had been left to the Merchant Service. At the time that the *Merrimac* was sunk, the famous *Warrior* had been afloat for only two years; and the Royal Navy had been fortified in building her by the long experience gained from the iron merchantmen.

No more acorns

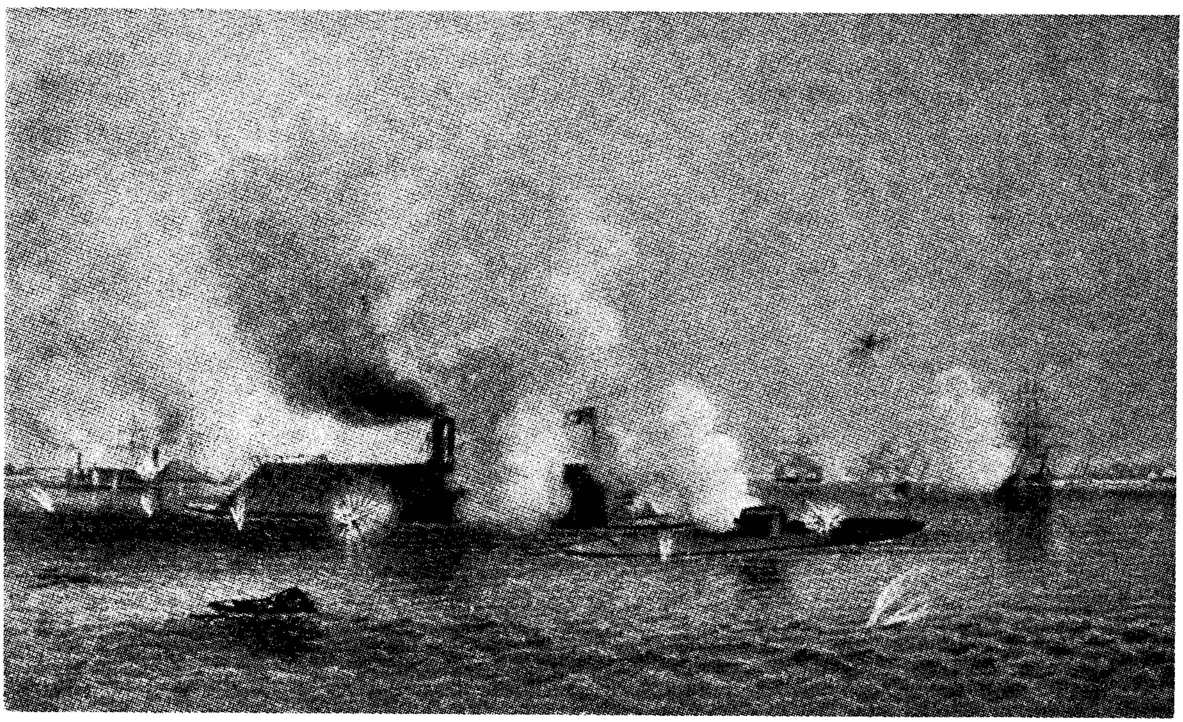
Admirals would no longer carry acorns in their pockets for children to plant so that England would not be conquered for lack of oak. The age of the wooden walls was passing, and Stephen Mallory saw the inevitability of the change with a clarity denied to most of the experts. Whenever the use of iron warships has been discussed by the normal peacetime government in Washington, barnacled admirals had snorted. Bred to the traditional principle that nothing new can be contemplated because it has not yet been tried, they looked upon iron vessels with the same distate that Haig, half a century later, was to feel for tanks and aircraft. They had a question which they regarded as final: "Did you ever see a piece of iron float?" It was answered, with equal finality,



Reshaping the MERRIMAC *at Gosport Navy Yard in Virginia*

From the remains of a Union frigate, the Confederate Navy devised a warship like nothing which had ever floated on water

Fight of the MERRIMAC *and the* MONITOR *in Hampton Roads*



by another question: "Did you ever see an iron dipper float in a keg of water?"

These high experts on ocean-war might have been living in the 15th century. Surely it was they, in an earlier existence, who had looked coldly on the armoured ship models of Leonardo da Vinci, quelling with their proud academic knowledge the imagination of a mighty genius?

Stephen Mallory was not among them. Before the Civil War had been in progress two months, he declared: "I regard the possession of an iron-clad ship as a matter of the first necessity. Such a vessel at this time could traverse the entire coast of the United States, prevent all blockade, and encounter, with a fair prospect of success, their entire Navy. . . ."

There was, unfortunately, one great difficulty in the way: where was the South to get the engines or roll the plates? In May of 1861, as I related in my articles on the launching of the *Alabama*, Mallory sent James Bulloch to England in quest of a British-built warship. A month later while the *Merrimac* was still a hulk, a Virginian named John L. Porter, from Portsmouth, arrived at the Confederate Navy Department in Richmond carrying a model. Porter had been in the Gosport Naval Yard when it was abandoned and had stayed on there, to join the South. The model that he had built provided the basis for the reconversion of the *Merrimac*.

Mallory immediately arranged for him to meet William P. Williamson, an expert on marine engines, and John Mercer Brooke from Florida, the inventor of the Brooke rifle. At first Williamson had the idea of removing the engines from the *Merrimac* and using them for a new ironclad. This suggestion grew, in discussion, into a proposal for using the *Merrimac* herself—all that was left of her.

Together Williamson, Porter and Brooke drew up a plan. They decided that the *Merrimac* (to be renamed the *Virginia*, though she remains the *Merrimac* in history) should be cut down to the water-line and provided with a 160 ft superstructure, framed in thick oak and pine, on her berth-deck. The superstructure would slant at 35 deg., like a roof, and be topped by a grating of 2 in. iron bars. Metal plates would encase the timber, and below the water line the wooden hull would be protected by an iron sheet.

The new warship would have a pair of two-cylinder engines and a Martin boiler. In the centre of the grating would be a smokestack.

On July 11 Mallory sent an order to Flag Officer French Forrest at Norfolk: "You will proceed with all practical despatch to make changes in the *Merrimac* and to build, equip, and fit her in all respects, according to the designs and plans of the constructor and engineer, Messrs Porter and Williamson. As time is of utmost importance in the matter, you will see that the work progresses without delay to completion."

Brooke had much to do with originating the project, and a Confederate patent was issued in his name. To him fell the decisions relating to plate and ordnance. His assistant was Catesby ap R. Jones, a Virginian of whose family origins there could be no doubt. As the son of Roger Jones had helped Captain John A. Dahlgren to instal his guns in the original *Merrimac*, he was the obvious person to work with Brooke on the rebuilding. He stayed with the ship afterwards, and heard her guns speak in battle.

John L. Porter who had brought the model to the Navy Department was soon engrossed with the drawings. Everyone had to work fast. As soon as Catesby ap R. Jones, after firing at various targets, had decided that the timber should be protected by two layers of iron each two inches thick, the metal was rushed by railway to Richmond, more than a hundred miles away, for the plates to be rolled at the Tredegar Iron Works, the only mill in the South capable of making the plates. There and at the Navy Yard 1,500 men toiled against time as the rumours spread that General McLellan had begun his advance on the capital.

Early in the new year a Negro woman arrived in Washington with a secret note from Gosport. It said that the engines of the new *Merrimac* were turning over, and that her bows carried a metal ram weighing 1,500 lb.

On February 24 the ironclad was launched. Less than two weeks later, on March 8, she steamed across Hampton Roads for the overture to a battle that would startle all the navies of the world.

★ *To be continued*

TOURBILLON . . .

Continued from page 357

The plate is reversed in the mandrel head and the brass is backed away from the jewel with a pointed polished graver. A disadvantage with this kind of hole is that no adjustment can be made for end-shake (end-float) in the pinions.

If engineers' lathes were fitted with mandrel heads, many a "How-can-I-hold-it?" problem would not arise. In normal design the mandrel head is a flanged collet which carries a plate running clear of the lathe bed. The plate has two curved slots and one straight slot, each containing dog clamps. The straight slot allows its dog to pass the centre. Three large lightening holes in the plate permit the work to be viewed from the back.

The collet is bored through and reamed dead true in place. It takes a pump centre operated from the back of the lathe head where it is guided by a bush. This is a wring fit in the back of the lathe mandrel and is slightly taper. The jaws of the dogs are casehardened, and some are fitted with an adjusting screw to prevent the idle end from tilting and bending the bolt. You have no poking about with the back centre while the tailstock is in the way, and spanners, bolts and packing blocks are all over the work; and you are free from doubts that the back centre is not quite where you would like it to be.

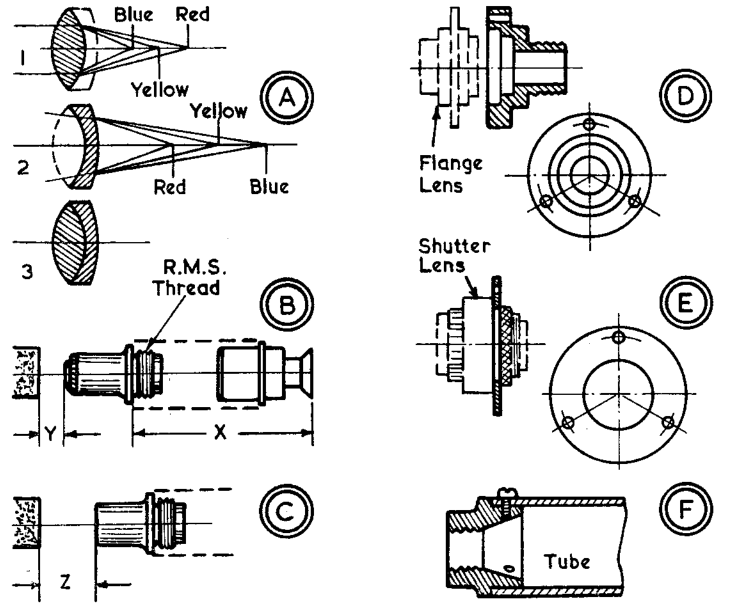
Toolroom button set-ups are simple with this arrangement. Although the pump centre cannot be used, a jig plate is easier to handle and plenty of light passes into the hole being bored.

With an engineer's split die I turned the pillar screws from $\frac{5}{32}$ in. silver steel, to take a 12 BA thread. I turned the ends taper so that they stood upright in place on assembly. A short part of the steel was reduced with a slight taper to form the side of the head, and the screw was parted off (Fig. 5). Screwdriver slots were cut with a screw slot-file. Then the threaded part was held in a collet and the heads were rounded with a pivot file. The ten screws were bound together with iron binding wire, coated with Fluxite, and were heated to a bright red and quenched in water.

I polished the heads in the lathe with a buff stick (a piece of hardwood with emery paper bonded to it) and made a loop in a piece of binding wire in which the screws were rested while the temper was drawn almost to black in a spirit flame. If screws are left as cut by the die, the comparatively rough thread quickly destroys the thread in the brass work.

★ *To be continued on April 4*

MICROSCOPE on the lathe—6



It is true that fine work can be done on the lathe without the aid of optical instruments which, by themselves, cannot produce anything.

The same may be said of micrometers, whose functions are similar—to impart information and help decisions. With micrometers you check dimensions very precisely. With microscopes you go a stage further and verify shapes, alignment, finishes, and so forth. The result is a better understanding of matters which many craftsmen who have been trained in traditional ways tend to forget. They look on optical instruments as luxuries. Our grandchildren may well regard them as necessities.

We all know how important it is for parts to be properly designed and precisely made with good surface finish. We do not neglect their lubrication, but we sometimes forget some rather elementary facts.

By a simple calculation we arrive at the theoretical surface area of a journal on a shaft. Suppose we finish the surface with a Swiss file. We place a piece of clean paper under the work and collect the swarf. Then we examine the fragments under a microscope, noting their intimidating roughness. The surface from which they have been torn is similar.

We can imagine this surface in contact with another like it, the two touching at the high spots. It makes nonsense of our calculation of surface area! We see that finish governs contact area; and we realise that to prevent keying and seizure, lubrication is all-important. In fact, the rougher the finish, the smaller is the area of contact, and the greater the burden on lubrication.

Tools provide other shocks. Under a microscope we see the Stone Age caricatures of " points " and " cutting edges " on our worn scribers, centre punches and lathe tools. As never before, we appreciate the need for us to give time to their upkeep and care to their use.

Knowledge of a few facts in optics equips the practical man to make the most of his own instruments, now that optical components are obtainable in variety. Oculars can be bought for about 50s. and for objectives we can chose according to our needs.

A simple magnifying glass does not give good results, for the reason shown at *A*1. Rays of different colours focus at different distances; but when a lens of this type, in crown glass, is supplemented by the type shown at *A*2, in flint glass, to make the lens at *A*3, the aberration is corrected at one distance and is very small at others. In a microscope, it is usually a set distance, but the draw-tube allows for adjustment here as well as for altering magnification. For workshop use, exact correction is not essential as we are looking at a narrow range of yellows and greys. A 60-watt lamp is all that we need.

The set distance of a microscope, *X* in diagram *B*, can be varied through the tube; and the working distance *Y* for the objective can be increased to *Z*, diagram *C*, by removal of the front lens. Working distance is less than the focus. I mostly use a 1 in. objective, which has a normal working distance of $\frac{13}{32}$ in. This I increase to $\frac{7}{8}$ in. by removing the front lens. By using the lens of a small camera, I get 4 in. working distance, and with the Ross lens of a Selfix I get about 6 in. These longer distances are a help in looking into things like clocks and speedometers.

A microscope objective has an RMS thread which can be easily cut on a lathe. It is 36 t.p.i., Whitworth form. The maximum outside diameter is 0.7982 in., and the minimum 0.7952 in. The corresponding root diameters are 0.7626 in. and 0.7596.

My small camera lens has a flange mounting, and I use it in the ordinary microscope with a duralumin adaptor, as at *D*. This has the RMS thread. A lens with shutter can be mounted on a ring, as at *E*, and then in a similar adaptor.

When you make your own microscope tube, the end for the objective can be as at *F*, in brass or duralumin. This inside RMS thread has a maximum top diameter of 0.803 in., and a minimum of 0.800. The maximum root diameter is 0.7674, and the minimum 0.7644. ▣

NO SPECIAL CORES FOR THESE

MANY of the castings employed in model engineering can be cast from solid patterns, or with plain cores which do not involve the need for special coreboxes. But it does not follow that the extra work involved in the making of coreboxes should be avoided at all costs. If they help the moulder, or improve the fidelity or general quality of the casting, they may be considered well worth while.

Economy in metal is not usually of first importance in small castings, though waste of any kind is always bad. The cost of the castings depends more upon the time or difficulty involved in moulding than upon their weight, or the price of the metal.

Whereas in a large and heavy casting it is often desirable, or even necessary, to complicate patterns and introduce several special cores to save metal, these measures are rarely helpful with small castings, and may make them more costly by increasing the work of the moulder.

FOR THE SCHOOLS

Continued from March 7, page 299

One of the simplest and most practical ways of saving time in moulding is to split the pattern at a well-defined parting line as near the centre as possible. This method does away with the need of using a false or oddside box in the moulding operation.

With solid patterns, except when the parting line is on one flat face, or there is only shallow relief, a box is prepared by filling it with sand and then scooping out a cavity in which the pattern can be imbedded up to the parting line. After the top box has been placed in position and rammed up, the assembly is inverted and the false box is removed and emptied or discarded, before a proper mould is made for the second half. With split patterns, one half can be laid flat on a moulding board, and the box be placed over it, filled with sand, and rammed. After inversion, the other half of the pattern is then laid in place, and the top box is filled and rammed. In this way, major moulding operations are reduced from three to two.

Split patterns need to be fitted with pegs or dowels to set the two halves in correct alignment with each other. The dowels may be of wood or metal; they can be bought ready-made from dealers in foundry requisites. They should be fitted before the final operations on the pattern, in case the holes to take them may not line up perfectly. It is usual for them to be positioned unsymmetrically, so that the halves of the pattern are not fitted the wrong way round in relation to each other.

To produce round patterns, in which the main shaping is by turning, pieces should be trued up to form the two halves, and temporarily fix them together during the operations. You can do this by using small screws with the heads sunk well below the subsequently finished surface; the holes can afterwards be enlarged to take the dowels.

Professional patternmakers often prefer to glue the halves together with a thin sheet of paper between; while they are held firmly enough for tooling, they can be easily separated by the insertion of a sharp chisel at the joint line. In either instances the workpiece must be exactly centred in the lathe chuck or between centres for the turning operation.

When the dowels are fitted, they should be easy enough for the halves to be separated without trouble, but not so easy as to allow of any appreciable displacement. It is generally possible to lift split patterns from the mould by the projecting dowels in one half, or the holes in the other, but sometimes we need a special means of lifting them without affecting the impression in the mould. The moulder using solid patterns often has to drive a spike into them: this method, especially if it is repeated a few times, may mar the surface of the casting or damage the pattern itself.

Another way to reduce the work of the moulder is to join two or more patterns together, to connect them so that they can be cast from a single pouring gate or runner. Small patterns are obviously difficult to mould singly, and it is usually convenient for a number of them to be put in one moulding flask. When they are joined up in a group or "spray," the manipulation is easier and takes less time than individual patterns. Sometimes the complete set of castings for a model can be grouped. To produce castings for a twin engine, having right and left-handed components, the patterns may be "siamesed" so as to make opposed pairs of parts.

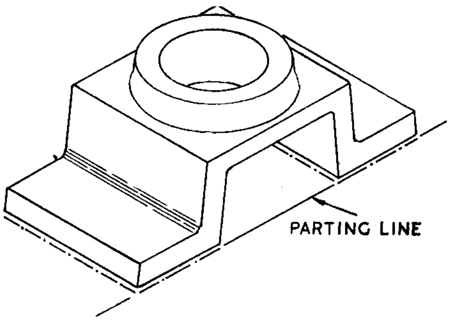
Multiple castings which are made in this way and have to be sawn apart afterwards should have the dividing line well defined, by a notch or V-groove, so that you are unlikely to make mistakes in parting them.

Castings may be marred by the well-intentioned but misguided attempts of the moulders to cut away runners and so forth. To be on the safe side, tell them that no fettling is required.

I will give some examples of patterns suitable to be made in solid form or split on the centre line. They do not represent actual examples, and are not necessarily drawn to scale; they are intended only to show general principles of pattern design.

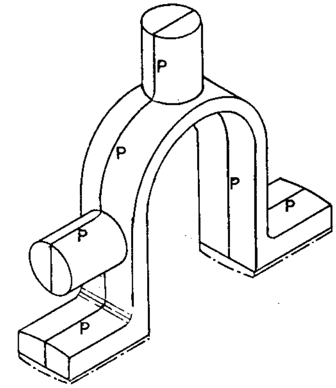
Fig. 6 represents a bearing bracket or endplate such as may be used for an electric motor or dynamo. If the rectangular recess and the bore of the bearing housing are well tapered, they can be cast without the need for coring. The pattern is laid flat on the moulding board, and the first half of the mould is made right away. As the ends of the recess are open, some trimming of the mould will be necessary when it is inverted. The sand is cut away at an angle so that the impression made in the second box will lift out without fouling.

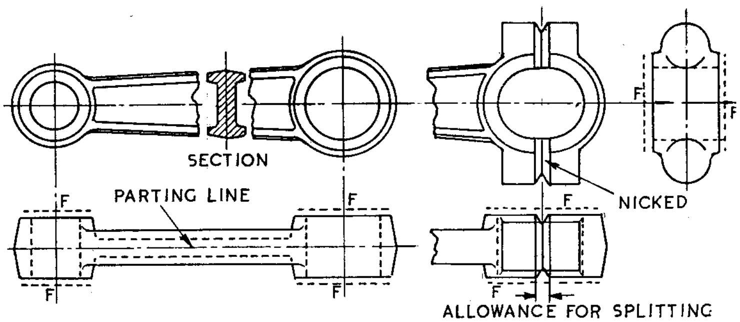
Connecting rods for model engines can be made in the form of castings when the load which they will encounter can be kept within reasonable limits, though for really high performance you may have to



Right, Fig. 8: Pattern for governor bracket of a steam engine

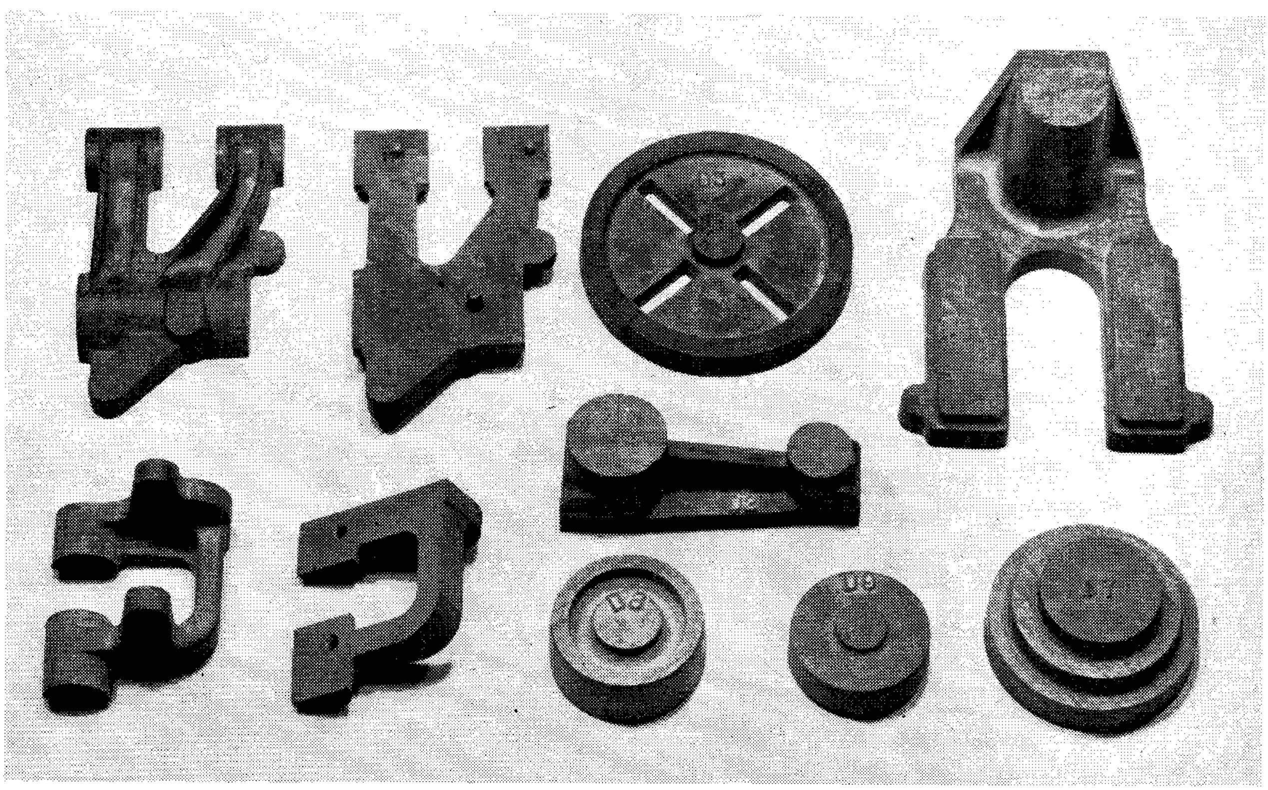
Left, Fig. 6: Shallow-recessed pattern which is suitable for a bearing end-plate, as on an electric motor or a generator





Left: Connecting-rod pattern with solid and split big ends

Below: Set of patterns for ME drilling machine. Note both halves of the split spindle head and the countershaft bracket (Woking Precision Models)



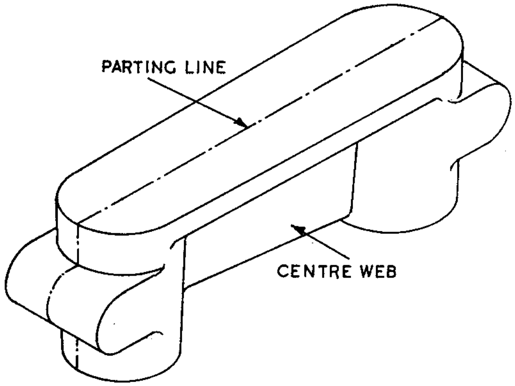


Fig. 9: Bracket pattern with clamp bosses

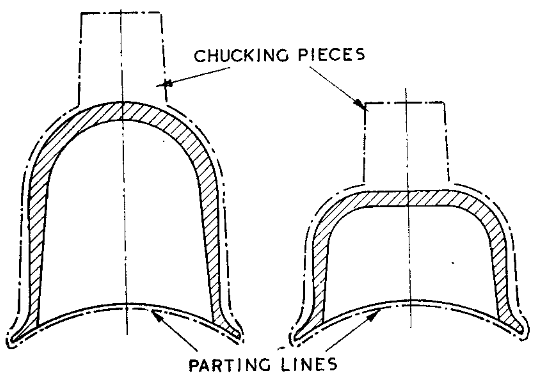


Fig. 10: Patterns for two dome covers

machine them from solid steel or high-tensile light alloy. The machining operations thus involved are often complicated (unless you can get drop forgings). Castings, when they can be used, allow the later work to be greatly simplified.

The pattern shown in Fig. 7, in two forms, with solid and split big end bearings, may well be split on the centre line, though it is somewhat fragile in small sizes and solid patterns are more usual. With accurately made patterns and careful moulding, the "ideal" shape, with barrel-shaped bosses and H-girder shank, can be produced more easily than by any other means which you are likely to have. The eyes may be left solid, though you will often find it better to reduce the section of the metal by making deep indentations on both sides of the pattern.

If the big end is to be split, allowance must be made for the metal to be removed in cutting, and the parting line should be indicated by a deep nick, as shown. In machining the casting, you should drill and tap the bolting holes before cutting off the caps and truing the joint faces, so that the parts can be temporarily fixed together for boring and facing the eye.

The pattern in Fig. 8, for the governor bracket of a steam engine, incorporates bearings for a horizontal drive shaft and a bevel-geared vertical shaft. It may be made either solid or split. The parting line is at *P*, and a slight taper or rounding-off both ways from this line is provided for draught. Not uncommonly, castings of this kind have a centre web all round the bow, so as to produce a T-section, giving extra rigidity with relatively light construction. Machining allowance is commonly provided on the underside of the feet and the ends of the bosses.

The way in which moulding can be influenced by minor details in design is indicated by the bracket pattern in Fig. 9. In the form shown, the pattern is moulded half in each box, split on the parting line, and tapered away from this point on both sides. The clamping bosses at the ends prevent it from being moulded with the main boss ends down, unless the parting line is stepped, which is generally undesirable. But if the clamping bosses can be shifted upwards, so that their tops are level with the flat top surface, the pattern, in an inverted position, can be moulded from the moulding board, in one box only. The rounding-off of the top of the clamping bosses, if this is essential, will then need to be done after the casting has been made. Such alterations are not always practicable, but their possibilities should always be borne in mind.

On the whole, deeply recessed or hollow castings are best made with the aid of a corebox, but if the internal shape is simple, and the moulder is co-operative, the inside shape can sometimes be cast direct from a simple pattern. The two locomotive dome covers illustrated in Fig. 10 show what can be done; clearly, the deeper of the two is likely to be more difficult and the moulder may need to employ some means of reinforcing the internal impression and of providing it with adequate venting. As the castings are generally curved on the underside to fit the boiler barrel, the parting line must conform to this, and an oddside box will have to be made.

As the outside of the castings must usually be machined, a chucking piece may be provided, and held in the chuck for dealing with as much of the surface as is accessible. If possible, the mouth of the bore may be skimmed out true, so that after the chucking piece has been cut off it may be mounted on a spigot for the machining of the top surface. Machining castings of this sort is always a problem. We cannot carry the work to its logical conclusion as we are unable to machine the outward curve of the rim by plain turning and must usually file it.

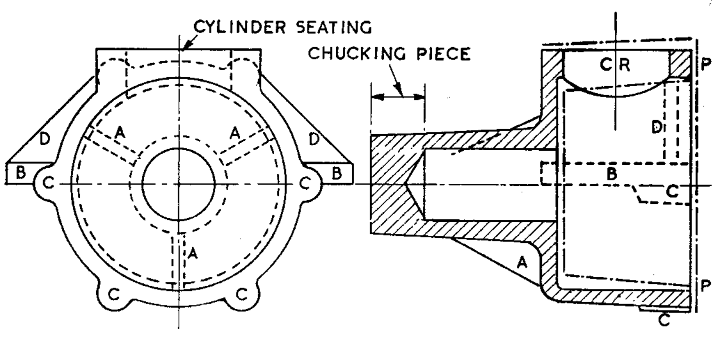


Fig. 11: Crankcase pattern for casting without separate core

● *Continued on page 367*

DIVIDING ON A SUPER SEVEN *Concluded from March 14, page 325* By M. E. TREVOR

I should have tried the last method first!

I DRILLED the chuck back-plate by fitting a temporary drilling bush in the ½ in. hole in the baseplate, and using a centre drill in a hand brace. With a 40-tooth change-wheel, mounted on a stub mandrel held in the chuck, I was able to index the required eight positions.

The last and most versatile method (Photograph 3) uses the lathe mandrel to support the change

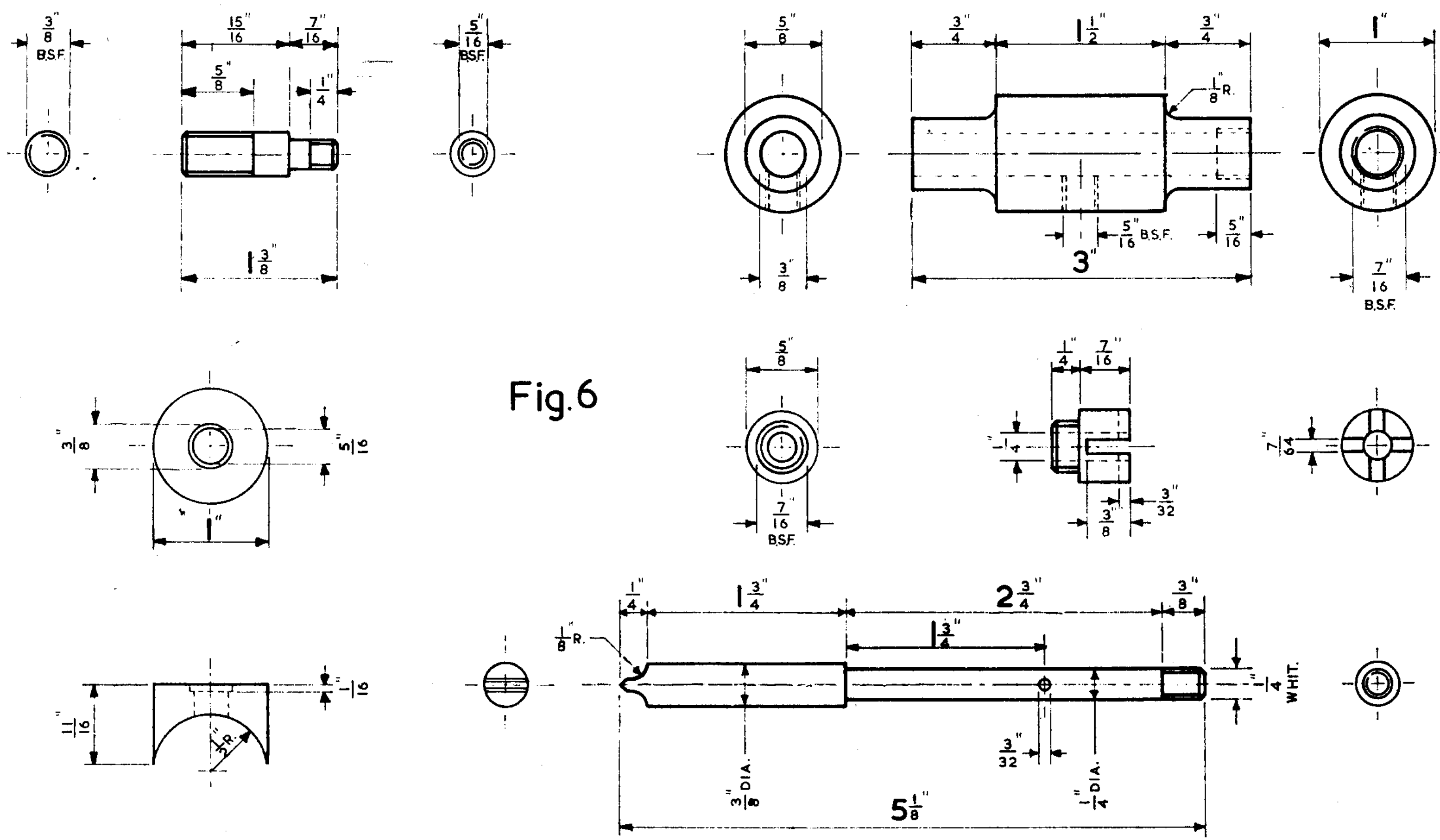


Fig.6

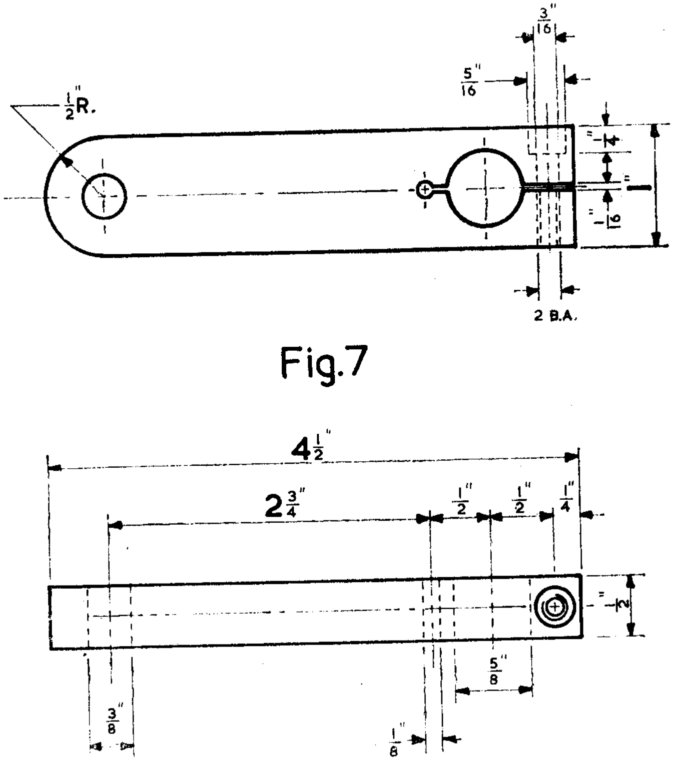


Fig.7

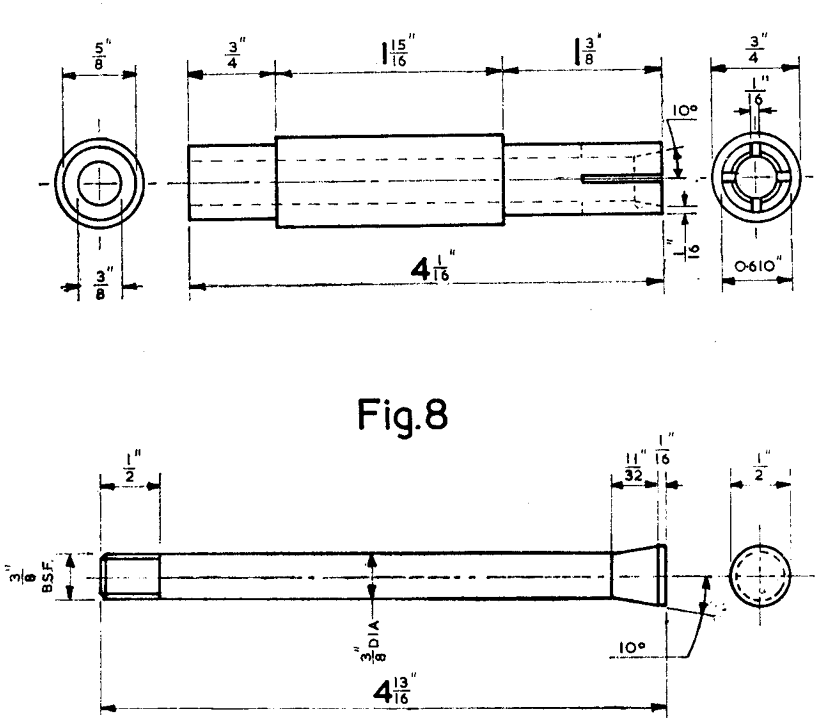
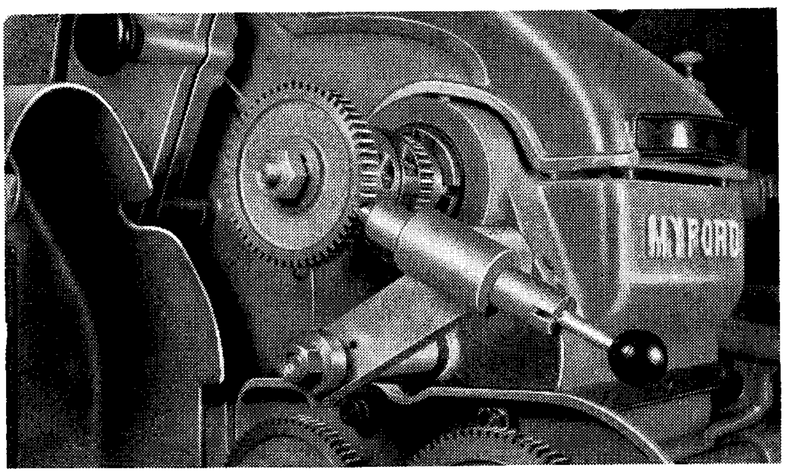


Fig.8



wheels, and the bearing hole for the tumbler reverse gear as the anchorage for the detent bracket. Details of the body and the detent are given in Fig. 6. The body is made in two parts, held together by the stud and then brazed.

Fig. 7 gives the dimensions of the arm which clamps on to the stud in Fig. 8. The stud is inserted in the hole normally occupied by the tumbler reverse gear. Before the right-hand end of the stud is machined, the hole must be measured accurately: it has to be a good fit. If the topslide is not altered between the machining operations on the two 10 deg. tapers, you should have little trouble in making the tapers fit well.

A split adapter, clamped to the end of the lathe spindle by a 2 BA Allen screw, carries the change wheel. You should use a change wheel as a gauge when you machine the ⅝ in. part, as this too must be a close fit. I formed the slots with a slitting saw.

There is no point in making the bolt from hexagon material of the size shown in Fig. 10, because you will not have enough room for a box spanner. I used an odd length of steel and had to make a screwdriver slot to tighten it.

While all the attachments have proved useful, it would have saved me time if I had thought of the last method at the outset! ■

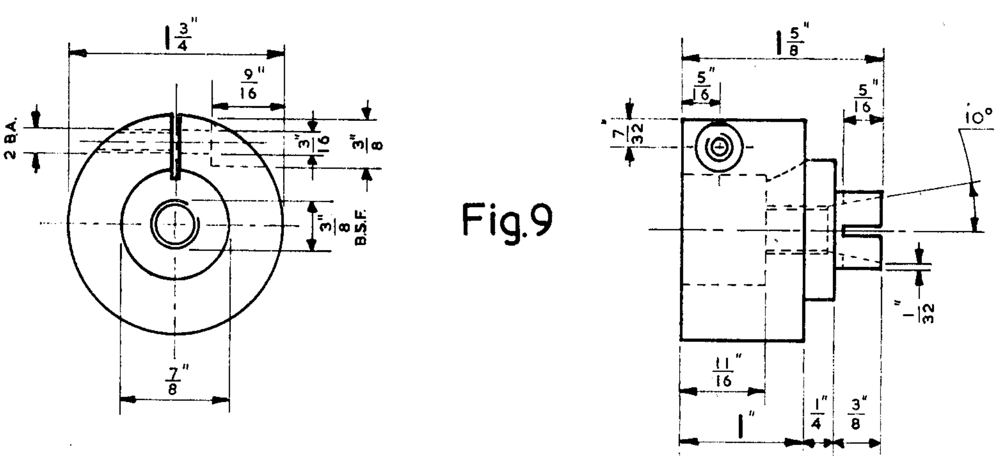


Fig.9

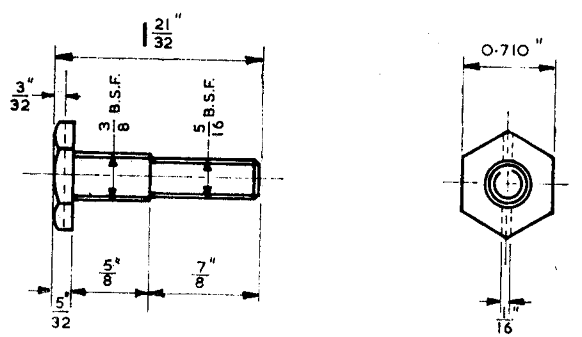
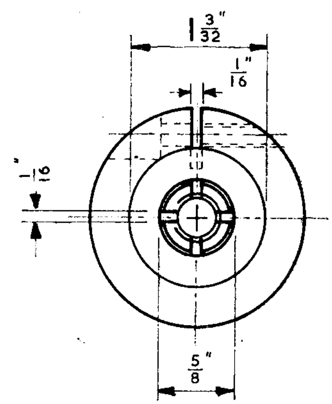


Fig.10



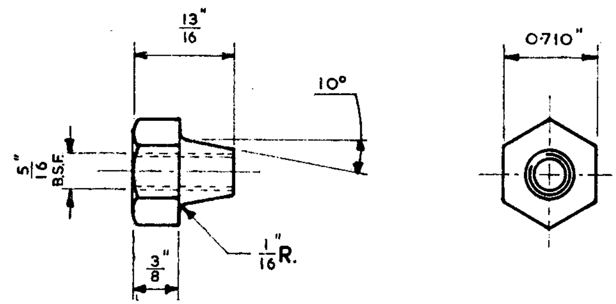


Fig.11

NO SPECIAL CORES . . .

Continued from page 364

The crankcase of a small i.c. engine or air compressor can sometimes be cast without a corebox by suitable attention to details of design. With a good internal taper as shown in Fig. 11, the main cavity can be cast direct from the pattern, the front face of which is the parting line. The outside contour of the body and bearing housing must taper away from this point, and also the bolting lugs *C*, the top cylinder seating (with machining allowance), and any stiffening ribs *A* or bearers *B*. If side ribs *D* are needed, they should be close to the parting line, or flush with it if possible.

It is not often practicable to cast the bore of the bearing housing by this method, and drilling the casting from solid is the only alternative; the chucking piece should not be drilled through, as its rigidity must be maintained for all the main machining operations to be carried out at one setting. You must bore the cylinder register *CR* from solid, together with the facing of the top seating, by mounting on an angle plate, square with the machined front face.

★ *To be continued on April 4*

SLEUTH—A QUEEN IN ANY COMPANY

THERE is probably no one in the model yachting world who has had more experience in designing 10-raters than Mr A. W. Littlejohn; nor is there anyone who has had better opportunities for studying the development of the class.

The Length-and-Sail-Area rule on which the class is based was formulated by Dixon Kemp in 1887 and was adapted for model yachts soon afterwards. The rule is simple and easily applied, and at the same time gives great scope for experimental design. It soon became popular, and it has continued in favour down to the present day, a period of 75 years—ample proof of its soundness.

When the Model Yacht Racing Association was formed in 1911 the 10-rater was the principal class. In 1922 the association was re-constituted as the Model Yachting Association. The 10-rater was, of course, retained. It has continued ever since as the principal class.

Soon after 1922 the " A " class was introduced, and much later the " M " class arrived from America. Both these classes have achieved popularity, but for the many who prefer that a yacht should look slender and graceful the 10-rater will never lose its appeal.

The Model Yacht Sailing Association (MYSA) is one of the oldest clubs in the country, and sails on the Round Pond, South Kensington. It has specialised in 10-raters ever since the rule was formulated. As a designer Mr Littlejohn—a prominent member, like his father before him—has been responsible for much of the development of the 10-rater class, and has had unique opportunities for study and experiment.

When the Bermuda rig was introduced, and more especially as the advantages of the high aspect ratio sail were appreciated, it had a revolutionary effect on the design of the hull, increasing its l.w.l. and making it altogether longer and slimmer. As an illustration of the increase, the famous 10-rater *XPDNC*, designed by Daniels about 1910 and published in an early Model Engineer Handbook, had an l.o.a. of 60 in., an l.w.l. of 36 in., a beam of 12 in., and a draft of 9 in., with displacement of 15 lb. and sail area of 1,666 sq. in. She had, of course, the usual gaff rig of the time. As a contrast we have Tucker's *Water Fairy* design, published in *Ships and Ship Models* in April 1956, with its l.o.a. 85 in., l.w.l. 55 in., beam 12⅞ in., draft 12 in., and displacement 30½ lb.

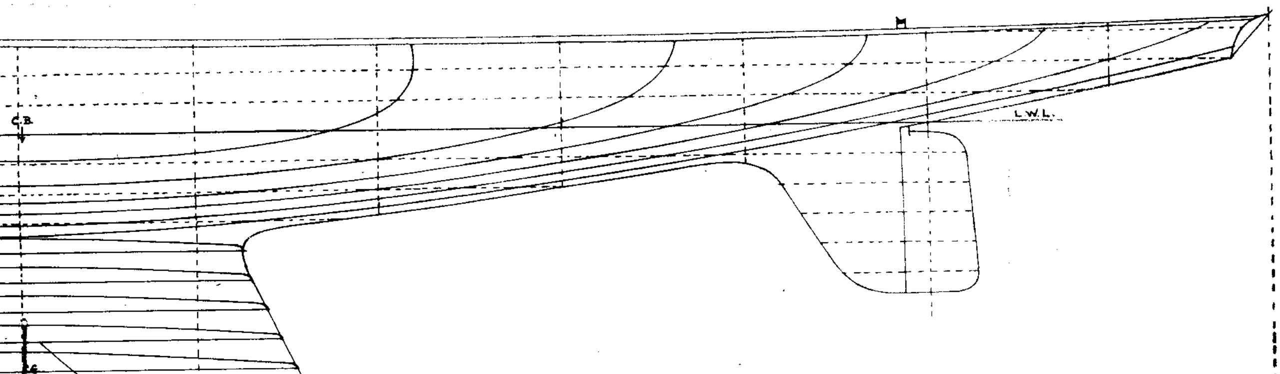
However, an extreme design does not necessarily produce a faster boat. In the examples quoted *XPDNC* was permitted 1,666 sq. in. of sail area with which to drive her weight of 15 lb., whereas *Water Fairy*, with her displacement of 30½ lb. was permitted only 1,090 sq. in. sail area—admittedly area of a more efficient shape.

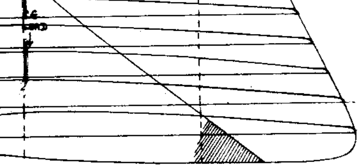
Triplane II, which won the National Championship at Hove last year, is another extreme type. She has a beam of 13 in. and a transom 8¾ in. wide. With her deep V-sections forward and her wide, flat run aft, she is at her best running down wind and planing on her wide transom. The winds suited her in last year's regatta and, with careful handling by her skipper, helped her to win.

In 1959 the champion was *Daddy-Long-Legs*, built and sailed by R. Redhead of the MYSA, a boat of a very different type, with a l.w.l. of 61½ in., and a beam on the l.w.l. of 8½ in. She is extremely long and slender with a rather short overhang at the bows and a long tapering counter. Obviously the winds at the 1959 regatta suited her particular type.

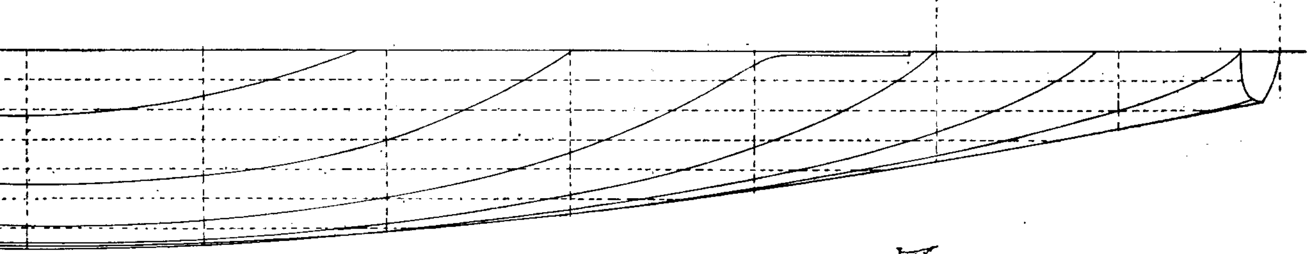
As will be seen from the reproduction of the plans, Mr Littlejohn

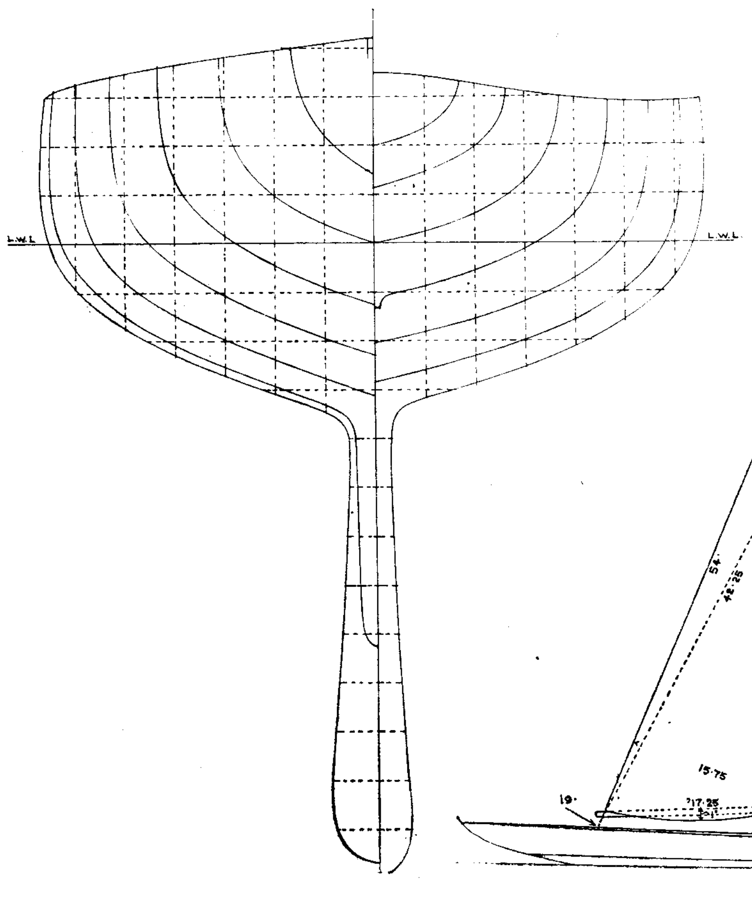
● *Continued on page* 374

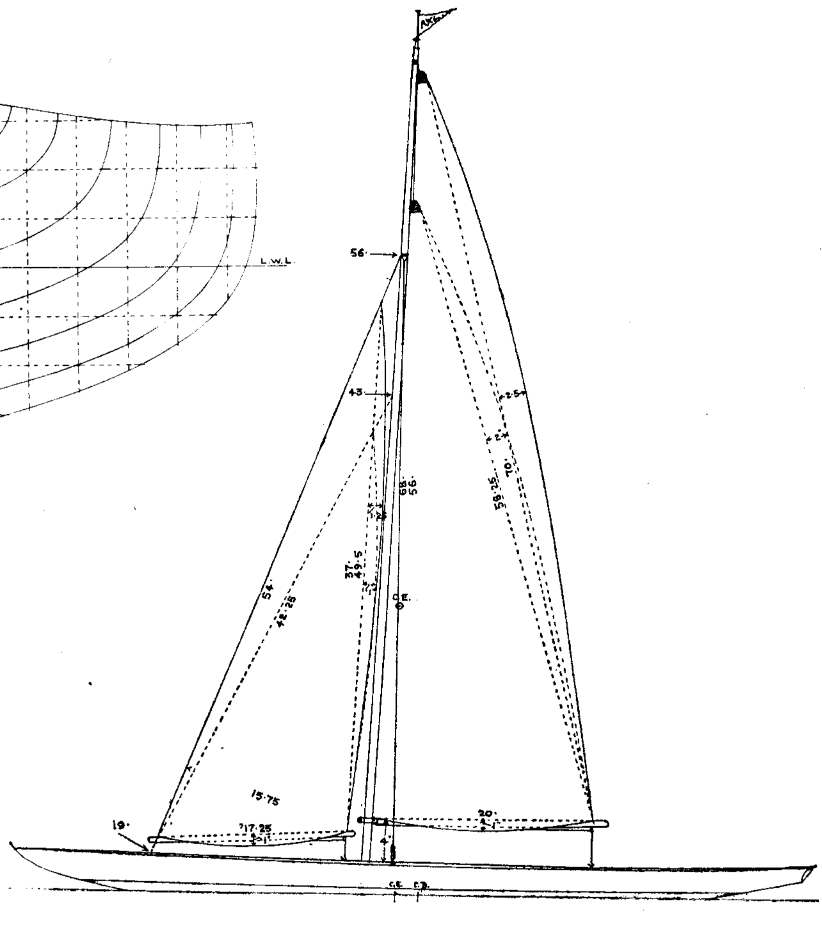


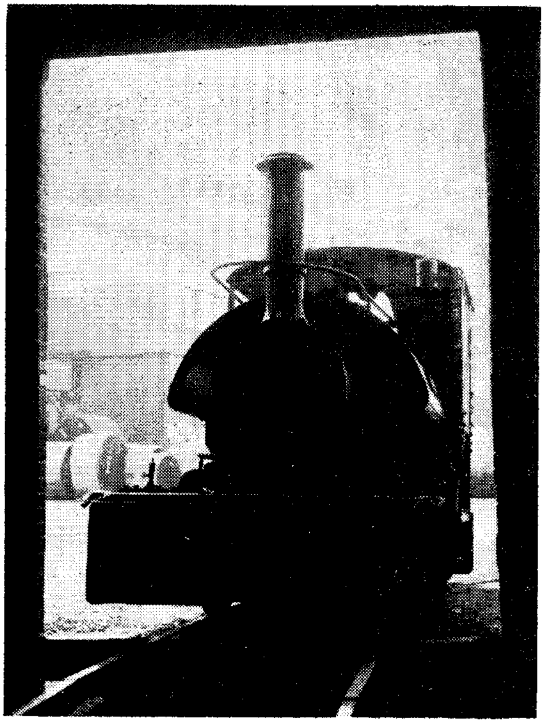


Working from an unsurpassed knowledge of 10-raters A. W. LITTLEJOHN produces another model yacht for ME. To EDWARD BOWNESS she is a slim and graceful winner









While the 3 ft 6 in. gauge railway at the Erith works of British Insulated Callender's Cables is not so busy as it was when most of the internal traffic was handled by the little steam engines, it is still in daily use, with diesel traction. The two surviving steam engines help in the moving of heavy loads.

The first engine was supplied by W. G. Bagnall Ltd of Stafford in 1900, and a further three engines by this same maker were provided in 1916, 1924 and 1925. The last two, Nos 2133 and 2135, are still running. There were also two other steam engines—a Hunslet obtained secondhand from a brickworks near Southend, and a new engine from the Yorkshire Engine Co.

The surviving engines are *Woto* (No 2133) and *Sir Tom* (No 2135). *Sir Tom* is called after Sir Thomas Callender, and *Woto* after the two Callender brothers, William Octavius and Thomas Octavius, whose full names were too long to put on such a small tank. They are both 0-4-0ST engines of Bagnall's standard design with cylinders 7 in. × 12 in. and 1 ft 9½ in. driving wheels on a 3 ft 6 in. wheelbase. In working order they weigh 8½ tons. The boiler has a circular marine firebox, and the total heating surface is 128 sq. ft.

When they were converted to oil, a large tank was fitted on the left-hand side of the cab. The oil is sprayed into the firebox by a steam jet from a supply in the works until the engine has sufficient power to work the burner.

The regulator valve is in the small dome on the firebox. Steam is supplied to the cylinders through a cast-iron pipe in the smokebox, and then through the small elbows seen between the valve chests and the smokebox

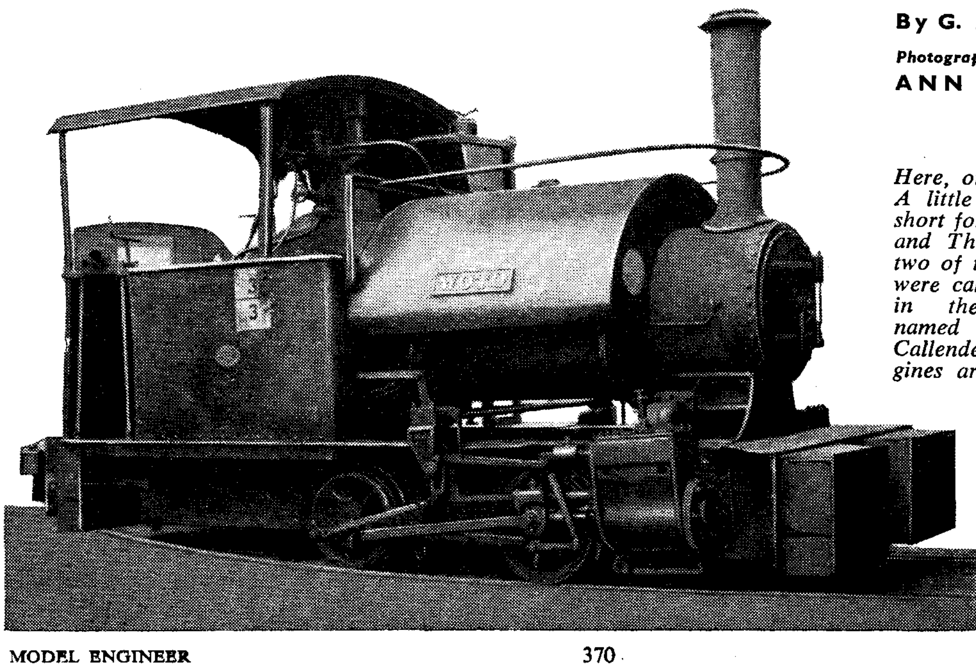
● *Continued on page 379*

Sir Tom and Woto are still busy

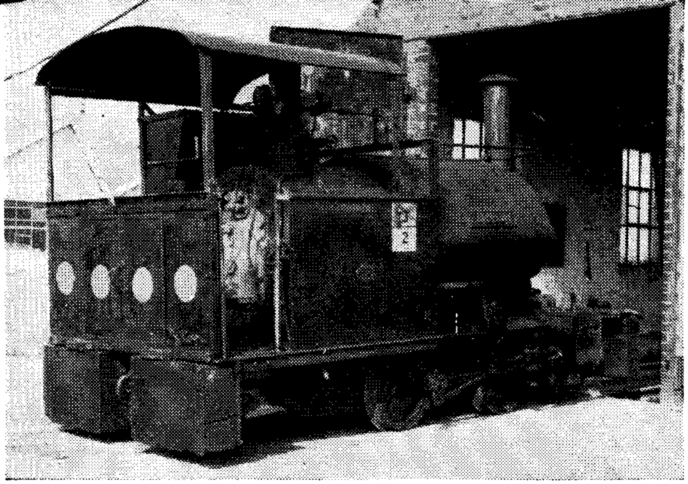
By G. R. HATHERILL

Photographs taken by

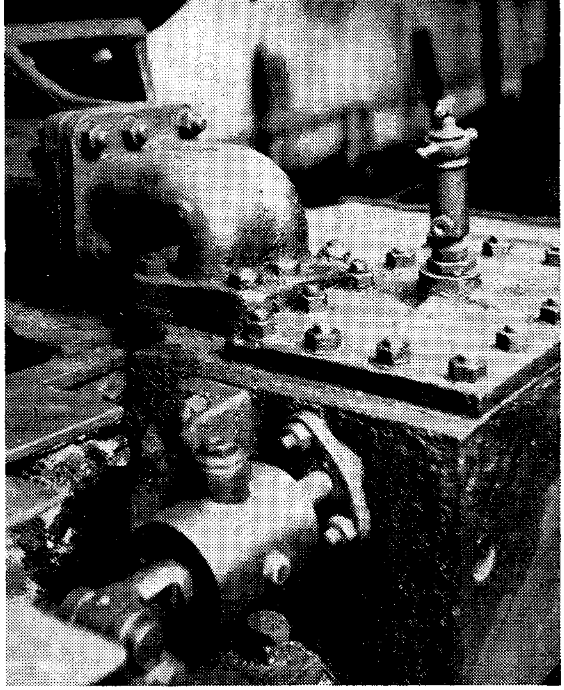
ANN C. CARTER



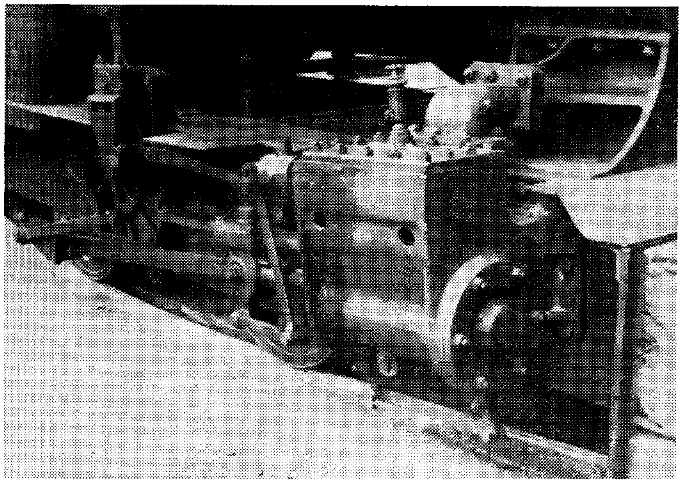
Here, on the left, is WOTO. *A little tank engine is too short for "William Octavius and Thomas Octavius," as two of the Callender family were called.* SIR TOM, *seen in the title-picture, is named after Sir Thomas Callender. The two engines are at Erith in Kent*



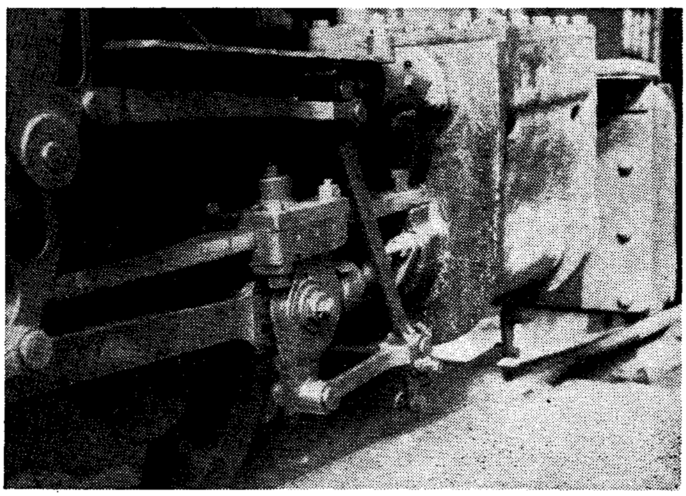
SIR TOM *again*

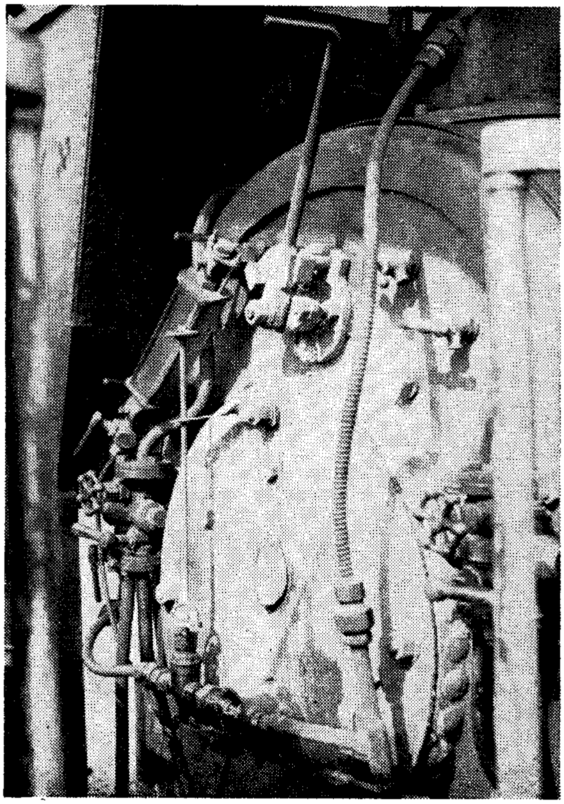


Combined steam and exhaust elbows and cylinder lubricator. The footplate fittings are seen below



General view of motion. Below are crosshead and cylinder. There is no separate cover at this end





 Continued from March 7, page 310 By F. M. CLARK

Only a little practice is needed

WITH the construction advanced to this stage, I reassembled the spindle of my lathe, and used it for some time, operating the cam with my fingers when occasion demanded. It seemed to have no vices and so my next operation was to connect the cam to the backgear engagement lever.

The construction of the sector, while basically very simple, involved much unnecessary work because of the difficulty of securing clearance inside the headstock without my having detail drawings of the headstock and its contents. In making the sector, I went to far more trouble than would have been warranted if I had a fully dimensioned drawing of what I was trying to make. The only excuse I could offer for this clumsiness lay in the feeling that, if the device could be made to work at all, it would be because the backgears naturally had a bit of play in them, while the sector gears could be made a pretty tight fit, without backlash. Hence I had to be sure that the sector gears were right. The final shape of the sector is shown in Fig. 10.

Accurate meshing

Probably the most important dimension is the centre-to-centre distance between the lathe spindle itself and the spindle on which the backgears are mounted. In my lathe this distance was very close to 2.45 in., which immediately gave me difficulty with the computer gears which I had been able to get. With 72 teeth and 120 teeth at 40 d.p., the designed centre-to-centre distance was 2.4 in. I could have cut some new gears, but as I knew from drawings that the sector would have only a few teeth on its periphery, I decided to take a chance by cutting a bore in the 120-tooth wheel deliberately off-centre, and using the part of the gearwheel periphery suited to the lathe and to my purposes.

Unfortunately, the headstock was too small to admit the 120-tooth wheel on the back gear spindle, and so I either had to cut the gearwheel right first time, or devise some adjustment to accommodate whatever errors in the engagement of the gears had crept in during the machining.

I decided on the second course; hence the eccentric boss shown in Fig. 10A. As this part of the sector was to be used for clamping, it was made from 2 in. × ½ in. steel bar. Lathes not equipped with a Trileva have much more than ⅛ in. clearance beside the backgear lever spindle, and so a rather more robust sector arm would be possible, and indeed preferable. The exact positioning of the locking screw and the grease nipple recess were, of course, of first importance. They had to be accessible when in position, but it was not possible to determine where in the sector they were to be placed until the sector had been fitted and was working correctly, and the swing of the sector was accurately known.

I machined the bore for the gearwheel on the basis that if the bore were machined about 0.053 in. off centre the correct centre-to-centre distance for my lathe would be at an angle of 22 deg. to the direction of the eccentricity, and the adjustment, when the gearwheel was mounted on the eccentric boss shown in Fig. 10A, would be adequate.

Both the steel sector of Fig. 10A and the gearwheel sector of Fig. 10B were originally cut rather larger than they are drawn. They were mounted in place on the backgear spindle and adjusted by the eccentric action until the mesh with the camwheel gear felt right. You are unable to see what you are doing at this stage; the mass of the bullwheel and the shape of the headstock block your view. When I had decided upon the adjustment and centre-popped the positions of the steel sector and the gearwheel sector, I removed the two members from the headstock and fastened them together with a 5 BA countersunk screw.

The next thing to do was to make quite sure that the adjustment of the backgears themselves was satisfactory. The backgears must mesh with just the slightest backlash; I used the old trick of running a strip of thick paper through the gears and adjusting them hard on it. With the backgears properly adjusted, the starting and stopping positions of the backgear spindle are determined and the sector may be mounted.

At this point it is best to replace the bearing caps temporarily on the lathe spindle bearings; we want the smallest practical clearance between the camplate gearwheel and the finished sector, but not a clearance so small that it is materially affected by the tightening down of the bearing caps.

Then the tedious business of try-and-cut must be continued until the sector is the right shape. You can remove the unwanted teeth on the oversize sector at one go, leaving a sector which is going to allow the locking screw to be put in on one side, and the grease nipple recess on the other.

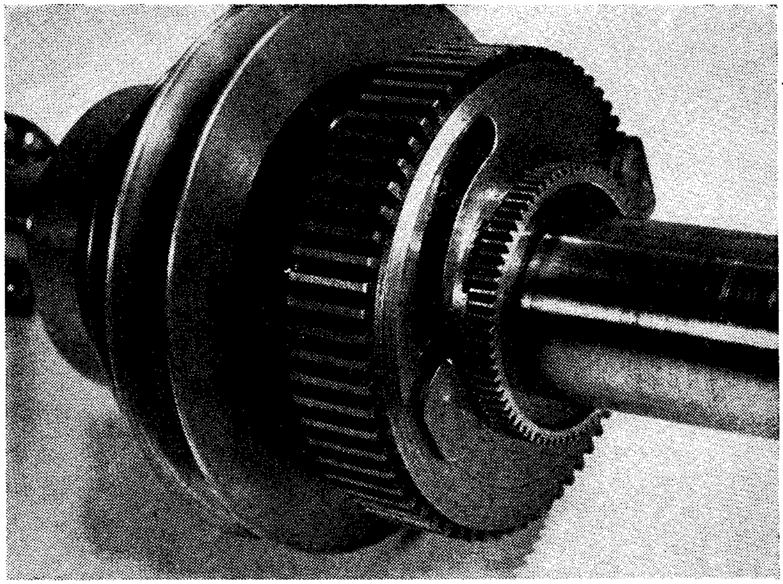
Locating the sector

I found that the locking screw was best reached from the back of the lathe; if you try to insert the screw so that it can be operated from the front, you may end by fouling either the sector itself or the grease nipple recess. When all but one or two teeth more need to be removed from the sector to give the clearance at the extremities of the backgear spindle travel, the locking screw should be inserted and the sector lightly tightened on the backgear spindle. You may have to remove a tooth cautiously to see if the screw can be adjusted to be free of the complete gear at both ends of the travel.

As soon as the sector is free of the camplate, turn the locking screw hard home to make an impression on the spindle; a touch with a drill at that point leaves enough of a depression to engage the end of the lockscrew and ensure that the sector does not get out of position.

When the sector is correctly set up, the recess for the grease nipple needs to be cut. I had to cut through the gearwheel sector completely at one point. There was no need to worry about loss of strength, for it was simple to bond the remnant of the gearwheel to the steel sector with Araldite. The assembly is strong enough if used intelligently—probably stronger than the rather frail 40 d.p. teeth on the ends of my sector.

Let us suppose that the lathe is in direct drive and you wish to engage backgear. The chuck is held steady with the right hand, and the backgear lever is brought up $\frac{1}{4}$ in. to $\frac{3}{8}$ in. only, until the sector is in engagement with the camplate gear, while the backgears themselves are free. Then the chuck is twisted with the right hand, until the ball clip lock may be felt to engage. During the twisting, the backgear lever is held steady by the left hand, with the sector and the camplate held in the one position while the twisting of the chuck rotates the bullwheel, and hence withdraws the bullwheel segment. The direction of twisting the chuck depends on the hand of the camplate spiral. With a right-hand



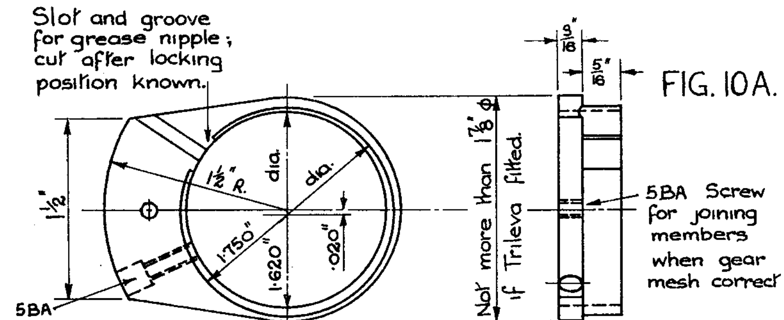


FIG. 10A.

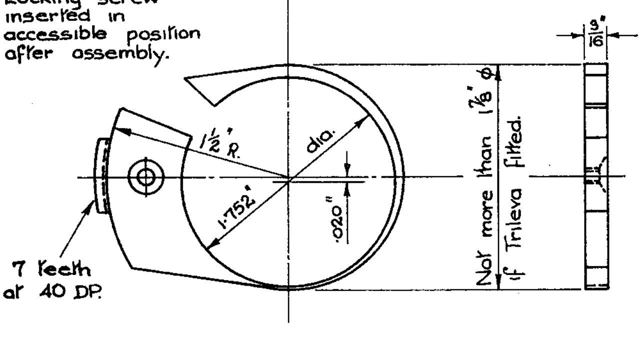
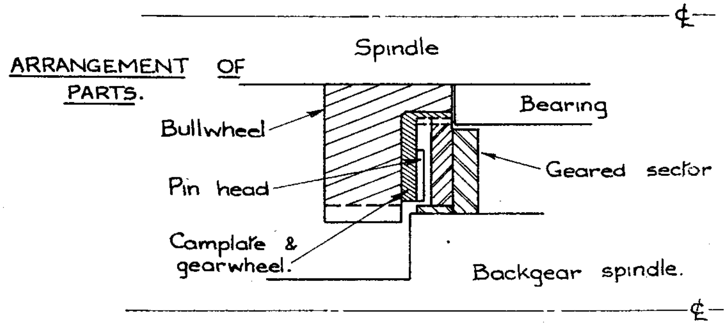


FIG 10 B.



ARRANGEMENT OF PARTS.

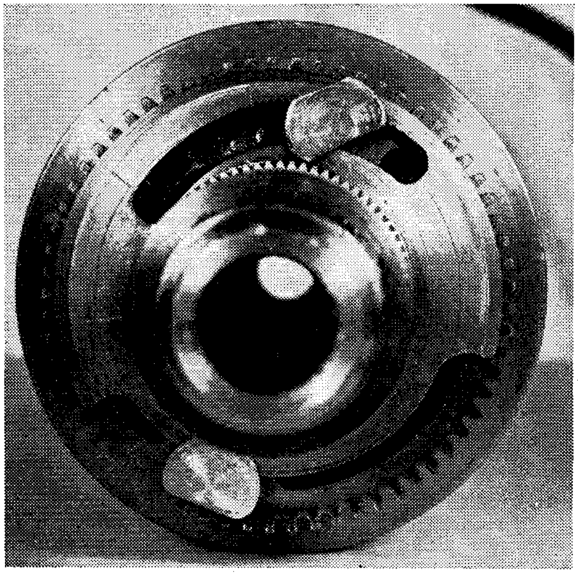
spiral such as I used the backgear lever and the chuck have to be operated in the same direction.

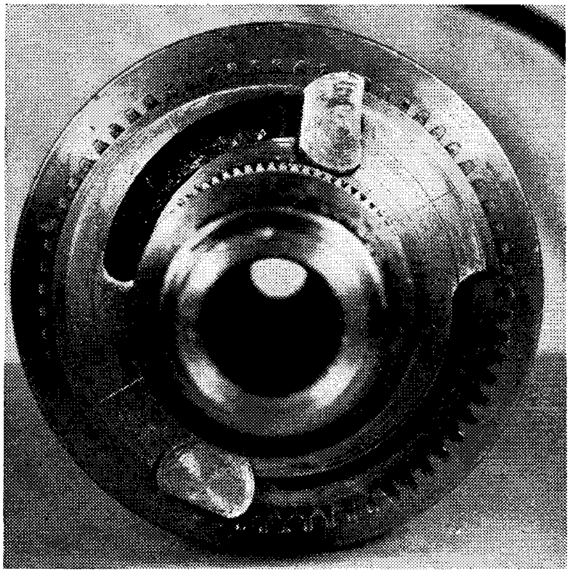
Further operation of the backgear lever will bring the backgears into contact, and into engagement if you are lucky; if the gears will not slide in at the first try, oscillate the chuck through a small arc until they do. " Rattling " the gears home in this way tends to disengage the camplate lock unless a fairly stiff spring is used in the ball clip; hence the use of a rather stiff lock. In the final stages of the engagement the chuck must be allowed to rotate with further movement of the backgear lever until the sector disengages the camplate gear.

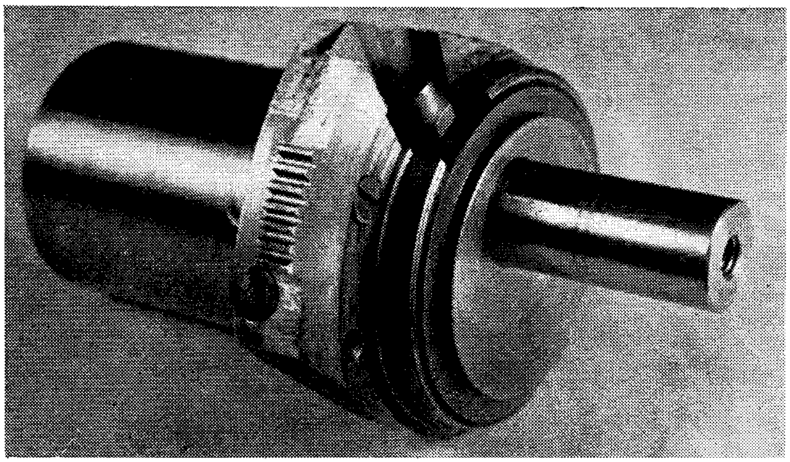
Re-engaging direct drive

Suppose that, having engaged backgear, you want to re-engage direct drive. As before, you bring down the backgear lever just enough to engage the sector and the camplate gear, and twist the chuck in an effort to engage the bullwheel segment. If you are unlucky, the bullwheel segment will not enter the pulley gear. You are left with the backgear partly engaged, and no direct means of overcoming the spragging of the segment. Fortunately, because the backgear is still engaged, rattling the gears is all that is needed, because the backgear drive can be made to move the pulley gear until engagement by the bullwheel segment is possible.

The knack is very easily acquired with a little practice. When I first put this device into my lathe, I was expecting a jam which could only have been cleared by taking the







Top, left: End-elevation of working position of camplate when backgear is in use and spring lock operative. Pin B *has been rotated to illustrate how it fouls the* 40 *d.p. gearwheel in the working position. Pin head differs a little from the shape seen in the drawings as clearance was needed when spindle rotated in headstock*

Above: End-elevation of camplate in assembly position. It shows the only position in which pin B *may be screwed into the gearwheel segment*

Left: Backgear spindle. The gearwheel sector is mounted in place. After bonding of the two pieces, the brass gearwheel was partly cut away to give access to the grease nipple

headstock to pieces. But it did not occur. I used extreme care in changing gears, and with increasing familiarity I gained confidence.

If you are prepared to avoid the use of violence, the worst that can happen if you set out to cheat the device is that it can get out of phase; you can finish with the backgears out of engagement and the bullwheel segment out too, so that there is no drive. To correct such faults, with the backgear lever in one position or the other, spin the camplate with the fingers. ■

SLEUTH—A QUEEN FIT FOR ANY COMPANY

Continued from page 368

in his latest design has avoided extremes. *Sleuth* has an overall length of 73 in., l.w.l. of 53 in., beam of 11.8 in., draft of 11.4 in., and a displacement of 28 lb., of which 19 lb. is in the lead keel. The sail area is 1,132 sq. in.

These are good average figures. The body plan of *Sleuth* shows a moderate V-section with easy bilges and a slight tumble-home. Her keel is heavily raked to prevent turbulence between keel and rudder and so allow the vane gear maximum control.

With her slim lines and beautiful proportions, she would look a queen in any company.

Mr Littlejohn has always aimed at making a graceful design and *Sleuth* is no exception. It embodies years of careful study and practical experience, and should produce a boat which can be depended on to give a high ratio of successes over a season's sailing. After all, that is What really counts. E.B.

DIESEL-ELECTRIC
—*A challenge to the modeller*

G. C. BIRD is a locomotive engineer who builds little steam engines—but he admires the modern unit as well

It seems to me that many of the ME contributors and many readers who write to Postbag are very much biased against diesel or diesel-electric locomotives in favour of steam.

Let me be the first to admit that steam locomotives have a peculiar allure. For many years I have been trying to discover exactly what it is that makes the puffer so fascinating and thrilling. For want of some more profound explanation I have come to the conclusion that it is the gentle warmth emanating from the boilers.

There is an irresistible human urge to seek out and get near to something warm, and when we have found a source of heat we receive a sense of pleasure and well-being. Much more interest is shown in a steaming locomotive than in one which is tucked away in a corner of a running shed, looking rather sorrowful and derelict.

There is, too, the terrifying thrill of the footplate at speed—80, 90 or more miles an hour—with the engine swaying and lurching as it hurtles forward in what seems to be one's journey to hell.

In the period before the last war—the hey-day of British Railways—we used to read of speed and endurance tests and of remarkable locomotives which had been developed. Cars and aircraft were not commonplace then, and millions of holidaymakers would throng the main line stations every summer. Every child wanted to see the steam engine.

I think that the station which captured the holiday spirit more than any other was Paddington. For me, Paddington still conjures up the memories of blissful holidays in the West Country.

But let us be fair and face facts. The steam locomotive is about the most shockingly primitive machine ever invented, and cannot possibly qualify for a place as a prime mover in the modern age. It is wasteful, dirty and cumbersome, and at the very best of times has only a very low figure for availability.

I think that prejudice blinds the eyes of many to the interest which can be found on a diesel-electric. This locomotive abounds in intricate detail. The engine itself is a marvellous piece of machinery built to precision standards which would satisfy even the most fastidious. I know, of course, that one cannot see it work, but it can be felt and heard. It is very satisfying to me to hear the rhythmic throb of an idling diesel engine, with a potential output of 2,000 h.p. or more.

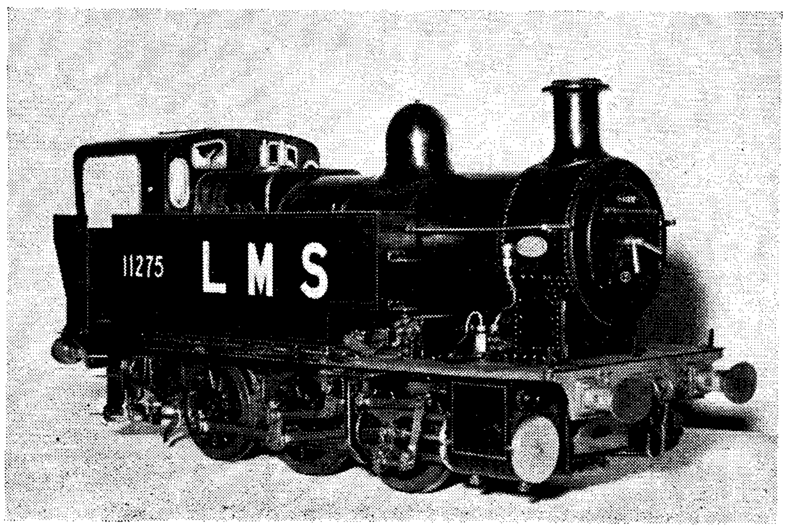
Then there is the fascination of the electric set, and an auxiliary. The machines tick away without an apparent means of propulsion. Studying the control gear is a pleasant pastime. We cannot watch it work for long without wanting to know more about it.

The most interesting part of a diesel-electric set is the load-regulating system. Working automatically from the engine governor, the load-regulator with its associated equipment compares the output of the main generator and the diesel engine and adjusts one or the other so that the engine is not overloaded and the generator absorbs the best power output from the engine.

Now, model engineers, let us look upon the diesel-electric as a challenge. I am sure that a unit can be built in, say, $1\frac{1}{16}$ in. scale—and I do not mean one with an oversize petrol engine poking its cylinder head through the roof. How about a Deltic blasting its way round the track?

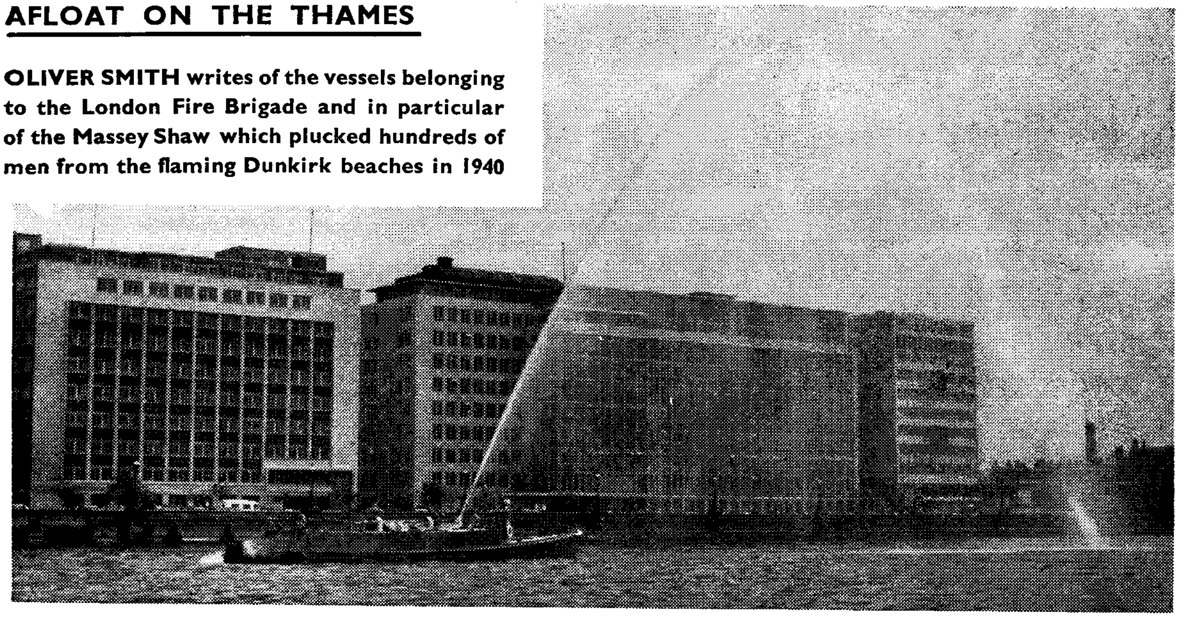
I have a 5 in. gauge dock tank and am building a $1\frac{1}{16}$ in. Castle with four cylinders, a copper-capped chimney and a monumental safety valve cover. You can guess what my next model will be. ▣

The author's 5 in. gauge dock tank locomotive



AFLOAT ON THE THAMES

OLIVER SMITH writes of the vessels belonging to the London Fire Brigade and in particular of the Massey Shaw which plucked hundreds of men from the flaming Dunkirk beaches in 1940



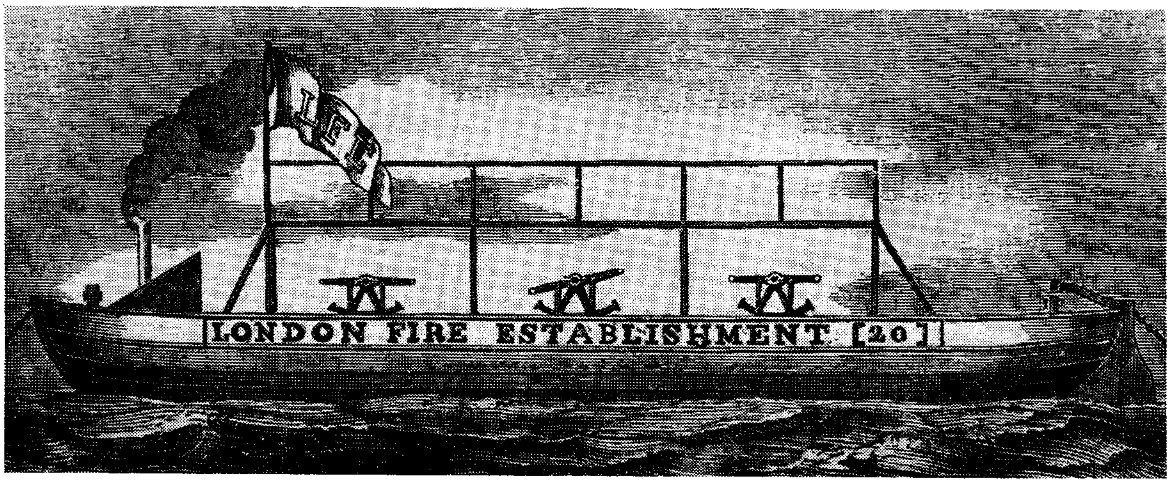
DAY AND NIGHT THE FIRE-FLOATS ARE READY

NEARLY 12 months ago I featured in this series the duty boats manned by the Thames Division of the Metropolitan Police. These little craft serving the community between Dartford and Teddington are a familiar sight on London River.

Another branch of London's essential services which operates highly specialised vessels is the River Service of the London Fire Brigade. Although they are not seen quite so often in the course of the day as are the Police boats, which are constantly on patrol, they are nevertheless on stand-by right round the clock, ready to meet any call made upon them.

The foundation of the present fire service, both ashore and afloat, was laid by the insurance companies to protect property in which they had an interest. It is believed that the Sun Insurance Office had a fire engine in commission on the Thames in about 1760. Another appliance was commissioned seven years later. In 1812 a floating fire engine was built by Tilley, predecessor of Shand Mason and Company, for service in London Docks. The pumps were manually operated on the crank-motion principle, and a steam engine provided the power for propulsion.

When several fire insurance companies amalgamated their fire fight-

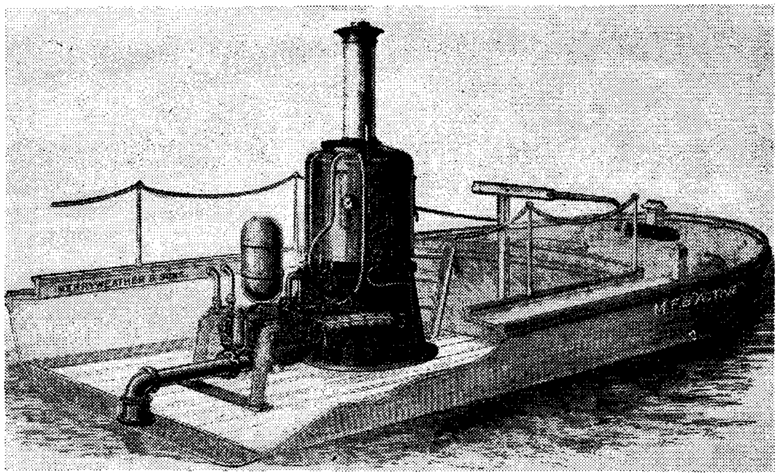


This floating fire engine belonged to the London unit in the early 1830s. The pumps are seen after their conversion from rotary-crank working

ing forces on 1 January 1833 to form the London Fire Engine Establishment, two floating engines similar to Tilley's were included in the equipment of the force. One was moored at Southwark Bridge and the other at King's Stairs, Rotherhithe. They were greatly restricted in their effectiveness at riverside fires because their draught prevented them from operating close-in at all states of the tide. The manual operation of the continuous rotary or crank motion was always liable to cause accidents to the men working the pumps. Braidwood, the superintendent of the London Fire Engine Establishment, later introduced levers similar to those used on the shore appliances.

In 1866 the London Fire Engine Establishment was merged in the Metropolitan Fire Brigade established under the control of the Metropolitan Board of Works. To protect riverside property and the docks, a large floating fire engine and a powerful steam engine were then kept on board an iron barge off Rotherhithe. Additional craft of the lightest possible draft were later added to strengthen the brigade, and the pier on the west side of Charing Cross Bridge was acquired as a floating fire station.

In 1877 the Chief Officer, Captain Eyre Massey Shaw, recommended that the pumping and propelling machinery of the floating fire engine should be separated. The steam-driven pumps were placed on rafts or barges and towed by steam tugs. Because of the very shallow draught



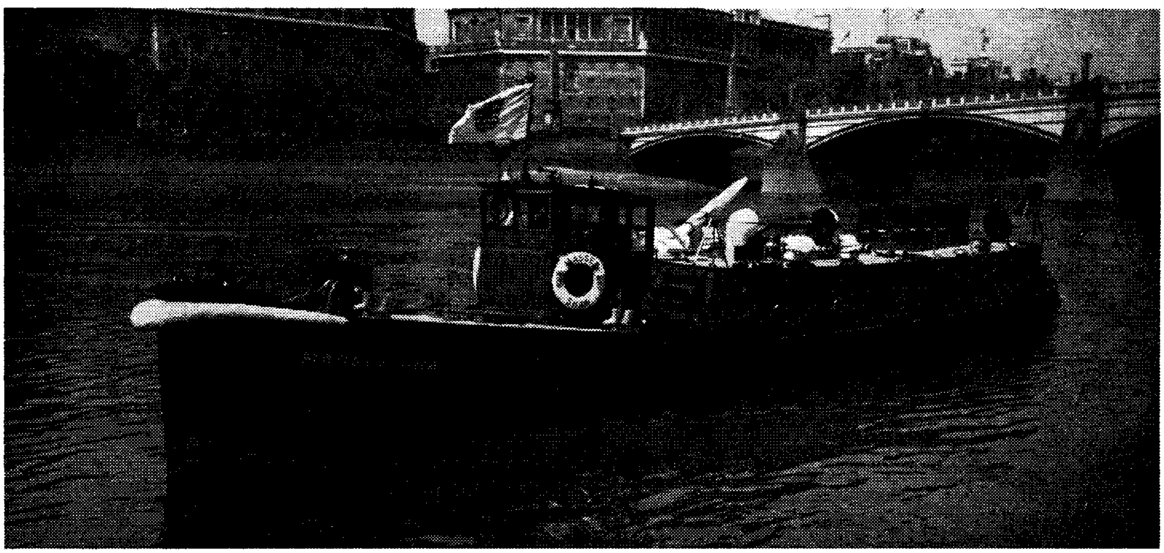
Floating fire barge or raft of the Metropolitan Fire Brigade in about 1860. *The pump, engine and boiler were made by Merryweather of Greenwich*

of the pump unit, the tug was able to push it close in, and even on to the shore. By 1894 the brigade had nine steam fire engines or barges and eight steam tugs.

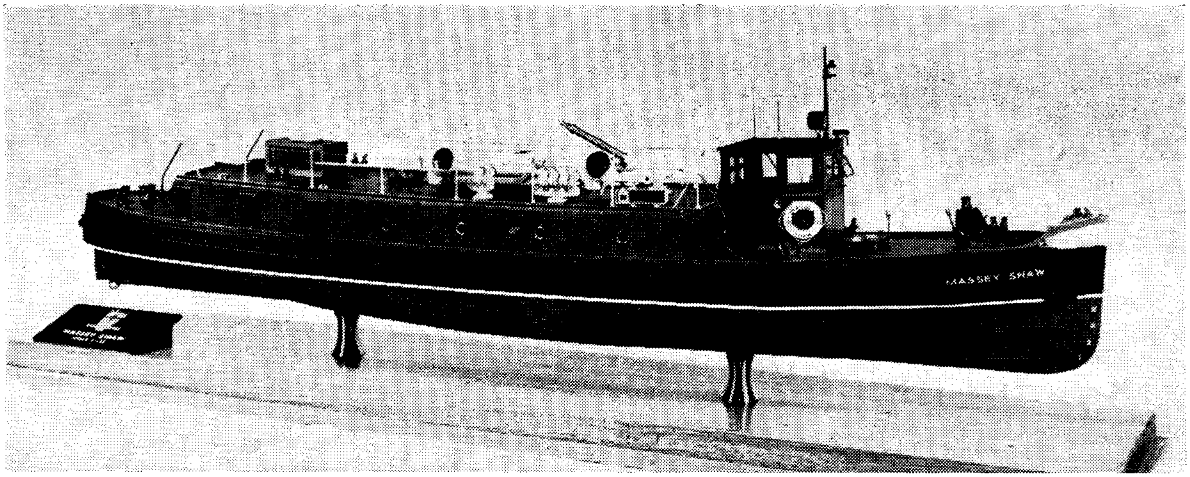
At the turn of the century a new type of self-propelled fireboat was stationed at the new river station at Blackfriars Bridge. She was built by G. Napier and Sons of Southampton and named *Alpha.* As she was of shallow draught she was an exceptionally handy fireboat as she could be used at all states of the tide.

Further experiments were also carried out with the fire-floats, which drew about two feet of water, but relied on tugs for propulsion. They were converted into self-propelled fireboats, and the results proved very satisfactory except when winds and tides were unfavourable.

Beta II, a new fireboat commissioned in 1906, surpassed anything which had gone into service up to that time. She had twin screw engines fed by two water-tube boilers, and could steam at over 11 knots. Each of her four pumps was capable of discharging a thousand gallons of water a minute.



Here the MASSEY SHAW *is lying in the Thames outside the new brigade headquarters on the Albert Embankment*



Mr J. S. Baines's model of the MASSEY SHAW, *a prizewinner at the Model Engineer Exhibition*

But the end of the steam fire engine was not far off. In 1911 the first of the new fireboats with internal combustion engines came into service, the *Gamma II*. Such was the saving in fuel costs (there was no constant head of steam to be maintained with i.c. engines), and in the wear and tear of the boiler and other gear, that a second boat, *Delta II* joined the flotilla in 1913. *Alpha II* (the Roman numeral had been added after she went into service) then went into reserve. In 1914 *Beta II* was temporarily withdrawn from service to be modernised, with internal combustion engines in place of her steam plant. She continued to give the brigade good service for the next 19 years. When she was sold in 1925 *Beta III* replaced her. This vessel was a slightly larger version in size, power and pump capacity of *Gamma II*.

Ten years later the faithful *Alpha II* was sold a few months after the arrival of the *Massey Shaw*, perhaps the best known of London's fireboats. The name of the new vessel commemorates the late Captain Sir Eyre Massey Shaw, KCB, who was Chief Officer of the London Fire Engine Establishment and the Metropolitan Fire Brigade from 1861 to 1891.

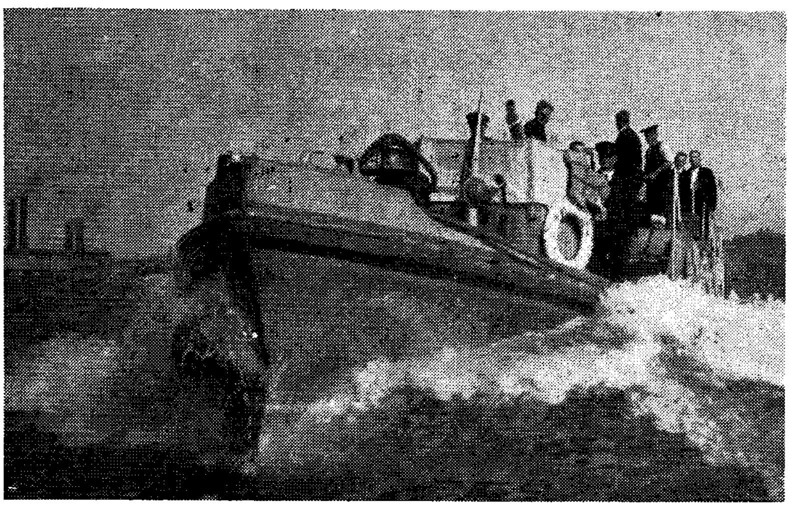
Her design received special attention, and exhaustive tests were carried out with a model at the National Physical Laboratory before construction began. The hull is shaped so as to produce the least possible wave-formation and wash at a full speed of 12 knots. This is a highly important consideration because small craft moored near the water's edge could be seriously damaged by the wash of a vessel travelling at high speed. The draught also received special study so that the fireboat could pass under all the Thames bridges in the county area at any state of the tide.

She is a twin screw vessel, 78 ft long, and is powered by two 160 b.h.p. eight-cylinder Gleniffer oil engines. Her steel hull has five watertight compartments. The pumping and propelling machinery amidships claims about one-third of her length, and the remainder of the accommodation provides stores for hoses and similar equipment, and a large cabin with cooking facilities for a crew of eight.

Each of the two turbine fire-pumps is capable of delivering 1,200 gallons of water a minute at 125 p.s.i. Working in series, they deliver 1,200 g.p.m. at 250 lb. Through swivelling deck discharge boxes on the port and starboard sides, water can be projected by eight lines of $3\frac{1}{2}$ in. hose.

In addition, a monitor at the forward end of the top casing can be swivelled through 360 deg. and elevated and lowered through an angle of 90. With a $3\frac{1}{2}$ in. nozzle, 2,800 gallons of water can be delivered every minute at a pressure of 84 p.s.i.

The *Massey Shaw* has a proud record of exploits during the Second



Her finest hour. The MASSEY SHAW *returns with damaged bows from Dunkirk*

World War. Apart from her activities during the air raids on the capital, she was one of the small ships which answered the call at the time of Dunkirk, as John Masefield has recorded in *The Nine Days' Wonder*.

Crossing from England with a crew of volunteers under the command of a naval lieutenant, she helped in the evacuation of the soldiers from the beaches by ferrying more than 500 men to the larger ships lying off shore. She made three trips to Margate with a total of 106 soldiers, and on her final journey she rescued 40 members of the crew of a French ship which had struck a mine. When this fireboat ends her days, her story will be worth reading.

After the war, the River Service of the London Fire Brigade gradually fell into its peacetime routine, and in 1961 took delivery of its latest fireboat, the *Firebrace*. Like the *Massey Shaw* the new vessel takes her name from a former Chief Officer, Commander Sir Aylmer Firebrace, CBE, RN (Retd.

She is slightly shorter than the *Massey Shaw* by 9 ft. Twin propellers and twin rudders provide good manoeuvrability, and her two Dorman 6QA/M oil engines give her a speed of $11\frac{1}{2}$ knots. Two identical engines drive two Merryweather two-stage pumps each capable of delivering 2,000 gallons a minute at 100 p.s.i. A Russell Newbery 27 b.h.p. oil engine drives an a.c. generator for the lighting, heating and cooking. Additional portable equipment, such as floodlights, cargo clusters and light salvage pumps are also powered from this generator. In all, the *Firebrace* is extremely powerful and efficient.

The equipment of the London Fire Brigade ashore and afloat has often attracted modellers, and at the last ME Exhibition J. S. Baines of Sidcup in Kent won an award for his model of the *Massey Shaw*. In time we may see a model of the *Firebrace*. ■

Sir Tom and Woto are still busy . . .

Continued from page 370

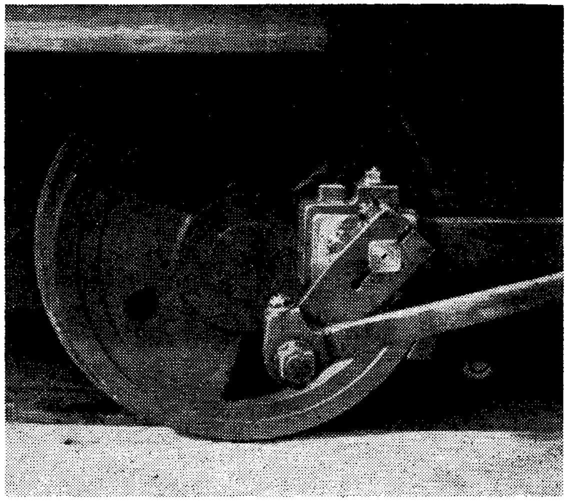
saddle. The pipe in the smokebox is cast in one piece with the exhaust pipe. This arrangement, which must cause loss of heat from the live to the exhaust steam, may be seen in the picture of the blast pipe. The steam pipe is cast on to the back.

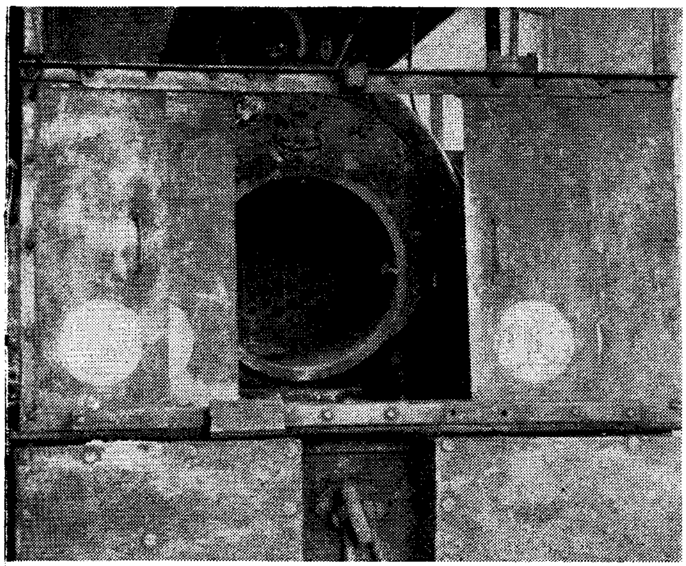
These two little engines are well maintained. They are used when it is necessary to move heavy loads to and from the jetty on the Thames, as the very severe gradient to the jetty is beyond the ability of the small diesel locomotives.

The wagons have a curved frame to carry cable drums and are coupled by long drawbars with hooked ends. For carrying lead pigs flat wagons are used.

A single-road brick engine shed in the works yard houses the engines. The track leading from the shed has a curve of about 15 ft radius.

I am told that the company does not intend to scrap the engines, and so they may have a useful life for some years to come. ■

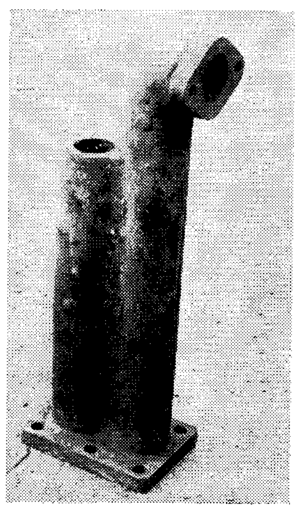




Above: Big-end and fly crank

Right: Steam and blast pipe

Left: Firebox of marine type



Readers' Queries

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

City of Truro

I am building a 5 in. gauge *City of Truro* and would be pleased if you could tell me the original colours of this engine as there is some difference of opinion between enthusiasts to whom I have spoken, especially in regard to the frames and wheels.—L.A.D., Whitchurch, Cardiff.

▲ *The livery of the GWR City class when the engines were first built was:*

Mid-Brunswick green—boiler, firebox, cab sides and front, sides of wheel splashers, inside of cab, tender sides and ends.

Black—smokebox, saddle, mainframes above footplate, upper parts of footplates, cab roof, tops of splashers, buffer heads, wheel rims only, inside and tops of tender.

Dark indian red—outsides of mainframes, bogie frame, and tender frames below footplate level, wheel centre only.

Lining—double chrome yellow (or yellow-orange).

Vermilion—insides of mainframes, buffer beams and buffer bodies. Polished brass safety valve cover. Brass cast name and number plates. Crest on middle panel of tender ("GWR"—not the later crest).

Smooth castings

What is the best method to make castings with a smooth finish?

Would it be expensive to have them done by die-casting? If so, would gravity die-casting be economical for quantities of one gross?—J.M., Belfast.

▲ *There are several methods of producing a smooth finish on castings, mostly by after treatment, but we assume that you mean producing them smooth from the mould. This process depends very largely on care in moulding and on the smoothness of the patterns employed. Specially fine moulding sand will help greatly but still finer finish can be obtained by moulding in plaster of Paris where the nature of the work permits.*

Die-castings are necessarily expensive when only small quantities are required, as the dies have to be made in a metal sufficiently durable and of high melting point to stand up for long periods and repeated use.

Gravity die-castings are practicable for certain kinds of metal, and give a reasonably good finish, but here, too, the cost of dies may be fairly considerable, though it is much less than the cost of pressure die-castings, which are generally produced by special machines.

Boiler firing

I have just completed the mechanical side of a model stationary steam mill engine, and am having some difficulty in finding the information for making the boiler.

The engine is of ¾ in. bore with a ⅞ in. stroke and employs a slide-valve mechanism. Although spirit-firing is the obvious choice for a portable engine, I am doubtful whether it would give me the necessary steaming qualities. Butane gas and electric firing have been suggested, and any advice you can offer me will be extremely welcome.

Will you also try to give me some idea of the best boiler size, as I realise that this is important? The engine would not be used for sustained runs. It is intended more for academic purposes, and probably ten minutes would be the maximum.—D.P., Sheldon, Warwickshire.

▲ *The ME internal flue boiler (M10), price 5s. 6d., would be quite suitable for steaming an engine of ¾ in. bore × ⅞ in. stroke, and is suitable for firing by a butane gas burner, as well as by town gas or a paraffin blow-lamp.*

Electrical heating of a boiler is practicable, but in that event the most suitable arrangement would be to make the boiler simply in the form of a plain vessel capable of withstanding the required pressure, and to fit it with an immersion heater.

There is very little established in practice on this method of heating, as it has seldom been used.

A 1 kw. heater would probably produce sufficient steam for your purpose.

- **Queries must be within the scope of this journal and only one subject should be included in each letter.**
- **Valuation of models, or advice on selling cannot be undertaken.**
- **Readers must send a stamped addressed envelope with each query and enclose a current query coupon from the last page of the issue.**
- **Replies published are extracts from fuller answers sent through the post.**
- **Mark envelope "Query," Model Engineer, 19-20 Noel Street, London W1.**

All-steel boiler

I would appreciate your comments on the suitability of an all-steel boiler for the 5 in. gauge *Maid of Kent*.

Would it be necessary to flange the plates, as I propose to weld the boiler?

Which method of welding would you recommend, electric arc or gas?

Should the firetubes be welded in, brazed or expanded?

Should bronze bushes be brazed to the shell to accept the boiler fittings or should the bushes be of steel?

Should the firebox stays be screwed?

Is ordinary commercial steel plate suitable? Is it practical to have the finished boiler tinned inside and out?—J.P.M., Tonbridge, Kent.

▲ *While ME does not recommend steel for small locomotive boilers, there is no doubt that a sound boiler can be made in this material.*

All the usual plates should be flanged and the joints welded or Sifbronzed. Oxy-acetylene welding plant would be preferable to arc-welding.

The firetubes and flues should be expanded in, if they are made of steel, or silver-soldered if they are made from copper.

Steel bushes should be fitted to the barrel, but if the backhead is made of 5/16 *in. steel they could be dispensed with. Other plates should be ⅛ in. thick throughout to allow for possible corrosion.*

Stays should be threaded and nutted on the inside.

Commercial quality mild steel should be satisfactory.

On the advisability of having the whole boiler tinned or galvanised, you could ask the advice of a firm specialising in such work. Any of the following in London might be able to help you: Industrial Metallic Castings, 90 Dawes Street, SE17, ROD 3671; Stone's Plating Company, 10a Ernest Avenue, SE27, GIP 7331; Frederick Braby and Company, 352 Euston Road, NW1, EUS 3456; G. A. Harvey and Company, Greenwich Metal Works, Woolwich Road, SE7, GRE 3232; and Lamden Sheet Metal Co. Ltd, Littler's Close, SW19, LIB 2267.

POSTBAG

The Editor welcomes letters for these columns. A PM Book Voucher for 10s. 6d. will be paid for each picture printed. Letters may be condensed or edited

BLAST PIPES

SIR,—I was very much interested in Mr E. Rowbottom's letter on blast pipes (Postbag, February 21). I do not know the origin of the one-in-three rule. One-in-six is the angle at which steam is supposed to expand on leaving the nozzle. (In practice, I believe it is usually less.) In all probability LBSC was the first to publicise the use of this formula for small locomotives. Whether he was the first to use it is another matter.

No formula can give the correct diameter with certainty. In fact, it is possible for two models of the same design to need different nozzles even for the same fuel. Full-size practice cannot usually be followed exactly, but the simplest of the many formulae is quite a good starting point: blast nozzle diameter equals cylinder diameter divided by four.

The hole in the nozzle should be parallel for the final fraction of an inch at least, and should have a smooth, clean edge but not a bevel or radius. Nozzles should always be made so that they can easily be changed. For this reason I dislike the combined blower-blast-nozzle. If the first choice is incorrect try a nozzle $\frac{1}{32}$ in. larger or smaller, as circumstances indicate. The final choice may call for smaller changes in diameter. It should be remembered that no one size can ever be correct for all conditions either on a model or in full-size practice.

With regard to Martin Evans's comment on my letter about Silfos, the data sheet which I have (No 2131) does not contain the paragraph quoted.

Birmingham. J. H. BALLENY.

AGAINST RUST

SIR,—I use a mixture which prevents the rusting of the bright parts of machines when they have to lie idle for some time, and of machine tools that are used only occasionally. The advantage of this mixture is that it is not dirty and therefore does not require to be wiped off each time that the tool is used.

Melt together 1 lb. of lard (free from salt), 1 oz. of gum-camphor and 1 oz. of clear resin. Skim the mixture carefully, and stir into it a sufficient quantity of fine blacklead to give it the colour of iron.

After cleaning the machinery thoroughly smear it with the mixture and allow it to remain thus for 24 hours. Then go over it with a soft cloth, rubbing it clean.

Machinery treated in this way has been found to retain its brightness for several months. I treated my ML7 lathe and tools with it at the beginning of this severe winter, and my lathe is like new, with no trace of rust.

I have been a reader of MODEL ENGINEER for more years than I can remember.

Treorchy, South Wales. M. J. REYNOLDS.

RYBURN ENGINE

SIR,—I read with great interest W. J. Hughes's article on the beautiful beam engine at the Rochdale mill of James Schofield and Son. Unfortunately a great number of these engines have now been broken up.

I remember a lovely engine at the Stones Mills in the Ryburn Valley where I spent 29 years as a cotton twiner. This engine (now scrapped) was not as old as the one at Rochdale, but nevertheless was a work of art. It was built by Wood Brothers of Sowerby Bridge and I was told by the engineer that it developed 600 h.p.

One very rare feature was the method of transmission to the line shafts. The engine used steel belts—belting of sheer spring steel, in flat section, just like huge clock springs. They were in 3 in., 5 in. and 8 in. widths and the largest weighed 3 cwt.

The flywheel had been altered by a conversion band from groove to flat, and was covered with cork for a gripping surface.

Not being an engineer myself, I cannot give much detail of the pattern of the engine save that it was a vertical and was fitted with a patented "rocking off" device to prevent it from running away.

My son has recently completed a Wimshurst machine which will perhaps interest a certain reader of MODEL ENGINEER. The discs are made from Perspex and are extremely efficient and the machine is itself extremely lively. A spark $\frac{1}{16}$ in. thick and $1\frac{1}{4}$ in. long can be quite easily generated.

Some idea of the power of the machine may be gathered from the fact that a Neon plug tester will light up when it is held a good two inches away from the discs.

We should be only too pleased to give any details of the machine, including the kind of materials used—most of them from W. Listors of Stockport.

You will have gathered that I am a keen reader of MODEL ENGINEER. While I have quite a few small jobs to my credit I have never done anything really big. Nevertheless I get a great amount of pleasure from what I do and also from the work of past and present craftsmen.

Thank you for a great magazine.

Harrogate, Yorkshire. T. WILSON.

OILSTAINS

SIR,—To remove oilstains from paintwork [Can You Help? February 17] get from your doctor an old 15 in. × 17 in. X-ray film. Clean off the picture, on both sides, with caustic soda. Suspend the clear film on a movable arm behind the lathe or other machine.

If your doctor cannot supply the film get one who can.

London. SCUTARI.

[*Normally ME does not publish letters under pseudonyms, "Scutari" is a doctor.*—EDITOR.]

WEDGE WRENCH

SIR,—My own wedge wrench is smaller than the one described by Mr H. H. Nicholls on February 14 (page 215): 12 in. long, with a jaw depth of 2 in. It bears evidence of much use, and I can only conclude that the brass hammer was lost very early!

I also have a Wells Engineer's

Lamp No 4, which I found almost totally embedded in a lump of earth in a station yard about 16 years ago. It still contained a good length of wick and traces of a rather evil-smelling oil.
Stamford, J. T. BEATON.
Lincolnshire.

LIVERPOOL TRAM

SIR,—The Liverpool trams were finally withdrawn, I believe, about five years ago. Some readers may be interested to hear that one at least still remains in existence.

In the Liverpool Edge Lane Depot I saw this tram standing on a bay in the body department. Unfortunately I was rather late for my next appointment and could not pause for a closer inspection or to take photographs.

If any readers are interested I will try to obtain permission to photograph the tram and, if possible, to obtain some information.
Hale, H. B. CLEWORTH.
Cheshire.

COLUMBIA

SIR,—I took my grandchildren to Disneyland yesterday and we had a short trip on the *Columbia*. The Columbia river in Washington State is said to have been so-named when the ship put in there on her three-year circumnavigatory voyage from Boston to Boston.

This replica of the original ship I saw being built in Disneyland about three years ago.
Fullerton, ROLAND V. HUTCHINSON.
California.

THANK YOU

SIR,—Congratulations on your most interesting magazine.
Uckfield, C. BIGNELL.
Sussex.

FURNESS LINE

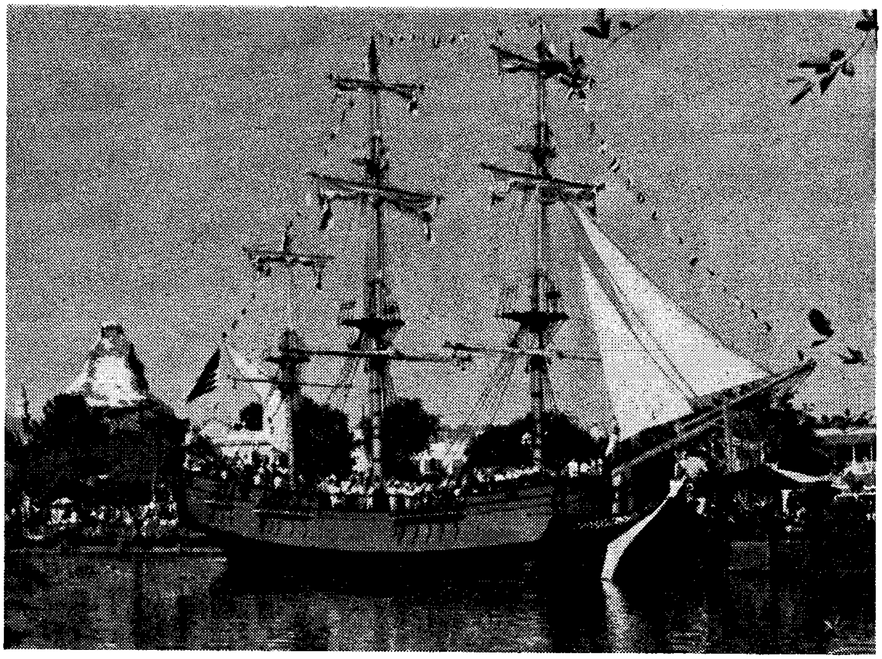
SIR,—In ME of 21 April 1921 (Vol. 44) on pages 307 and 308 will be found some particulars of the Furness railway tanks (Queries, February 7), including a photograph and a line drawing of side and front end elevations. The drawings give all the main dimensions and may be of some help to P.M. of Sheffield.

To me these engines were good to look at, though their indian red livery was, with the sole exception of the Brighton infantile yellow (Patrick Stirling's description, not mine) the least pleasing on any British railway.

I did not hear anything about the performance of these engines. The Furness Railway was rather out on a limb and had no startling services. Judging by the general layout, with especial reference to the long wheelbase of the bogies and to the inside cylinders, they should have ridden very easily.
Rustington, K. N. HARRIS.
Sussex.

CARTESIAN DIVERS

SIR,—With reference to the recent enquiry from a reader on Cartesian Divers, I understand that small glass bulbs or ampoules, delicately balanced to approximately the same specific gravity as water, are supplied by some dealers in laboratory glassware. They are used, I believe, as sensitive hydrometers in medical or biological research, to check or indicate any change in the density of solutions.
London NW1. J. K. FARMAN.



Disneyland's COLUMBIA, *a replica of Captain Robert Gray's ship, the first vessel to carry the United States flag around the world. She is sailing down the Rivers of America, with the Sleeping Beauty's Castle and the snow-capped Matterhorn on the bank. Walt Disney, a friend of* MODEL ENGINEER, *has created a fairyland for the young-in-heart*

HMS VICTORY

SIR,—I was very much interested in the report of the re-rigging of HMS *Victory* in Smoke Rings. I am sure that your shiploving readers all over the world like to be kept up to date with these events.

As Vulcan so rightly says, the Society for Nautical Research pays for the materials for the upkeep of *Victory*, through the Save the *Victory* Fund. In fact, a grant for the supply of teak was made from this fund in 1961.

The Society for Nautical Research also maintains the *Victory* museum in Portsmouth Dockyard.

It is hoped that more people than ever will visit both HMS *Victory* and the museum this year. There is much to see and there are many souvenirs to buy. A very interesting day can be spent there.

By your visits you are helping the Save the *Victory* Fund and so perpetuating these relics of our great Naval past.

If you have more serious interests in nautical research, you can apply for membership of the Society for Nautical Research. The society publishes a journal four times a year, as well as publications on specialised subjects and an official set of plans for building HMS *Victory*.

A society can make application to join the SNR and so gain a valuable addition to its library.
Leyton, A. STANNARD.
London.

FULL STOP

SIR,—Solely in the interests of accuracy, I would like to point out that Mr W. Finch is not correct when he states that all L & NWR locomotive names had a square full stop after them (Postbag, February 21). In this room, as I write, I have one of the nameplates from the famous *Wild Duck*, built at Crewe in September 1911, and it is without the full stop.

The stop appears to have been discontinued about 1907, at about the same time that building dates were introduced on the number plates. Perhaps some reader has the exact information.

One peculiar feature of the L & NWR nameplates, which persisted down the years, was the hyphen placed between "Crewe" and and "Works."

New Romney, Kent. GEORGE A. BARLOW.

CURWEN ENGINES

SIR,—It is pleasing to see that several of the locomotives built at David Curwen's little shop at Baydon are still giving good service.

I joined his small band of enthusiasts in 1947, when the two 4-6-2s were in the chassis stage. Later I did most of the machining on all the 4-4-2s—about six, I believe, including one which went to Africa.

The second digit of the number gave the month of completion and the last two digits the year. This numbering system was abandoned afer Mr Curwen left the company.

The 4-6-2s were a scaled-up version of LBSCs' *Lassie* and were built with the aid of his notes and sketches. Nearly every part was enlarged 3: 1. The two cylinders were 4⅛ in. bore.

One of the engines went to Weymouth and the other to Hilsea, and later to St Helen's, Lancashire.

The 4-4-2s were a shortened version, with a larger firebox, and with very rigid tunnel castings instead of separate horns—a very good idea, especially when the track was on a sandy ground. Too much weight at the trailing end caused heavy tyre wear, despite the fitting of high-tensile steel tyres. Apart from this defect, they were good, reliable engines, which did heavy work with little fuss, and were fairly economical, for saturated machines. The Baker gear gave no trouble.

The typically rugged Goodhead boiler caused no anxiety, and the two excellent Buffalo injectors helped to make the driver's life a happy one.

Aldbourne, Wiltshire. J. KNIGHTBRIDGE.

DYNAMO

SIR,—After reading ME since my schooldays I am writing to you for the second time. Having been apprenticed to a firm whose speciality was steam fittings of all descriptions, I never lost my interest in steam, although later my activities were occupied differently. As I lack the space to run a small locomotive, my interest centred on another project, a showman's road engine. I began with a set of drawings for a 2 in. scale Burrell engine *Thetford Town* drawn by Ronald Clarke and supplied by Dick Simmonds of Erith.

I built the boiler to the correct design as drawn, the only alteration being in the tube arrangement. Then I made the wheels and the transmission gearings. The model is now well advanced, after five years of limited spare-time work.

I was encouraged by seeing the same design of engine at the ME Exhibition at Central Hall, London.

As there is much interest in road engines at the present time, and no showman's engine is ever without a dynamo, can we persuade the versatile Mr Westbury to produce a suitable design? I have tried to get a book dealing with a simple type of small dynamo. An ME book by A. H. Avery is now out of print. I know that one can convert a motorcycle dynamo, but I would prefer to make one if I can. If any reader can offer advice I shall be grateful.

In conclusion, should any kindred spirit near Upper Norwood care to get into touch with me I would be pleased to co-operate as I am a lone hand—with good workshop facilities.

The best of luck to all at Noel Street.

Upper Norwood, London. A. F. LEGG.

DOWN TO EARTH

SIR,—In "Down to Earth, Please!" of March 7 Mr E. M. Graville wonders when some club will get away from the perpetual elevated tracks and build one at ground level. Such a track already exists. The main circuit of Derby SMEE's 3½ in. and 5 in. gauge ground-level line was completed last October in time for a steaming season before winter. The first dual-gauge point was completed during the winter and work on the turntable is in hand.

The main advantage of such lines is, of course, the comparatively low initial outlay. This, together with the added realism in the way of points and so forth, makes the project attractive. There is also the point that we have less far to fall in the event of a derailment!

The main disadvantages are probably the increase in weeding, grass-cutting and the correction of levels, particularly following winter frosts.

Stability should not give rise for concern if 5 in. gauge riding vehicles are used, with a suitable match vehicle for 3½ in. gauge locomotives. True, it is rather a long reach over a 3½ in. tender, but this could be overcome by fitting pedals on the tender, the driver articulating himself between the tender and the leading vehicle.

On 5 in. tender engines one rides on the tender. There should be no difficulty with tank engines of either gauge.

While it would be pleasant to consider ourselves as pioneers, I doubt if this is so, for if I remember correctly the Lincoln track was a ground-level line. In any event I would be interested to hear from other clubs with "down-to-earth" lines.

Notwithstanding Mr Graville's remarks, we are still in a rut—18 in. deep, cut out of solid clay, for the North Curve of the track!

General Secretary, Derby SMEE. D. G. MONK.

SIR,—Probably other members of the Derby Society of Model Engineers have, like myself, read with interest the article by Mr Graville.

My own ground-level multi-gauge track, which includes cutting, bridge and viaduct—not by choice I'm afraid, but because of the undulating ground—has been in existence for almost ten years.

Horsley, Derby. S. B. WHITMORE.

DISCOVERY

SIR,—I did not know that MODEL ENGINEER existed until last Friday, when a friend at work showed me his. I was greatly interested and have now ordered it from my paper shop, Kent's in Moseley Road.

Edgbaston, Birmingham. S. W. CORBETT.

[*There are many others like Mr Corbett—especially younger people. The old reader who introduces ME to a person hitherto unaware of it may himself be grateful for a similar act in the past. Had it not been for someone's kindness, for a moment's curiosity, or for some other apparent chance, many who enjoy ME might never have happened upon it. PM Book Vouchers for 10s. 6d. each will be awarded for the most interesting letters on "How I Came to Read ME"*—EDITOR.]

CLUB NEWS

Send news and notices to The CLUBMAN 19-20 Noel Street, London, W1

THERE is more news from Australia this week. At Easter, the members of the Adelaide Club are putting on a special show for the Royal Adelaide Exhibition. At the same time, they are organising the usual inter-state visit. Good representation is expected from both New South Wales and Victoria, not only in model locomotives, but also in boats, aircraft and cars.

From Australia, too, comes the heart-warming story of help given by the Surrey Hills Steam Locomotive Society to the Society for Crippled Children and Adults. Several members worked on fitting up an A2 locomotive for a holiday camp at "Hilltops," near Yarra Junction.

MALDEN PREPARES

Malden and District Society of Model Engineers is checking and extending its tracks for the grand opening on Easter Day and the Monday. Members are hard at work refurbishing engines.

Mr Harry Amey will bring along a 7¼ in. *Royal Scot*. Mr Gordon Smith is forging ahead with his 2-8-0 oversize locomotive, and Mr Sinclair Smith is busy on his 3½ in. gauge 4-6-2 Pacific *Pamela*, which won the 1961 locomotive trials.

Kingston's track at Thames Ditton will also have its opening at Easter.

ROMFORD PLANS

Romford Model Engineering Club plans to begin work as soon as possible on its new track site, in the grounds of Ardleigh House, Hornchurch. A continuous multi-gauge track over 700 ft long is contemplated.

The club hopes that experience gained from visits to other societies will enable it to produce the best track and signals in Britain.

NEW CLUB

A South Yorkshire Traction Engine Club has been formed at a meeting organised by Mr S. C. Butler of Sheffield.

Instead of the expected 40, 150 prospective members attended. A committee was appointed and a committee meeting was organised to discuss the possibility of a rally at Hickleton, near Doncaster.

The new club has the good wishes of ME.

KENT SURVIVOR

I hear that the Wainwright C Class Preservation Society is making good progress. It was formed to buy the last South Eastern and Chatham Railway Wainwright Class C goods engine, the 31592, built in 1901 at Longhedge Works, Battersea.

This engine is the lone survivor of a class introduced at the beginning of the century. They faithfully performed most of the goods work in Kent for 60 years with virtually no modification.

In the 1914 War they ran the dangerous "Gunpowder Specials" from Plumstead to Richborough, and in the Dunkirk days of the last war they headed many evacuation expresses up to London.

The society has raised about a quarter of the money needed to purchase the engine. She will have a home on the Westerham Line, which the Westerham Valley Railway Association intends to buy from British Railways.

TRIP TO WALES

The Tramway and Light Railway Society is planning a Whitsun Weekend trip to Wales. While the ladies will not be neglected, the serious part of the trip includes an inspection of the Great Orme and Festiniog Railways, and a visit to the Festiniog works and the Crich Tramway Museum.

A party will leave from Paddington on June 1. Full details may be had from the organiser, Mr K. H. Thorpe, 42 Ravensbourne Road, Catford, London SE6. Please enclose a stamped addressed envelope.

SHIP MODELS

The Models Group of the Paddle Steamer Preservation Society is holding a meeting at 6 p.m. on Saturday, April 6, at The George, 25 Old Bailey, London EC4.

All model enthusiasts are welcome. The group hopes that they will bring with them models whose construction and design can be discussed.

CLUB DIARY

Dates must be sent at least four weeks before the event

March 21 Romford MEC. Meeting at Red Triangle Club.
March 22 Colchester SMEE. "Bits and Pieces." East Bay House.
March 23 The Bedford SEPS. Annual Dinner, The Halfway House Hotel, Dunstable.
March 23 Malden & District SME. Annual Dinner and Dance at the "Toby Jug," Kingston-by-Pass, Tolworth.
March 23 Glasgow. 5 in. gauge Crampton—a talk by G. Small.
March 23 Wigan MES. Meeting at the Co-operative Guild Room, Thompson Street, Whelley, Wigan at 7 p.m.
March 25 Cheltenham SME. Visit Bristol Society Theatre & Arts Club, Bath Road.
March 25 Sutton Coldfield MES. History of the Birmingham Science Museum by Mr Bertenshaw.
March 25 Clyde Shiplovers and Model Makers. Show of work at the YMCA Club, 100 Bothwell Street, Glasgow.
March 27 Bradford MES. Night School open day.
March 27 Nottingham SMEE. Talk by Mr Glover.
March 27 Southampton SME. Meeting at the Banister Infants School, Westow Road, Southampton.
March 28-April 27. Surrey Hill Live Steamers. Royal Adelaide Exhibition, with section for model engineering.
March 29 Thames Ship Lovers. Talk by Mr Thornton of the Paddle Steamers PS, Coffee Room Baltic Exchange, EC3, 6.30 p.m.
March 29 Coventry MES. Photographic night.
March 30 SMEE. Rummage sale. 28, Wanless Road, SE24, 2.30.
March 30 Brighton SMLE. Track day at Hove Park.
March 31 Malden & Dist SME. Annual Hydraulic test of loco boilers.
April 1 Cheltenham SME. General meeting, Theatre & Arts Club, Bath Road.
April 2 Leeds SMEE. Leeds Trophy competition; Salem Chapel, 7.30.
April 3 Brighton SMLE. Lecture on York Railway Museum illustrated with colour-slides, at St Luke's School, Finsbury Road, Brighton.
April 3 Guildford MES. First Aid, a lecture by R. M. Graham Pole, at the club house.
April 4 Romford MEC. Competition night at Red Triangle Club.
April 5 Colchester SMEE. Railway films, Mr Lillywhite, East Bay House.
April 5 JIE Film Evening, Pepys House, 14, Rochester Row, SW1, 7 p.m.
April 5 Warrington MES. Meet at the Earlstown track to prepare for Easter running.
April 6 SMEE. Lecture by Martin Cleeve "Workshop Practice," 28, Wanless Road, SE24, 2.30.
April 6 Paddle Steamer Preservation Society. Meeting at 6 p.m. at "The George," 25, Old Bailey EC4.
April 6-15 Whitchurch and District MES. Exhibition at College of Art, The Friary, Cardiff.
April 6 Edinburgh SME. Vist of Falkirk & Glasgow SME to Edinburgh. Showing of the film "Titfield Thunderbolt."
April 8 Cheltenham SME. Locomotive Valve Gears. Talk by Mr E. J. Nutty, Theatre & Arts Club, Bath Road.
April 8 Historical MRS. Informal meeting, Keen House, 7 p.m. (Bring models for discussion.)
April 8 Sutton Coldfield MES. Navigation by Captain Marsden.
April 8 Clyde Shiplovers and Model Makers Society. Annual general meeting at the YWCA Club, 100, Bothwell Street, Glasgow.
April 9 Brentwood and District MES. Annual meeting Congregational Church Hall, South Street.