# Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED


WHEN STEAM STILL PULSES

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**Model Engineer**

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# Contents





## Cover picture

*Time stands still . . . The blue Burrell showman's engine* PRINCESS MARY *crunches up the gravel path at Woodton Old Hall Farm. Had the picture been taken thirty years ago it would have looked little different. Robin Orchard writes inside*

## Next week

*Earlier this year the famous old Brunel dredger was withdrawn from service in the Bristol Channel. In* MODEL ENGINEER *for May 24 Mr G. Watkins will describe some of the features of this historic vessel*



# Smoke Rings A weekly commentary by VULCAN

THE stand of the Crawley Model Railway Society at the Model Railway Exhibition at Central Hall last month showed what a little co-operative enterprise can do.

This impressive layout, representing a mile of railway, was begun only a few years ago by a small group of enthusiasts in the New Town, and was designed to give a realistic effect of a train travelling out into the open country.

When the society was formed, accommodation was limited and the track had to be assembled at each meeting. To facilitate erection and dismantling, and also to distribute the work as widely as possible, the layout was built in 3 ft sections.

Since the society acquired an ex-Government hut the line has outgrown this system, though much of the original sectioning remains.

## Landscaping

Serious attention has been paid to scenic effects. Topography accurately follows geological patterns, and careful thought has been given to the lie of the land. There are no smooth surfaces; the ground is fascinatingly irregular, as one finds in any rural area.

An illuminated diagram, expertly wired by a member, shows track occupation at the main station of Grantchester. The station is interesting, too, for it folds in half, the buildings "dovetailing" one into the other.

A new addition of which the members are proud is the working model of the Horsham roundhouse. Any road can be chosen on the selector panel and the turntable will swing and automatically lock in the correct position.

The exhibition, organised by the Model Railway Club Limited, housed many old favourites, among them the SMEE live-steam track, the model trams of the Tramway and Light Railway Society, and the authenticallysignalled layout of the Gauge 1 Model Railway.

A nostalgic look at the O Gauge Album stand, showing model railways of the Twenties—mostly in Hornby stock—illustrated more than anything the tremendous advances in detail modelling which have been made in the last 40 years.

I wonder, too, if today's ten-year-olds would be satisfied, as we were, with a *Caerphilly Castle* which had a 4-4-2 wheel arrangement!

At this pace, what can we expect when the twenty-first century dawns ?

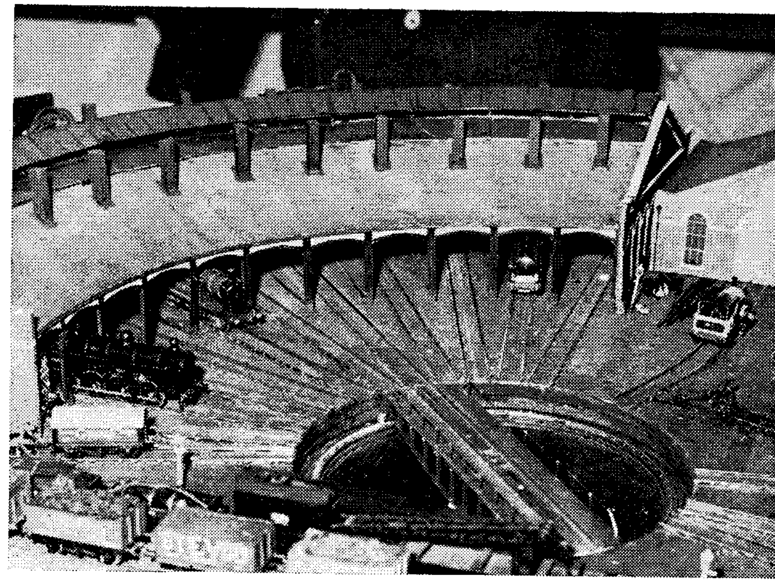
## ED gutted

FIRE destroyed a large part of the West Molesey factory of Electronic Developments in the early hours of April 29. It will be at least a month before the company can resume production.

Many of the records were lost, including those of engines returned for repair. Anyone who has sent an engine to ED should get in touch with them, enclosing the acknowledgment which was posted from the factory on receipt of the engine. It is essential that this acknowledgment, or a photostat copy of it, is sent with the claim.

The fire completely gutted the stores and despatch department, and did considerable damage to the building and plant.

The machines, affected by the flames and the hoses, will all need overhauling before they can be used again.

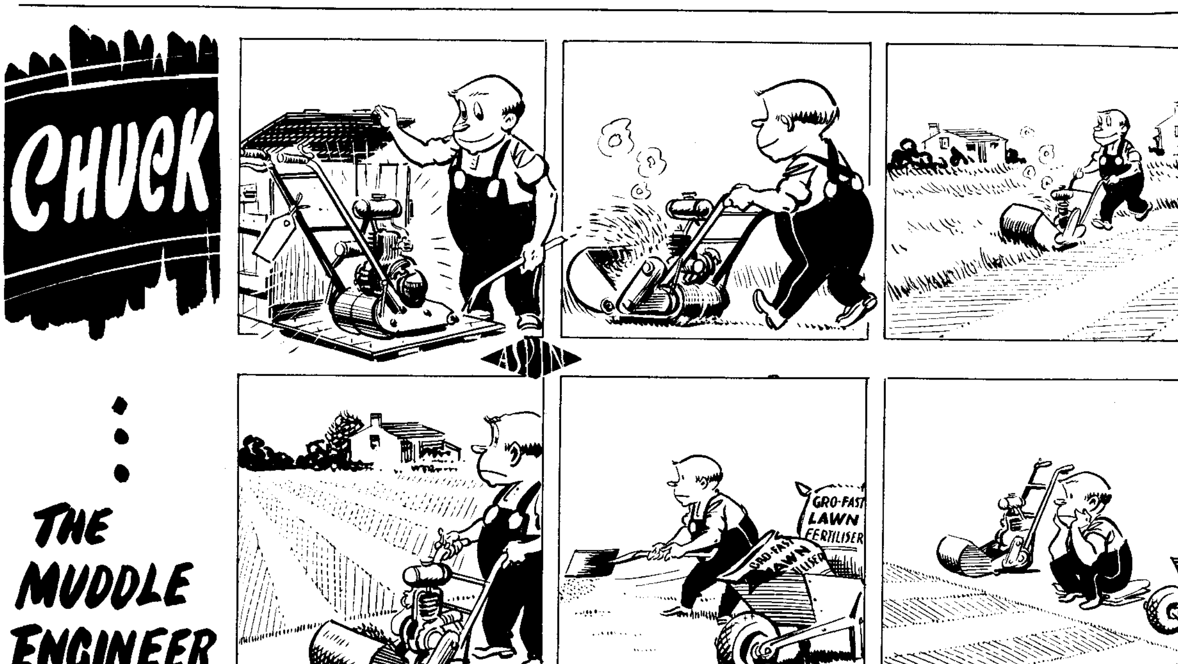


*When the road is selected the turntable automatically swings and then locks in position on this model of the Horsham roundhouse, part of the Crawley MRS layout*

## Convalescing

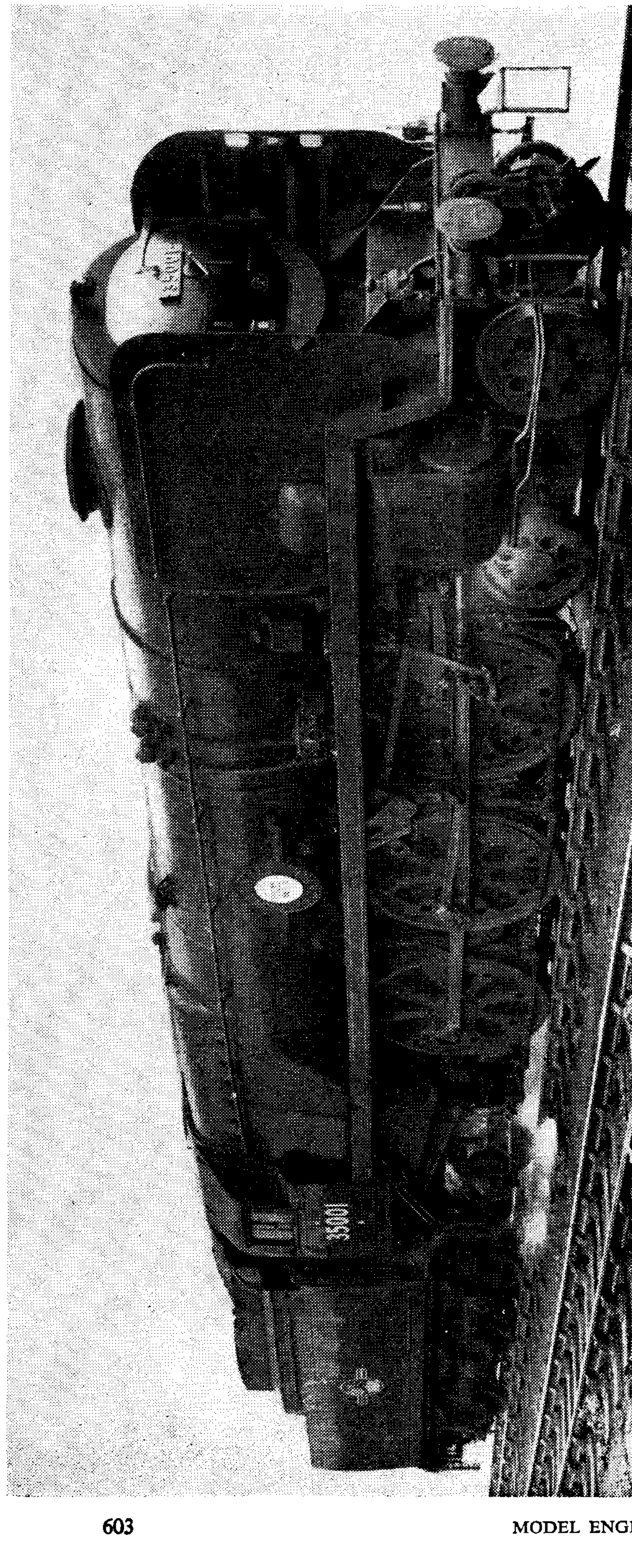
MARTIN EVANS, who has recently been in hospital for an operation, is recovering well. At the time of writing he is enjoying a short period of convalescence on the South Coast.

He hopes to be back at Noel Street and to continue with the *Firefly* serial during the month.



# BULLEID'S BRILLIANT PACIFICS

**SEAN DAY-LEWIS writes of a famous living designer and his locomotives. This article is a version of one already published in the "Daily Telegraph"**

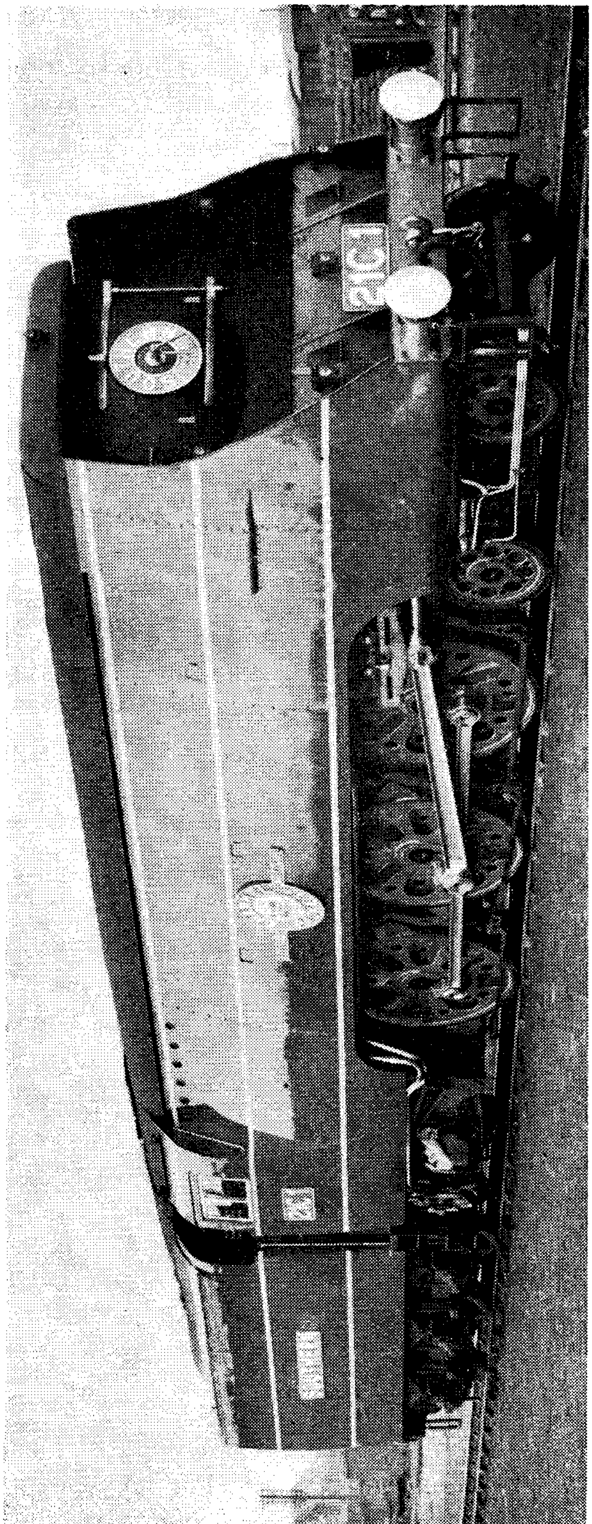


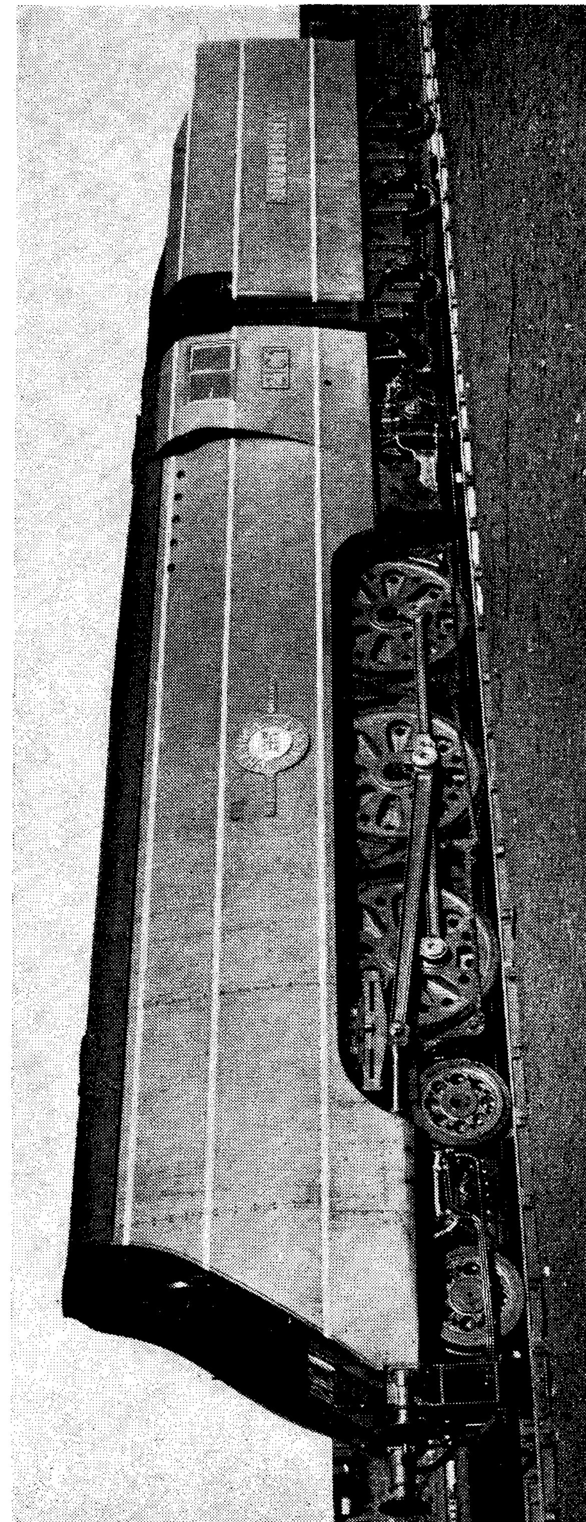
It is now a little over 21 years since the first Bulleid Pacific, *Channel Packet* of the "Merchant Navy" Class, went into service with the Southern Railway. But the impassioned and partisan controversy surrounding these brilliant engines continues as furiously as ever.

Bulleid himself has described his Pacifics as "the last English high-speed locomotives to be built by private enterprise in an atmosphere in which engineering progress had free play." Now that British Railways have committed themselves totally to electric and diesel traction his significance as the last genuine innovator of the steam age can be appreciated. His engines were new in every detail and, unlike those which came after, did not merely mirror traditional practices.

Oliver Vaughan Snell Bulleid was born at Invercargill in New Zealand, and brought up in Wales and Lancashire. His family intended that he should read for the Bar in New Zealand and he already had the sailing ticket in his pocket when a rebellious cousin at Doncaster took matters out of his hands and apprenticed him to H. A. Ivatt of the Great Northern.

He took to his work with ease and was quickly recognised by Ivatt as an outstanding apprentice. Later Bulleid drew even closer attention to himself by marrying his chief's daughter.





CHANNEL PACKET *after the casing had been modified (above) and in its earlier, less familiar form (below)*

[*BR Photos*

One of his earliest railway memories is of a visit to Doncaster in 1903 by Archibald Sturrock, who in 1850 became the first Great Northern chief of motive power after working for Sir Daniel Gooch on the Great Western—a remarkable link with the earliest days of steam.

After experience in France, Bulleid returned to the Great Northern and eventually became Sir Nigel Gresley's assistant on the LNER. Gresley was the master mind, but Bulleid made a significant contribution to the silver age of the East Coast route, which culminated with *Mallard* and the world speed record for steam.

In 1937 he succeeded R. E. L. Maunsell as Chief Mechanical Engineer of the Southern and prepared a critical report on the steam stock. It was not given an enthusiastic welcome by a management preoccupied with electrification schemes, and the new chief had to fight a lone battle against odds from the start.

The first need was to improve the timings of the unsatisfactory *Lord Nelson* 4-6-0s on the Dover and Folkestone boat trains. The Merchant Navy Class was designed for this specific task, but when *Channel Packet* appeared in 1941 this service was in abeyance and the new engine started work on the Southern's West of England line, assisting the hard-pressed King Arthur 4-6-0s.

Its qualities soon became evident to all travellers lucky enough to live between Salisbury and Exeter during the war years A locomotive which imperiously hauled a fully-loaded 20-coach train over the severe gradients of this line was clearly an improvement on anything the South had known.

Before Bulleid left the Southern in 1949 he built 30 Merchant Navy engines and 110 of the lighter West Country and Battle of Britain locomotives. If none of them has ever captured *Mallard's* record it is only because the designer regards such exercises as frivolous Their boilers were an outstanding asset and their power output, as revealed in the Locomotive Exchanges of 1948, created something of a legend.

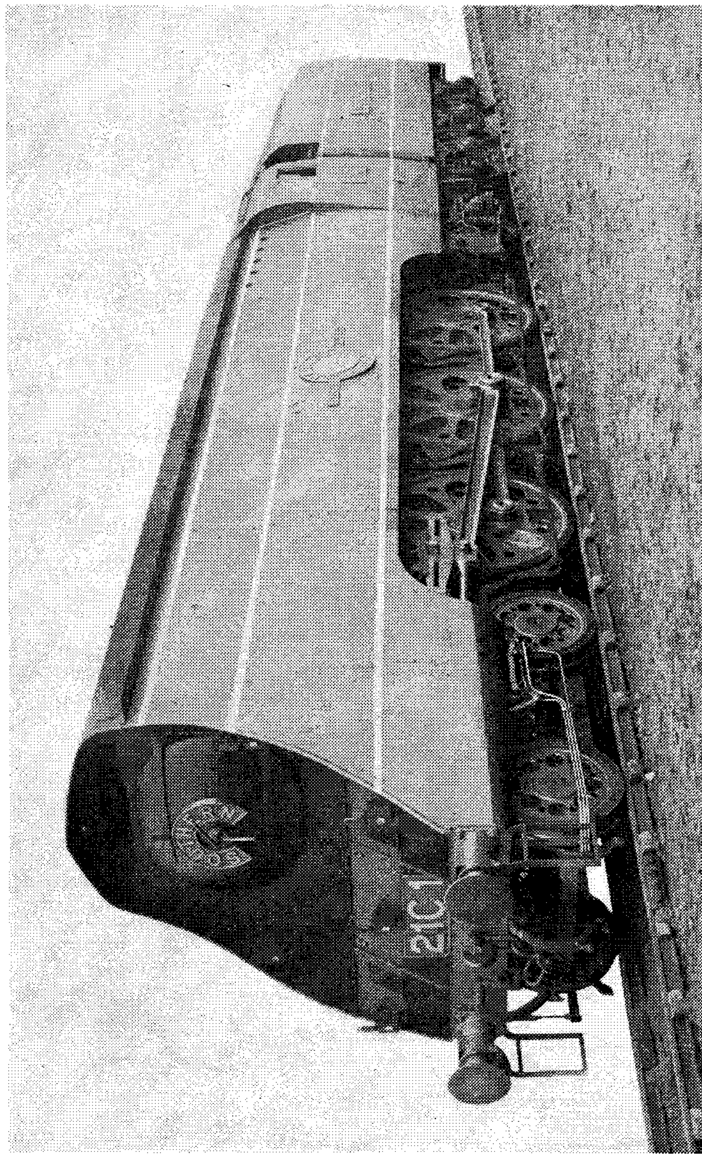
Against this can be placed high fuel consumption and the inaccessible chain-driven valve-motion. Bulleid does not believe that engineers should strive for accessibility, but should see that everything works so well that it is unnecessary. Unfortunately, this motion did not work perfectly and the designer himself now describes it as "a step in the right direction, badly carried out."

His intention was to produce a locomotive able to work long mileages without attention at running sheds. Even the famous "air-smoothed" casing on the outside was designed so that the engines could be cleaned quickly at automatic plants.

In an earlier age Bulleid's experiments would have been consolidated and he would have received due credit for the best features of his locomotives, which solved some problems for the first time. But the Pacifics were hardly ever used to the capacity which he intended and now 90 of them have been rebuilt in a conventional form which gives them a less exciting but also a less mercurial performance.

With a speed limit of 85 m.p.h. imposed between Salisbury and Exeter, the original design is scarcely necessary, though the Southern drivers sometimes turn a blind eye to the limit even now. Recently on the down Atlantic Coast Express a Merchant Navy touched 104 m.p.h. between Axminster and Seaton Junction, and even after the seven-mile climb to Honiton Summit (four miles at 1 in 80 or slightly steeper) the train was travelling at barely less than a mile a minute.

O. V. S. Bulleid meanwhile surveys the scene calmly from his retirement at Exmouth. He makes no exaggerated claims for his steam engines and is just as proud of his modernisation of Coras Iompair Eireann, the Irish Transport Company, which he carried out after leaving the Southern. ■



*Look at the word "Southern" on the front and then compare it with the similar feature in one of the pictures on page 604. Some railwaymen thought that the shape resembled an inverted horseshoe, and for the comfort of their superstitious minds the circle was closed*

**EDGAR T. WESTBURY re-designs the 30 c.c. petrol engine built for *Locomotive 1831***

# Now for the cylinder head

IN the original castings for the *1831* engine, the cylinder head was cast in bronze, and had the ports and passages cored in it. As bronze is harder than most aluminium alloys, its use for valve seatings is generally to be recommended, but unless it is used for the body casting as well, electrolytic action is liable to be set up in the parts of the casting in contact with cooling water. Experience has shown that a good aluminium alloy gives satisfactory results for valve seatings, but it is possible to fit inserted seatings of harder metal.

While cored ports and passages would also seem to be desirable, they present moulding difficulties, and do not simplify machining as much as might be expected. In the revised design, some of the first castings were made with cores, but problems in locating and supporting them properly have arisen, and it has been decided to supply them in this form only when it is specially requested. On the whole, I prefer to machine the passages from the solid, although they call for methods which some constructors may find rather unusual.

The first operation on the head casting is to machine the top and bottom faces exactly flat and parallel. With the top faces, location depends on the depth of the cavity for the water circulation, which at its shallowest part, over the valve passages, should be not less than $\frac{1}{16}$ in. The four bosses for valve guides should be exactly flush with the joint face around the rectangular rim.

Both these operations can be carried out by holding the casting in the four-jaw chuck, two of the jaws of which may be reversed if its capacity is limited. The parallel accuracy should be checked, and if necessary corrected, after a trial cut has been taken on the underside face.

After facing on both sides has been completed, the centres for the combustion chamber recesses may be marked out and circles $1\frac{1}{8}$ in. dia. scribed to locate their position. The casting is then again set up, preferably on the faceplate, and each of the circles in turn is set to run concentrically for machining the recesses, which are $\frac{3}{16}$ in. deep, with a $\frac{1}{16}$ in. radius in the corners. This gives a compression ratio of slightly over 7 to 1, which is satisfactory for general purposes, but may be raised or lowered by making the recesses either shallower or deeper.

Many constructors place an unduly high importance on exact compression ratio; but we should not jump to conclusions. The most suitable ratio for any particular duty is generally a matter for experiment. High compression increases power at the top of the range, but only if other things are in proportion, and often at the expense of flexibility. A low compression is conducive to docility, and to slogging performance at lower ranges of speed. I mention these points because they are so often the subject of queries or critical comment by makers of model petrol engines of all types.

The positions for the valve ports may now be marked out on the insides of the combustion recesses; if these have been cored, you will have to plug them temporarily, as described for the liner seatings. As you will see, the ports are offset $\frac{1}{8}$ in. from the longitudinal centre line of the casting. You can simplify the setting up for boring the ports, whether from cored holes or from the solid, by bolting two straight strips of metal to the faceplate, one on either side of the casting, to locate it in this plane.

Any roughness or unevenness in the side faces of the casting should first be removed by filing or machining. After setting up and machining one port, and fixing the strips in position, you may locate the other ports by dead measurement, without the need for separate marking out.

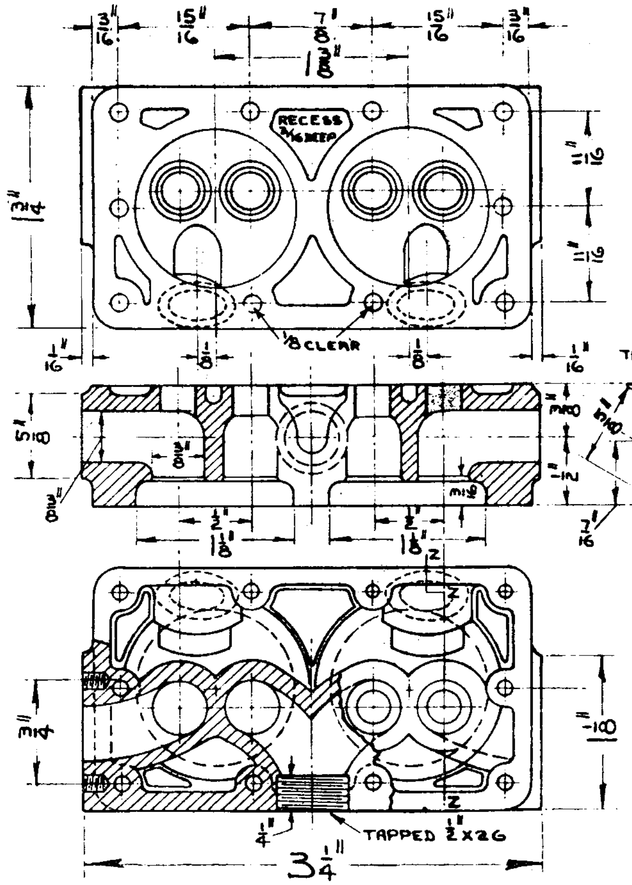
The utmost care should be observed in machining the ports and guide bores, as the entire success of the engine may depend on perfect alignment of valves with their seatings. I have encountered so many leaky valves caused by slipshod methods of machining ports or fitting guides that I must emphasise this point.

After the preliminary undersize drilling or boring of the port, you may use a piloted centre-drill to follow through into the guide, to ensure that it is equally true and concentric. Coring of passages is, in my experience, much more difficult than drilling from the solid, which should be quite straightforward.

A useful tool for simultaneously finishing the port and guide bore is a two-diameter D-bit, which is not liable to be deflected like a drill or reamer; it should have a radius to form the top end of the port, and may also have a chamfer to form the angle of the valve seating as well, though this is less important. If you intend to fit inserted seatings, you should counterbore them 15/32 in. dia. × $\frac{1}{16}$ in. deep at the mouth. The seatings should be made in hard drawn bronze, with $1\frac{1}{2}$ thou interference, and drawn into the counterbores by a screwed mandrel, with a step to centre the seating ring truly. Warming the casting in hot oil will simplify this operation; in any event it is a rather delicate operation, as the seating rings are very fragile.

You can machine the flanges for the exhaust pipe connections by setting the casting on an angle plate bolted to the faceplate, and drilling their centres $\frac{5}{16}$ in. dia. for a depth of about $\frac{1}{4}$ in. For the inlet port, a hole not more than $\frac{3}{8}$ in. dia. of similar depth may be drilled and spot faced. All three holes must then be joined up with the respective valve ports by curved passages. When these must be formed from solid metal, you may well wonder what kind of drill to use. I have been faced with this problem on many of my engines, and it is not as difficult as it looks.

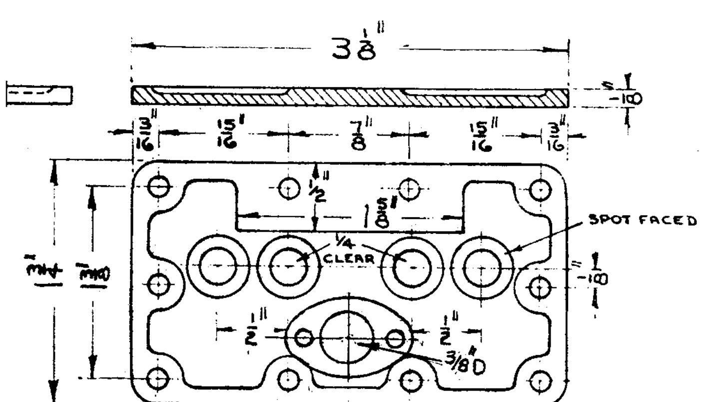
For the preliminary stage, a drill not more than $\frac{3}{16}$ in. dia. should be put through at an angle which joins up the ports as directly as possible. You can do it easier in the lathe than in the drilling machine, if a platform of suitable height to centre the holes is fixed—not merely rested—on the



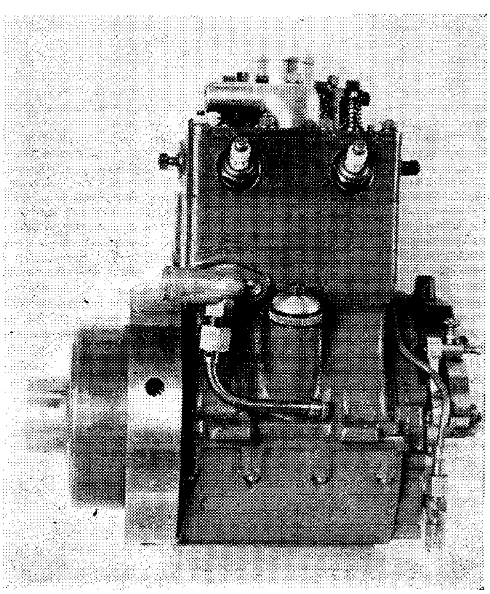

CYLINDER HEAD

1 OFF. L.A.

Right: *Photograph by N. F. Hallows of Ian Bradley's* LOCOMOTIVE 1831 *from the breather side. Dr Hallows and Mr Bradley are contributors to* MODEL ENGINEER




CYLINDER HEAD COVER PLATE



cross slide. By this method the casting can be manipulated at the required angles and the progress of the drilling watched.

Having established communication, you can then open out the passages to size, and work them into a curve, by a $\frac{3}{8}$ in. spherical-headed burr or rotary file, held in the lathe chuck and run at high speed. When I first used this method, only the small dental burrs were readily obtainable and I made a burr from silver steel with filed teeth. While it was slow, it did the job quite successfully.

After forming the passages, you can set the head casting up again on the faceplate for opening out the mouth of the inlet passage and tapping it $\frac{1}{2}$ in. fine thread. This operation should not be done at an earlier stage, as there is a risk of damaging the thread while the drill or burr is manipulated. A flange fixing for the inlet stub, or direct to the carburettor, is a practicable alternative, but beware of fouling the push rods.

To drill the holes for the sparking plugs, a piece of hardwood tapered to 30 deg. may be mounted on the angle plate, and the casting attached to it by wood screws through the valve guides. Note that, beginning from the flat side of the casting, the centre is $\frac{7}{16}$ in. above the base side. Having located this, you should deeply centre-drill it, taking care because of the oblique surface, and drill it through $\frac{1}{4}$ in. dia., with the same precautions when you are breaking through on the inside.

Some constructors have found that the *1831* engine, because of its efficient oiling system, is rather liable to oil up plugs. This trouble can be cured in various ways. One method which is very effective is to "pocket" the plugs by restricting the bore of the hole which communicates with the combustion chamber. If this course is adopted, a smaller hole, say, $\frac{1}{8}$ in. dia., may be drilled through, and the facing surface brought a little further out. In either instance, this surface should first be machined into the side of the casting, sufficiently deep to provide a seating for the plug washer, and large enough in diameter to clear the plug body.

In all machining operations where clamping or locating on already finished surfaces are necessary, a slip of paper should be inserted between contact faces, and packing slips of copper or aluminium be used to prevent brusing by the clamps.

The drilling of holes for securing the head to the body may now be carried out; it is a good policy to mark out and start them from *both* sides, as small drills have a notorious tendency to wander from the straight and narrow path! Ample clearance should be allowed in the holes, as jamming sideways is liable to introduce distorting stresses. The tapping holes in the body are specified as $\frac{1}{8}$ in. Whit., but as studs or bolts of this size are not easy to obtain nowadays, 4 BA, which is some 15 thou larger, may be substituted.

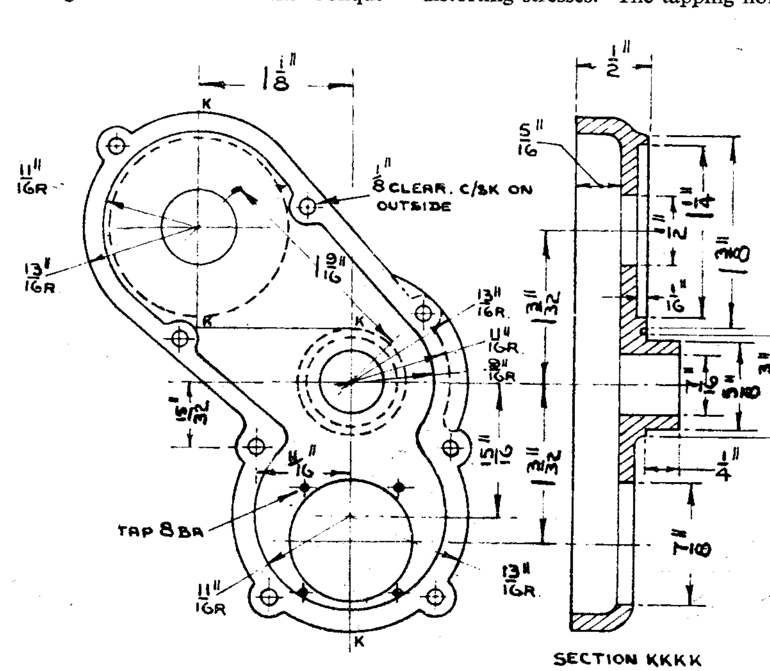
For communication between the head and body water spaces, holes are pierced in the contact faces in both parts, of the largest permissible area. If they are made of the shape and size indicated on the detail drawings, water circulation by convection, or thermo-syphon action, is sufficient without further aid by a mechanical pump or other means, provided that the tank or radiator is set at a convenient elevation.

Another way of connecting the water spaces is by external bridge pipes. For boat work, when water is taken from the pond, some kind of a pump or scoop is necessary.

The cover plate casting needs only to be machined on the underside and on the top rim, including the rocker bearing seating and the face of the water outlet flange. The fixing holes can be jigged from the holes in the cylinder head casting, and spot-faced to form seatings for the holding down nuts. To spot the holes for the valve guides in the cover plate, you had better use a centre drill or a spearpoint drill with a shank which exactly fits the holes in the head, as it is highly important that these should not be scored or otherwise damaged. The holes in the cover should be opened out to $\frac{1}{4}$ in. clearance, and spot-faced on the top surface. Finally, the joint surfaces of this, and of the head casting, should be lapped on a sheet of plate glass for perfect flatness.

The inner face of the casting for the timing cover should be faced off flat by holding it in the four-jaw chuck; centring is unnecessary. It should then be drilled for the fixing screws. Tapping holes are spotted and drilled in the flange of the body casting, and the timing case is temporarily secured in position. You can carry out the boring and machining of the main shaft boss in position, by mounting the body on a chuck-mounted stub mandrel, through the main bearings, thereby making sure that the bore in the case is truly aligned.

A similar procedure may be employed to line up the distributor seating with the camshaft centre. As these are light operations, the overhung mass on a small mandrel can be tolerated, provided that you take only light cuts with a keen narrow-pointed tool. It may not be easy to get a good finish, but the important thing is concentric location. The bore for the oil pump (if one is fitted) may be left to a later stage of the construction.




TIMING COVER
1 OFF L.A.

★ *To be continued on May* 31

WORKSHOP HINTS AND TIPS

# PRACTICAL DIVIDING

By GEOMETER

THERE are several methods of dividing that require only hand tools or the normal equipment of a lathe. Most problems of division can be solved through one or other of them, or by combining two or more; and though the time taken may be longer than if one had proper equipment, the results need not suffer, given care in the work.

A protractor which is marked in degrees can be used for some jobs, and a number can be performed by geometry, with a rule, scriber, dividers, and centre punch. Divisions which can be easily obtained in this way are two, three, four, six, eight and twelve.

Any line across a circle gives two divisions, and another line at right-angles gives four. The second line is located geometrically as at *A*. A light dot is made with a centre punch at *P* and another at *Q*. Using these points to locate dividers, you scribe small arcs outside the circle, and join the points where they intersect by a scribed line which crosses the first at right-angles. With each of the four points used for further bisections, the circle can be divided into eight.

To divide a circle into six, the dividers are left at the setting for radius and are stepped round the circumference. Three divisions are obtained by taking every point; and by bisecting from each of the six points, twelve divisions are obtained.

Problems which involve odd divisions can be solved with a protractor or by trigonometry. When a protractor is used, care must be taken to keep its centre to the centre of the circle, or the point of origin of the arc; but with trigonometry, the only tricky job is setting the dividers. This must be done by a micrometer or steel rule. Diagram *A* shows the principle by which any division can be obtained for any circle.

First, the number of divisions is divided into 360 for the angle of arc *R* in degrees. You then halve this angle and look up the fraction for the half-angle in the column of sines. Multiplying the fraction by the diameter of the circle *ST* in inches, gives you, as a straight line, the length *TU* to which the dividers must be set. When this has been done, the dividers can be stepped round the circumference of the circle, as when a circle is divided into six.

Small parts can sometimes be mounted in a piece of bar for marking-off, milling or grinding to common divisions such as two, three, four and six, and square and hexagon blocks can be used as at *B1* and *2*. After a part has been mounted, the block can be turned to its different faces and clamped for succeeding operations—which is usually easier and provides more accurate results than locating and holding the part itself.

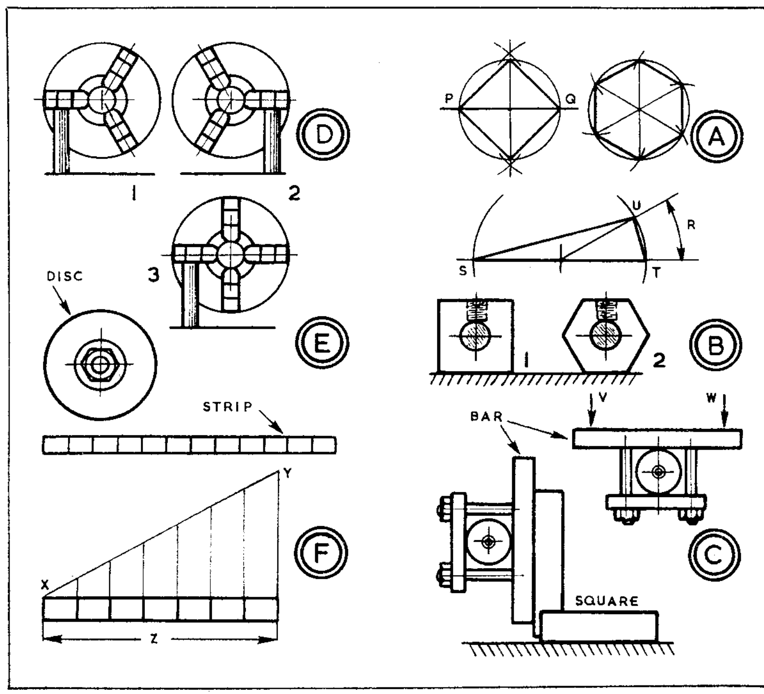
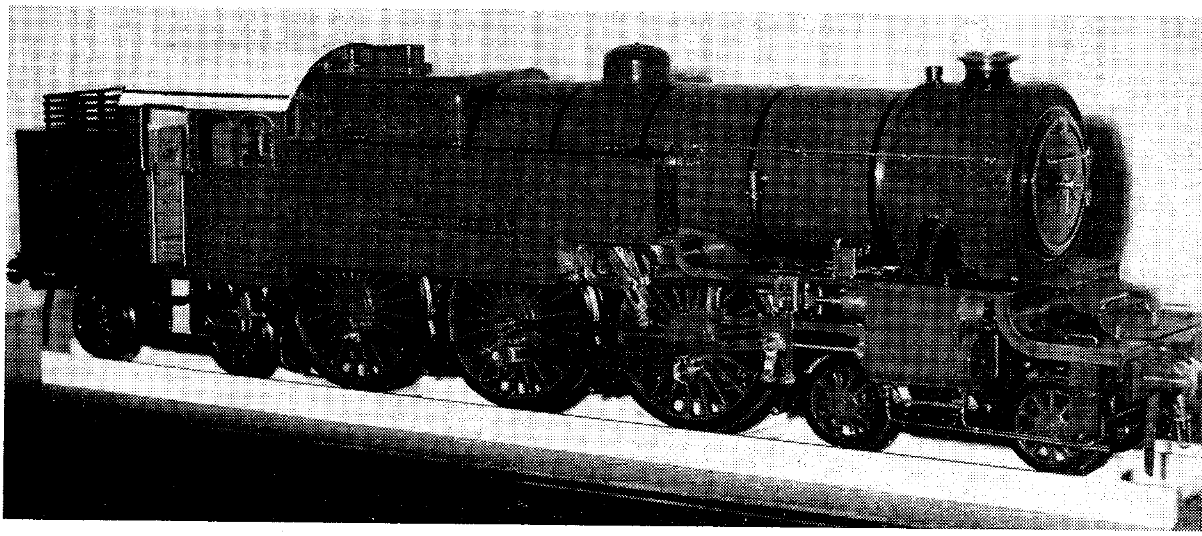



Diagram *C* shows another way which provides two or four divisions for work mounted between centres, on a lathe or bench. Clamp a straight bar to the work and set it horizontal by checking with a surface gauge or indicator at *V* and *W*. This gives two divisions. For two more at right-angles, the bar can be set by a square.

Three-jaw and four-jaw lathe chucks can be used for marking-off common divisions, as at *D*, on flat-bed lathes. On others, flat baseplates must be used to bridge the Vs. A support is machined to hold one jaw horizontal (*1*), while the work is scribed at both sides; or the support can be moved to the opposite side (*2*), so that a pointed tool can be employed from the slide. Using all three jaws at both positions, you obtain six divisions. A four-jaw chuck (*3*) gives four.

Any number of divisions can be obtained on a disc as at *E*—for the disc to be mounted to work. The strip carries equally-spaced divisions, and its length is divided by 3.1416 to provide the diameter for the disc. If both are of metal, they can be tacked with solder. Diagram *F* shows how you can divide a strip of given length, marking divisions on a sloping length *XY* and projecting to length *Z*. ▣

# Anyway, the driver's tea is safe!



**Observing every detail of the GER express tank, J. F. BANYARD provided a flap valve in the water pick-up and a shelf—with an upturned edge—for the tea-can**

Princess Amelia, *continued from page 529*

I MADE the clack boxes on the boiler barrel with a spigoted flange joint to the delivery pipes, as I used 10 BA steel bolts to keep the scale down and the spigot flange was a close fit in the clack box.

The construction of the many components under the cab floor called for some means of removing them as a unit; you could not get even half a finger in to reach the pins and bolts. Under the wooden cab floor I fitted a piece of 3/32 in. steel plate to cover the area between the backplate of the firebox and the bunker, cutting out gaps to suit. The plate is held by four 6 BA steel hexagon set screws in the long steel angles, which are close-pitch riveted to each mainframe and are for strengthening the rear part where the rear bogie runs and the heavy weight of bunker, coal and water is supported.

Under the plate, $\frac{3}{8}$ in. lower, is a steel frame stretcher with fabricated webs which carry the steam cylinder brake brackets and the steam cylinder. Further down is the brake gear shaft, with its two arms for connecting the hand brake gear and steam cylinder piston rod.

On the plate at the bunker end are bolted the two columns. The left-hand one is the fireman's hand-brake and the right-hand the water pick-up. Both have left-hand threads for the swivel die blocks in the crank arms operating gear, so that you turn clockwise to put on the hand brake and to lower the water scoop into the trough.

The columns are GER, even to the two slots where you could drop oil down on to the screw and nut. They are fixed to the plate with a square flange and four bolts. On the fine box end on the left is the bearing to hold the spindles for the front and back damper levers; and on the right is the bearing for the lever of the cylinder drain cocks. The bearings are small blocks of gunmetal $\frac{5}{16}$ in. thick, bored 5/32 in. for the lever spindles, and held to the plate by 8 BA bolts. All the levers and spindles are of silver steel, and $\frac{1}{16}$ in. dowel pins are fitted.

To the levers on the plate are fitted the links which hang down and are connected to the bell crank on the side of the ashpan for the front damper. The link which connects direct to the back damper is dealt with similarly, and the assembly is lowered into position.

With the threaded parts of the spindles in the two columns centred in their swivel nuts, both handles on the tops of the columns can be revolved and run through the nuts until the plate rests solidly on the tops of the frames and can be fastened down with the four 6 BA bolts. After several attempts to enter two swivel nuts at the same time at opposite sides of the frames, you get quite clever at it.

You then have various links to connect: the steam cylinder piston rod to the brake shaft arm, the hand brake lever to the brakeshaft arm, the back damper link to the door, the front damper link to a bell crank, and then a link to the front damper door. All are connected with 10 BA bolts. The number of different shaped box spanners which I had to make was nobody's business.

Then began a fascinating piece of work, the double-scoop water pick-up, all made from 18-gauge hard brass. I began the rectangular pipe with a flanged joint to connect to the bunker water space; I cut four pieces of metal to shape and cut out the flange plate and fitted it over one end. The plates were lightly bevelled on the outside edges and the whole was held tightly together with the flange. Several steel plates 3/32 in. thick were cut with a gap in them and pressed over the work to hold them together.

The whole was silver soldered. Except for a little running in the end of the open mouth of the pipe, it turned out fine, a silver line on all corners inside the pipe and a lovely clean bore amply repaying me for the rather tedious work of fitting five pieces of metal together.

Next came two pairs of hinges, made as small as possible A piece of silver steel strip 3/32 in $\times$ $\frac{1}{2}$ in. was drilled No 57 across the $\frac{1}{2}$ in. and supported on a piece of b.m.s. flat held on the topslide and slotted 3/32 in. deep, two male and two female. It had to be a tight fit without side play to prevent wobble on the lifting scoops.

Each piece was then thinned down behind the hinge loss to half thickness and was then sawn off the bar. The same was done with the four pieces. They were completed by 3/64 in. pins, and then the two scoops were fabricated and silver soldered as before, with their halves of the hinges.

For the operating gear you need two slotted links, offset to clear each other and held in a wide jaw of a lifting link which connects at the top with the rocking arm from the column spindle. You have to line up the column operating spindles outside the frames, and take your rocker arm spindles inside, with the lever attached. The necessary bearings also have to be made because the fireman must have a clear area to shovel his coal.

The scoop at full size is 10 in. wide $\times$ 6 in. deep. Mine is $\frac{5}{8}$ in. wide $\times$ $\frac{3}{8}$ in. deep, exact scale. Inside the mouth of the pick-up pipe is a flap valve, which on a tank engine prevents the water from going to waste through the other scoop. Well, as my dear friends at the club said, there is one there.

I used 18-gauge hard brass sheet. The sides and back were cut to shape, and so was the bottom. Much $\frac{1}{4}$ in. and $\frac{3}{8}$ in. $\times$ $\frac{1}{16}$ in. angle brass was tinned, riveted and sweated on before the sides, back and bottom were joined up. The coal bunker section I made the same way. I cut the coal rails and bolted them to the sides and end of the bunker with small steel angle, home-made, with a square edge. In the bottom I riveted and sweated pieces of $\frac{1}{8}$ in. plate. I drilled and tapped holes for water connections.

The connections outside the frames carry the water to left and right LBSC injectors. On all GER tender engines and on some tanks, each side of the cab at the rear of the driver's and fireman's seat, and just protruding above it, is a 4 in. flat handle on a spindle which operates the water valve to each injector. And so I had to make two water valves. I turned them fron phosphor bronze rods and made them big enough for a flange to hold three 8 BA bolts to the underneath of the outside footplate.

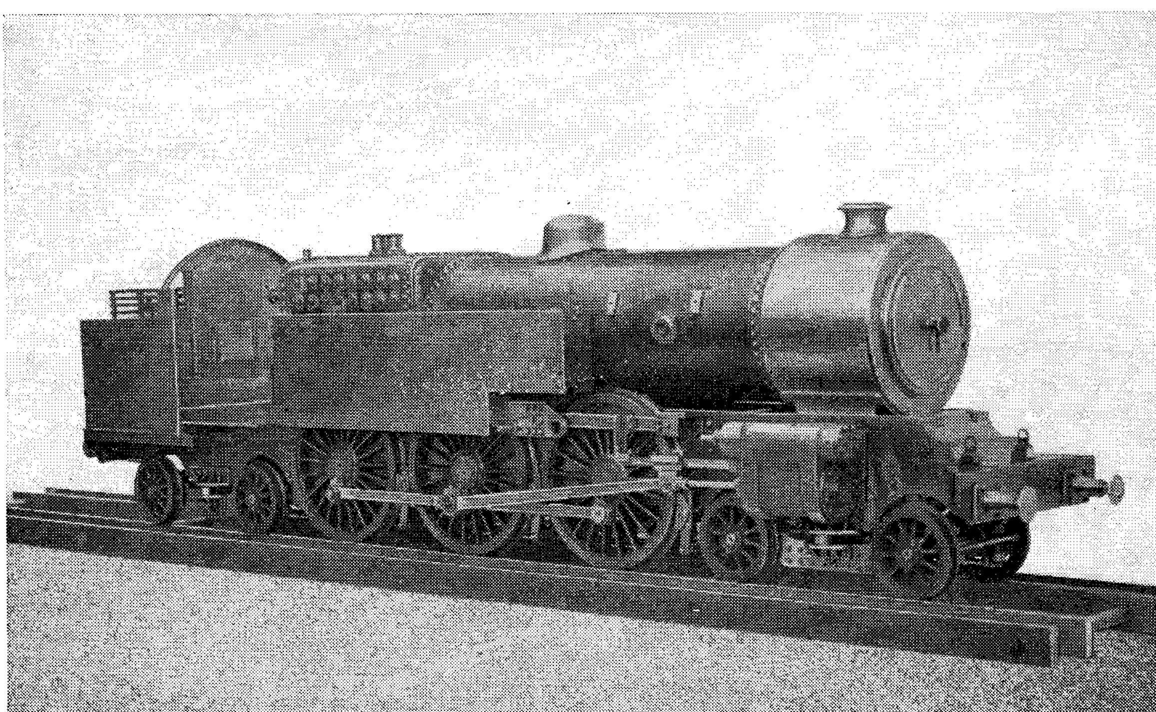
The spindle of the valve was machined with a boss on the end and was drilled and drifted out to fit the valve. A square was cut on the other end; on it fits the little handle.

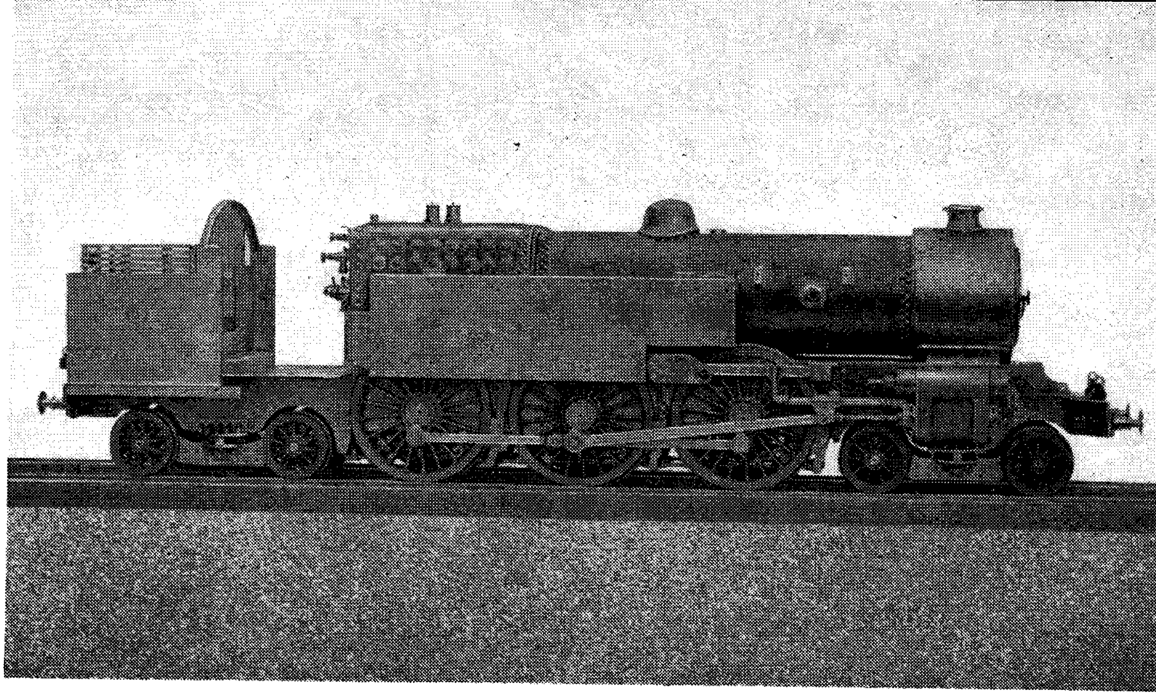
I had quite a problem with the equalising pipes which connect each side tank to the bunker. The pipes on the big engine present no problem as they are iron castings. But they have a bend at each end at 90 deg., so sharp that no tube of $\frac{9}{16}$ in. o.d. can be turned in. After much thought I remembered that many years ago sharp round bends, of $\frac{1}{8}$ in. gas and upwards, were made in malleable iron.

Making straight for an old-established engineering shop, I described the article for which I was looking, and suggested that it might be found in an old box in some corner, or on a top shelf. The assistant quickly found a box which looked promising. I said " Tip it over, son," and in a very varied assortment I discovered six $\frac{1}{8}$ in. gas round elbows. For a couple of shillings I had them all.

Setting them up in the four-jaw, I machined out the threads. I made four square flanges with a spigot on both sides, and drilled four 8 BA bolt holes in each of them. Then I tinned them on one spigot and tinned the elbows with plenty of Baker's fluid. I pressed one in each elbow. From a piece of $\frac{5}{8}$ in. brass rod I cut two pieces of the required length, drilled them, and turned down the outside diameter to $\frac{9}{16}$ in. I stepped down each end, tinned them, pressed them on the elbow at each end, and heated and sweated the lot.

After drilling the 8 BA tapping holes and tapping them all I put a joint washer on the flange spigots and





bolted up. You can see a little of them behind the cab footsteps.

The water pick-up had to be fitted to the centre of the bunker underneath the coal door. I made a brass T-piece with the centre hole backing on to the end plate of the bunker and the other two holes going outwards about 30 deg. The fitting was tinned in each of the two holes and on the face of the centre hole, which also had a flange face on it large enough to pick up the holes in the flange on the outside scoop pipe.

Two pieces of $\frac{3}{8}$ in. bore pipe were then bent in as big a radius as I could get under the coal bunker, and measured off to come up the water space at the sides of the bunker. They were tinned and gently forced into each side of the three-way fitting until they were in position. Then they were heated and sweated up.

There is also a central feather, made by drilling both holes to the centre of the T-piece at the angles. Each pipe is bracketed to the tank sides against the vibration and is finished with the proper shaped umbrella.

Windows were made for the bunker. Each window was marked out, drilled with a series of $\frac{1}{8}$ in. holes, and filed to the scribed lines. Then the outside was painted about $\frac{1}{8}$ in. wide all round the edge with Fry's paste heated up and wiped off. I set the dividers to a full $\frac{1}{16}$ in. and scribed a line all round the window. To show the line I used odd-shaped offcuts of 18-gauge brass. I tinned the back and drilled a small hole in the middle. Using a 6 BA bolt, and a small piece $\frac{1}{8}$ in. × $\frac{1}{4}$ in. strip for a clamp, I reset the piece of plate, inserted the bolt, and put the clamp on and tightened it. I drilled several 1/32 in. holes and lightly tapped in a brass wire.

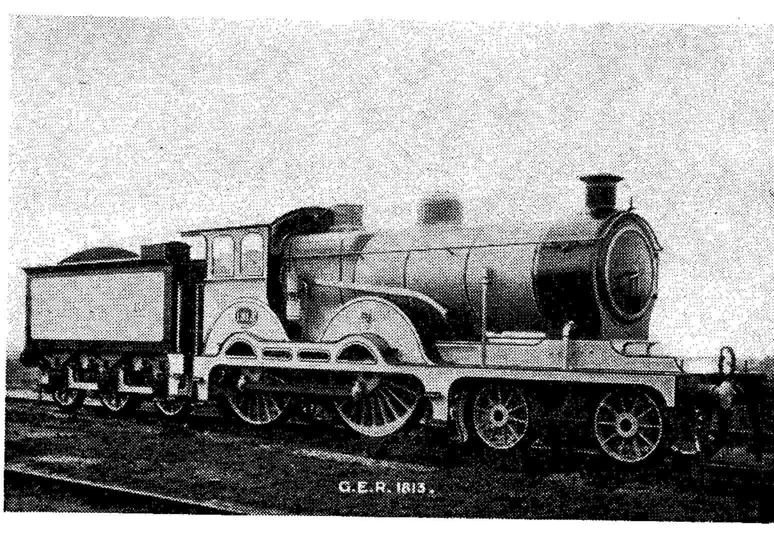
Heat up, wipe all surplus solder away from outside edges, drill out, and carefully file the the size of the window. You than have a lovely brass edging $\frac{1}{16}$ in. wide—1 in. on the big engine.

I clamped my parts with the windows in on to a piece of flat steel plate—a slab of machined steel 6 in. × 12 in. × $\frac{3}{4}$ in. given me by a friend. File the brass edging to a bare 1/32 in.; you cannot be too careful on this operation.

For the window I used Perspex. You must clear the edge of the outside brass beading.

I put much work into the driver's and fireman's food and clothes cupboards, one each side backing on to the cab side of bunker. They have upturned edges on the shelves, so that the food basket or tea-can does not jar out if the door is open.

Smaller hinges still were made to hang the doors on. The doors are locked by a handle and latch. On the top of the driver's cupboard are spare lamp irons, and on top of the fireman's side are spare destination-plate irons. A chain and spike are fitted to the coal door.




★ *To be continued on May* 31

# A TAPPING MACHINE

**MARTIN CLEEVE based this device on an old Sturmey-Archer three-speed gear. The work, he says, is much simpler than it seems and can be done with a model engineer's lathe**

At first I thought of making a tapping attachment for the drill press, but as an attachment would always be in the way, I made a separate machine—a course which, on the whole, was simpler, as it is often easier to design a complete thing than to be restricted to sizes and shapes already settled.

To start taps squarely in their holes I had formerly put the tap in the drill chuck and (with the work held in a drill vice, prevented from turning by resting against my trousers) had caused the tap to enter a few turns by feeding with the right hand and pulling the belt with the left. Then it was backed out, and the job was finished with a tap wrench in the usual way. All this, of course, was rather exasperating.

I found the requirements for a tapping machine rather peculiar compared with the single direction of rotation and simple in-feed for a drill press. A tapping machine calls for a comparatively slow speed with high torque. Some sort of overload release is needed to prevent tap breakage, and the taps must be fed and backed out from one control point, leaving the left hand free to hold the vice and work.

My machine is based on an old Sturmey-Archer three-speed. The parts used are the spindle with its integral pinion, the outer gear ring with its internal teeth, and the cage with four gears. In an experimental run with the three-speed spindle held in the drill chuck and revolving backwards, I found that holding the cage with the four gears caused the gear ring with the internal teeth to revolve forwards at a speed of one-third that of the central and backward revolving spindle.

It was then fairly simple to design a suitable dog-clutch arrangement whereby a normal downward feeding, as for drilling, caused the tap to press upon the work and the in-feed dogs between the chuck spindle and the internal tooth gear ring to engage, thus screwing in the tap. For backing out, a reversal of the feed by the capstan handle first disengages the in-feed dogs, and a further slight reverse bias on the feed then engages the backing-out dogs directly the backward revolving spindle and the chuck spindle. As soon as the tap is wound free of the work, the chuck spindle dogs assume a neutral position between the sets of oppositely revolving dogs.

The holding of the four-gear-cage consists of an arrangement in which a lever, fixed to and projecting from the cage (or cage extension boss), is prevented from rotating by being made to press against a pivoted bar restrained by a pair of springs which can be adjusted for tension to suit the size of the tap. Thus, if the tap "bottoms" or binds, the pressure upon the restraining bar is increased and, if the spring tension has been set properly to suit the tap size, the restraining bar is pushed to one side, allowing the four-gear-cage to revolve (backwards) instead of the tap (forwards).

As the machine is not a high-speed one, there is ample time, after the torque arrangement has tripped, to engage the reverse or backing-out dogs before the four-gear lever again strikes the restraining bar, although, of course, a repeated overload tripping does nothing except waste time.

You can adjust the machine to take taps of from No 6 BA to $\frac{5}{16}$ in. BSF. When it is so set, it can be relied upon to trip even when a No 6 BA tap bottoms in mild steel.

The general behaviour of the machine has decided me not to increase its capacity to suit $\frac{3}{8}$ in. taps although it will start a $\frac{3}{8}$ in. BSF taper tap sufficiently for later hand-finishing without going off-square.

I had great difficulty in making a friend understand that the machine was not built for production work and that I regarded it as a toolroom machine to help with one-off jobs. A production tapping machine which I have seen, with a capacity similar to mine, has a slowest speed of 1,000 r.p.m., whereas I am content to jog along with only one tapping speed of 100. My machine uses ordinary carbon steel cut-thread taps, although higher speeds would no doubt be possible if machine taps were to be obtained, as these, owing to their specialised design, require less power and have less tendency to clog with chips.

My motor, from Government surplus, has a speed of about 2,800 r.p.m. and an estimated horsepower of about one-tenth—just enough to tap $\frac{5}{16}$ in. BSF with a reasonable percentage of thread (85). The power needed for greater percentages of thread increases enormously as 100 per cent thread depths are approached. But as 100 per cent threads are seldom called for, this will not worry us.

The motor drives the chief machine spindle through the front-to-back horizontal shaft. There is a 1-2 1/3 pulley-and-belt reduction between the motor and this shaft, and a 1-4 reduction between the bevel gears; the epicyclic gears introduce a final 1-3 reduction in the tapping-in direction.

In the tapping direction the final speed reductions of 1-12 are through gears, so that the necessary high torque has been obtained without a call for large diameter pulleys and heavy belts.

The bevel gear arrangement allows the motor to be mounted on top of the machine, where it takes up the least useful space. The motor platform is carried on two vertical $\frac{3}{4}$ in. dia. rods, supported in block-bearers at each side of the machine column—a method which makes the height of the motor and the belt tension easily adjustable.

Of course, I could have saved myself the trouble of making bevel gears by having an ordinary gear reduction at that point, and using a horizontal belt drive similar to the one for a drilling machine. But sometimes it is pleasant to break away from the usual methods.

The tapping mechanism and feeding arrangements call for three supporting arms or brackets. The upper two are used to support the main spindle and rack-fed quill as in an ordinary drill press. Between the central and bottom support are the epicyclic gears and dog clutch arrangements. To exclude dust and to retain a certain amount of oil, the Sturmey-Archer three-speed components, after the necessary bushings, dogs and so on had been fitted, were covered in with mild steel shells or flanges.

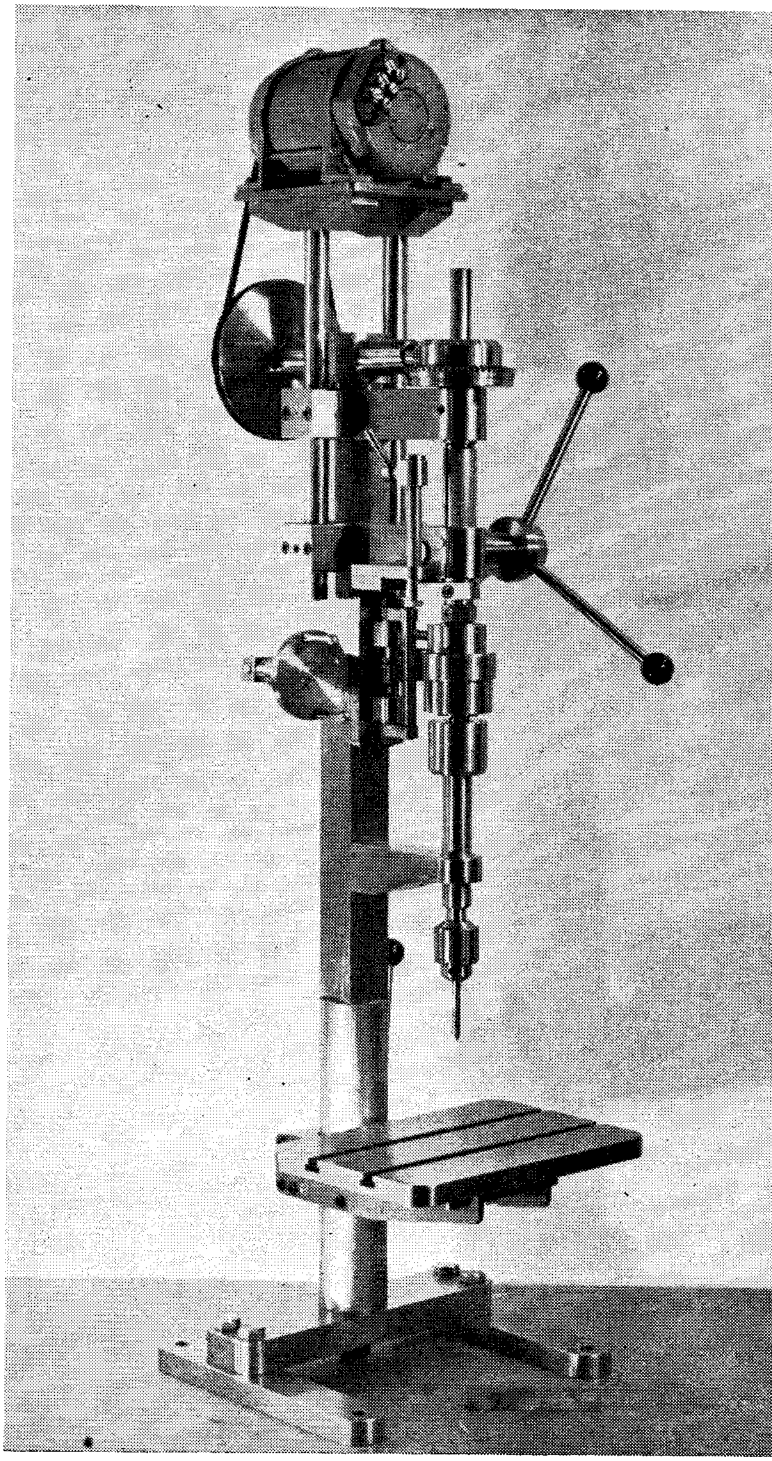
You will see additional mechanism mounted on the machine column behind the epicyclic gear housings. This is the adjustable torque tripping arrangement.

Here are more leading dimensions: quill movement $2\frac{1}{2}$ in.; throat $3\frac{11}{16}$ in.; table size $9\frac{1}{2}$ in. × $6\frac{3}{4}$ in.; T-slots for $\frac{3}{8}$ in. bolts; maximum chuck to table $8\frac{1}{4}$ in.; maximum chuck to floor 12 in.; bearings, ball and plain; overall height 3 ft 4 in.; total width $10\frac{1}{2}$ in.; depth 13 in.

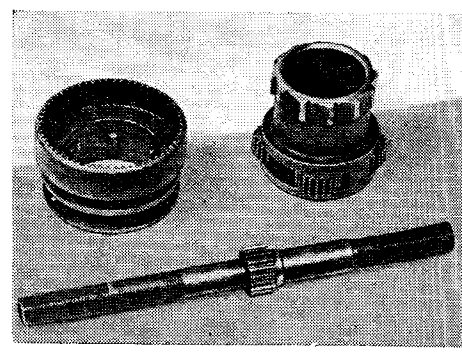
The round column for the table is a $9\frac{3}{4}$ in. length of $2\frac{1}{8}$ in. dia. mild steel, and the square column which takes most of the mechanism an $18\frac{3}{4}$ in. length of $1\frac{1}{2}$ in. square bright.

Although the construction of the machine may seem rather complicated, it is, in fact, fairly simple. Everything can be done easily with the average $3\frac{1}{2}$ in. lathe, but it is only fair to say that the three-speed spindle or pinion shaft needs a toolpost grinder to eliminate the threads. The ratchet teeth must be ground from the four-gear cage extension. If they are ground off by hand at first the toolpost grinder need be used only for a final true-up. No doubt an outside firm would undertake the work at a modest cost; great accuracy is not called for—merely smoothness. Bushings are afterwards made to suit.

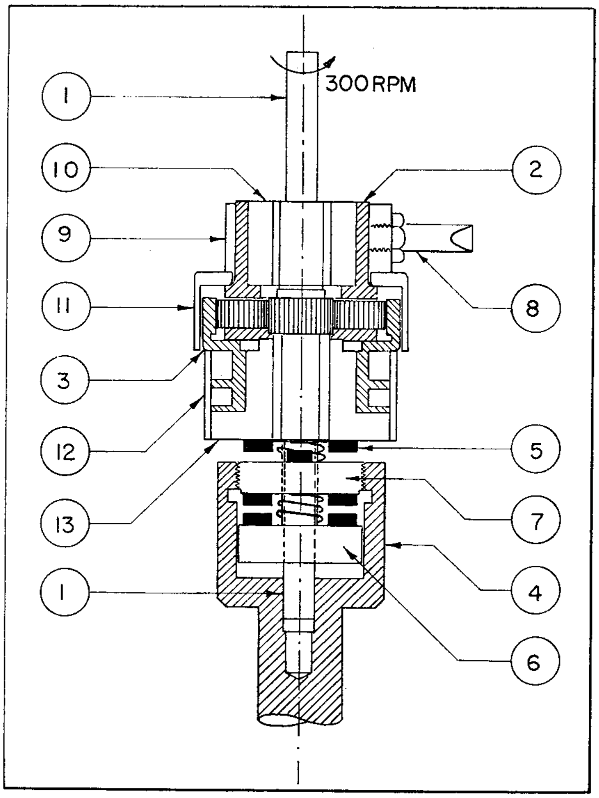
When I am tapping holes, I invariably hold the work in the drill vice (details of which were given in MODEL ENGINEER for 19 April 1956). Resting on the work-table with a piece of moderately thick card interposed to reduce a tendency to slipping, it has sufficient weight, and provides

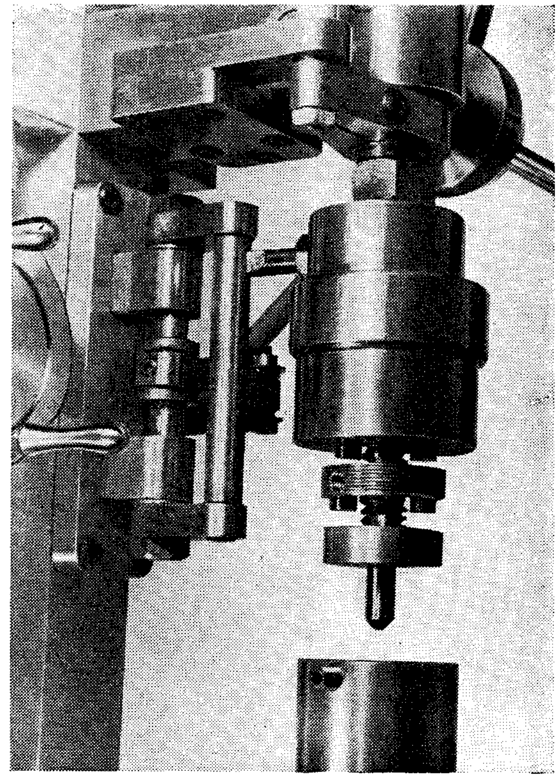


*Since this photograph of the tapping machine was taken, the capstan feed levers have been a good deal shortened. Tapping does not require greater pressure than is enough to keep the dogs engaged and to start the thread*



*Parts of a Sturmey-Archer three-speed gear used to get an "in-line" forward and reverse. They are seen before the bushing. The gear ring is on the left and the four-gears cage on the right, with spindle and pinion in foreground*



1. *Three-speed spindle with integral pinion. Driven " backwards " at constant 300 r.p.m. Lower end passes through* 7 *and bears in* 4. 2. *Cage with four gears; when prevented from turning by holding* 8, 3 *revolves forward (for tapping) at* 100 *r.p.m.* 3. *Gear ring with internal teeth.* 4. *Houses backing-out dogs and carries tap-holding chuck at the lower end.* 5. *Screwing-in driving dogs. Downward pressure on* 1, *as for drilling, presses dogs* 5 *into engagement with the upper dogs on* 7. 6. *Backing-out driving dogs. A retracting feed on* 1 *lifts* 6 *and engages dogs on* 6 *with lower dogs on* 7, *unscrewing tap at* 300 *r.p.m.* 7. *Dog carrier with driven screw-in and backing-out dogs.* 8. *The holding bar or arm which is released on overload.* 9. *External sleeve (force-fitted to* 2) *holding* 8. 10. *Bushing for* 2. 11. *" Shell " dust and oil cover for* 2 *and upper part of* 3. 12. *Sleeve cover for lower part of* 3. 13. *Bushing inside* 3 *holds dogs* 5. *(All are parts of cycle gear)*

*Covered epicyclic gearing with chuck shaft unscrewed and dropped, showing the dog teeth and the neutralising or equalising springs above and below the threaded component. At the left is part of the overland trip arrangement, and at the extreme left is the torque adjusting handwheel. Shown further up is part of an adjustable depthing stop*

sufficient hold for the left hand, to make further and more elaborate arrangements unnecessary. But in engaging the reverse dogs to back-out, you must remember to apply a little more downward pressure to the vice and not to bias the capstan feed in the out direction with more than enough pressure to overcome the equalising spring between the dogs. Otherwise the vice will be lifted from the table.

So far, I have found the best lubricant for the taps to be castor oil—veterinary, about 23s. a gallon from Boots. I have had the machine for about four years and have broken only one tap: a No 6 BA, during the first trip spring fitting and testing.

A rather inefficient torque trip test with crude levers and weights gave these results:

| No of turns on torque adjusting handwheel | Torque lb.—in. |
|---|---|
| 1 | 9 |
| 2 | 10.5 |
| 3 | 11.75 |
| 4 | 12.25 |
| 5 | 14.75 |
| 6 | 15.5 |
| 7 | 17 |
| 8 | 18.5 |
| 9 | 21 |
| 10 | 22.5 |
| 11 | 24 |
| 12 | 29.25 |

Provided that you do not attempt to get 100 per cent threads, " seconds " taps can be made to do all the work. ■

## MILES ENGINE

*Model Engineer* has been informed by Mr Basil Miles that his range of Diesel and Glow engines are now being manufactured exclusively by himself. In the past all Miles Engines were manufactured, distributed and sold through E.D.—all engines of 8 c.c. and upwards. Enquiries should be sent to B. Miles direct. At present the engines are produced only to order and therefore do not come under the normal arrangement of wholesaling. The wholesalers for the 5 c.c. engines are Ripmax Limited.

# CROMFORD AND HIGH PEAK

***G. NIGEL KING** rode on a line which was planned at the time of Stephenson's first triumph and is working today among the lonely hills of Derbyshire*

LAST summer I paid a short visit to the Cromford and High Peak Railway, in Derbyshire, a museum piece whose mode of operation has stepped straight from the early nineteenth century. It was sanctioned in 1825 and opened in the early 1830s, running for 33¾ miles from the Cromford Canal at Cromford Wharf to the Peak Forest Canal at Whaley Bridge. About half this length is in use today.

My first visit was to Cromford Wharf, where the workshops are down a short alleyway from the A6 trunk road. In the shop several sections of the original cast-iron fish-belly rails are in use, supported on stone blocks. They are 4 ft long and weigh 84 lb. each. The works are surprisingly self-contained and many of the wagons working on the line are repaired there. The equipment includes the beautiful old hand-worked drilling machine.

Cromford Canal is now disused, and traffic is worked on to the line over the three-quarter mile link from the Derby-Manchester main line at High Peak Junction to Cromford Wharf, opened in 1855. As the foot of the Sheep Pasture incline is outside the Cromford Works, the J94 0-6-0 saddle tank which runs on this section does not have a very arduous duty.

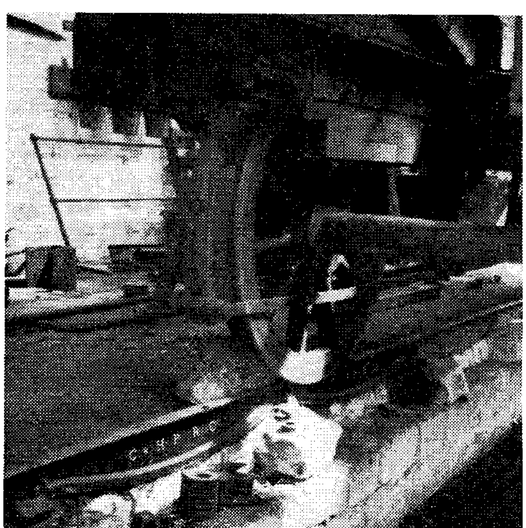
The Sheep Pasture incline is 1,349 yd long—the lower half at 1 in 8 eases to 1 in 9. It combines two inclines, joined in 1855. At the foot the continuous wire cable passes round a large horizontal idler wheel which is mounted under the track on ratchets, to adjust the tension. Wagons are lashed to the cable by chains, criss-crossed round it and then tied with leather thongs at the ends. One chain is allowed to take 19 tons load.

Near the foot of the incline, just above the A6 road bridge, is a large catchpit designed to prevent a recurrence of the spectacular runaway in 1888, when some wagons left the rails at the sharp curve at the bottom of the incline and leapt both the canal and the Midland Railway. The pointsman here does not set the points for the lines round the pit unless the gongs operated by treadles, 200 and 100 yd above indicate that the speed of the wagons is normal.

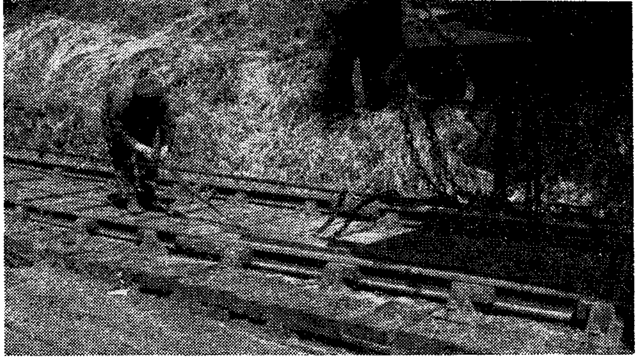
The winding engine of the Sheep Pasture incline can be reached from Cromford Wharf by a stiff scramble up the slope from the A6 or, more easily, along the railway from the Cromford-Wirksworth road. The original winding gear is still in use but the winding engine is of the locomotive type with 17 in. × 24 in. cylinders, mounted cross-wise near the back of the house. It replaced the old beam engine in 1883.

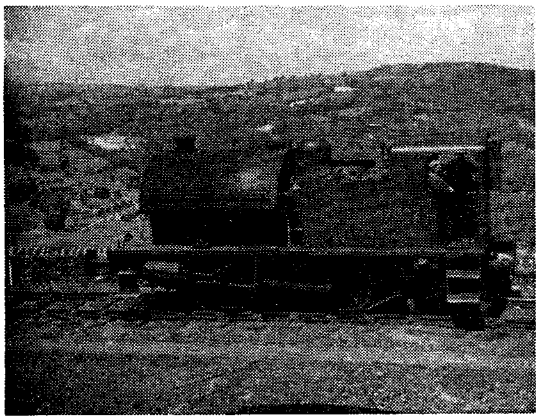
From Sheep Pasture top there is a level 1⅝ mile to the foot of the Middleton incline, with a branch to the big limestone quarries in Middleton village This line is worked by a quaint 0-4-0 saddle tank with a fine Derbyshire scene 400 ft below. The engine, built as recently as 1953, is suitable for the line as it is light enough to be worked up and down the Sheep Pasture incline for repairs.

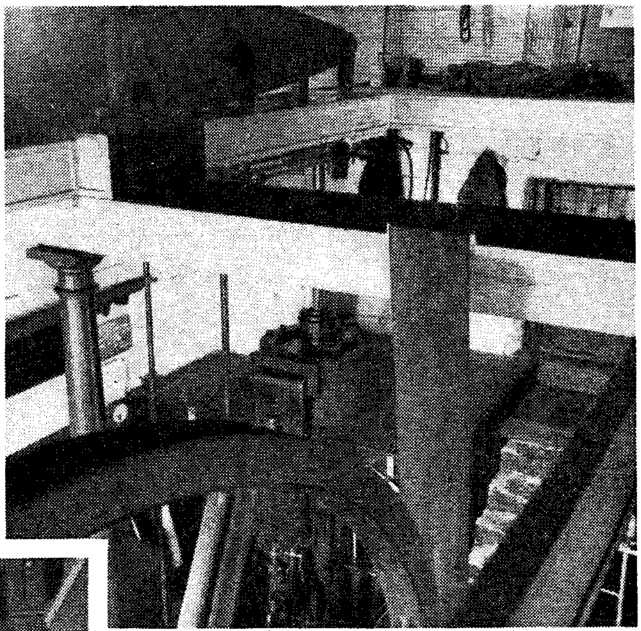
Middleton incline is 1,100 yd long at 1 in 8½ and its winding engine is the original made by the Butterley Company in 1829, with two condensing engines coupled together and 25 in. × 60 in. cylinders working at 5 p.s.i. Steam was supplied until recently by two Cornish boilers which are still

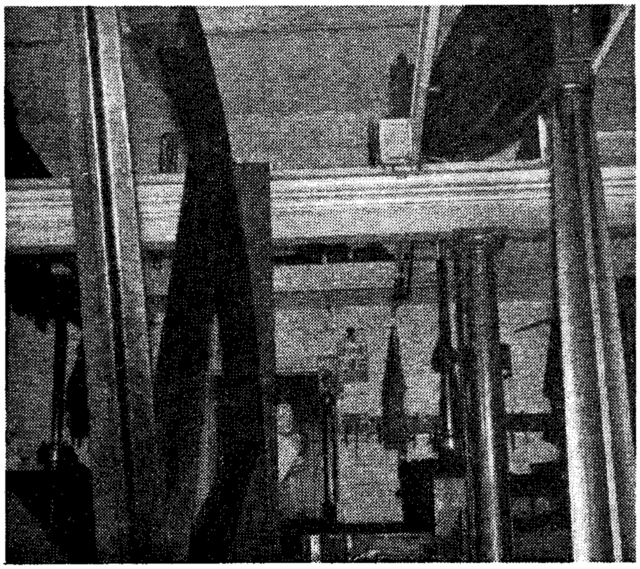


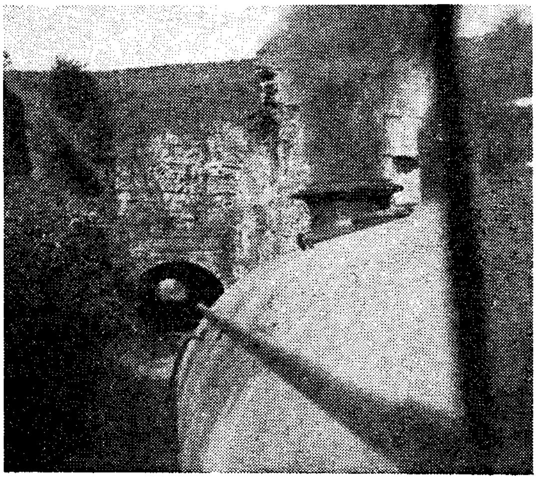
*Works at Cromford Wharf. Cast-iron tram rails marked " C. & H.P.R. Co." (left) and hand-worked drilling machine*





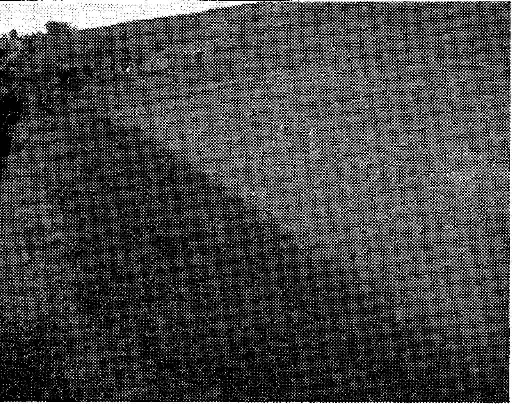


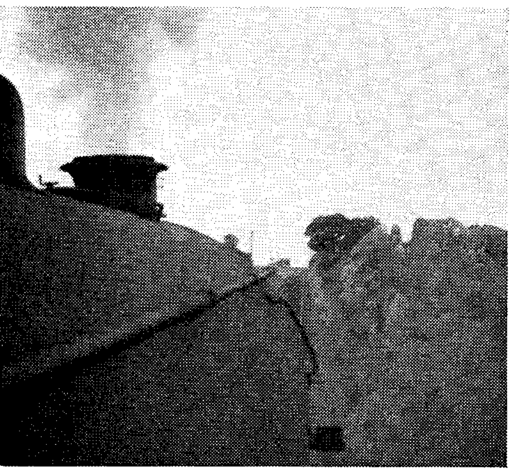


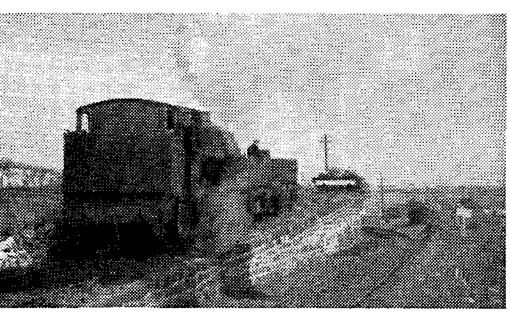


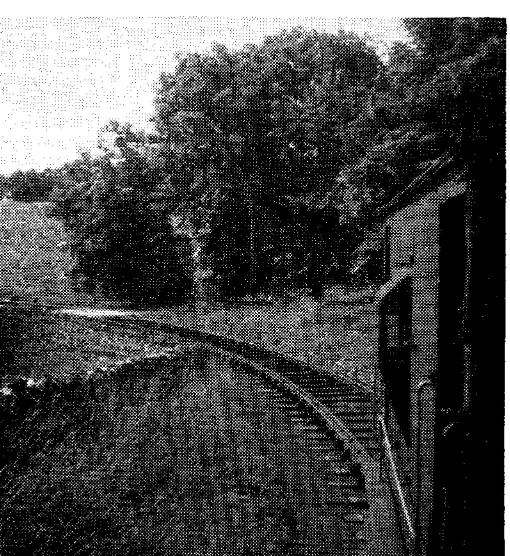
*Top: Two loaded wagons nearing the bottom of Sheep Pasture incline. The board says "1 in 8" (left arm) and "1 in 200." Centre: This tank built nine years ago (34 tons, 160 p.s.i., 15 × 20 in. cylinders, and 3 ft 10 in. wheels) is based on a 1932 Kitson design for the LMS. Above: Middleton incline winding engine belongs to the year that the* ROCKET *ran at Rainhill*

*Top: Untying wagons at the foot of Sheep Pasture incline. Wagons are lashed to the cable by chains. Centre: Until recently, Middleton incline engine was steamed by two Cornish boilers. The incline is 1,100 yd long at 1 in 8½. Above: Approaching the Hopton Tunnel. Hopton gradient is the steepest to be worked by adhesion on a standard-gauge line in Britain*









in position, but now an ordinary locomotive boiler mounted on a four-wheel chassis is used, pressure being lowered by a reducing valve.

The traffic worked on the inclines is mainly limestone down and water up, with empties of each in the opposite directions. As traffic is generally heavier downhill, the inclines are usually worked by balancing the load, with the boilers kept in steam to provide power if it is needed. Apart from the different engines, the layout and operation of both winding gears are similar. Speed is controlled by the huge brakewheel seen in two of the photographs. The inclines are in use during the mornings and up to about 1 p.m.

Through a pass kindly arranged by the Public Relations Officer of the London Midland Region, I travelled on the single freight train which leaves Middleton Top daily at 9 a.m. for Friden brickworks, where it makes connection with a trip working from Buxton. On arrival I found that it was made up of two full water-tank wagons and brake-van, headed by a J94 0-6-0 saddle tank built for the WD in the last war.

We soon set off towards the Hopton incline passing through the short Hopton tunnel. The Hopton incline, which was originally rope-worked, is 470 yd long, and 220 yd. are at 1 in 14, easing to 1 in 20—the steepest gradient worked by adhesion on any standard-gauge line in the country.

It is approached on a slightly falling gradient round a gentle curve on an embankment.

Small engines used until recently —for many years former North London 0-6-0 tanks—could make the ascent only by rushing the grade, passing a board with the words " Speed unlimited " soon after leaving Hopton tunnel.

There is a beautiful drawing of a North London 0-6-0 tank in a Percival Marshall book, *Locomotives Worth Modelling*, by F. C. Hambleton. The 0-6-0s were charming outside-cylinder side-tank engines designed by J. C. Park in 1879 and built at Bow Works, with 17 in. × 24 in. cylinders, and 4 ft 4 in. driving wheels. They weighed 44 tons and worked at a pressure of 160 p.s.i.

They came to this windswept Derbyshire line from their haunt in London's dockland in the early Thirties and were highly successful to only a few years ago—I just missed them on my first visit in August 1958.

I believe that they were allowed to work five loaded wagons up the Hopton incline.

The chunky J94 0-6-0 saddle tanks have 18 in. × 26 in. inside cylinders, 170 p.s.i. pressure, 4 ft 3 in. wheels, and a weight of 48 tons. They approach in a more restrained manner and mount the grade by sheer brute force. The incline is beside the Worksworth-Brassington road from which this spectacular ascent can be witnessed soon after 9 a.m.

From Hopton Top the line takes a fairly level but very sharply curved course, at about the 1,100 ft level. After two miles it reaches Longcliffe, where there are several sidings serving quarries. Water is brought to the quarries by rail.

There we left our two water-tank wagons, which were shunted up a steeply graded siding. In this high and dry limestone country the railway used to supply a number of outlying farms and cottages with water from Cromford Wharf, but recently the supply was condemned as unfit for drinking. No wagons were being worked forward and we continued to Friden with just the brake van. This was disappointing, as the train crew assured me that there was often a lot of traffic from here and a long train makes progress round the very sharp curves a difficult business. The sharpest curve, at Gotham, is only 2½ chains radius.

At Friden, where there is a large brickworks, we made connection with the pick-up freight from Buxton, headed by a former Midland 0-6-0. I left the railway here while our engine was busy shunting, making up its train to work back to Middleton later in the morning.

The Cromford and High Peak Railway is still used for a further 2½ miles on to Parsley Hay, 15 miles from High Peak junction. There it joins the old London and North Western Buxton-Ashbourne line, opened in 1894 and now closed to passengers. This line replaced the Cromford and High Peak Railway as a through-route to Whaley Bridge, though for about five miles on to Hindlow the newer line roughly follows the original on an improved alignment. A number of abandoned curves can easily be traced.

Apart from a length near Harpur Hill, three miles south of Buxton, which is still used to serve quarries and lime works, the line through to Whaley has long been abandoned. But in this bleak countryside the course can easily be traced and is well worth following.

Despite the archaic methods of operation, the Cromford and High Peak line keeps fairly busy. ▣

*Top to bottom: Hopton Incline ahead; J94 steaming to the summit; shunting full water-tank wagons at Longcliffe; and leaving Gotham Curve (2½ chains)*

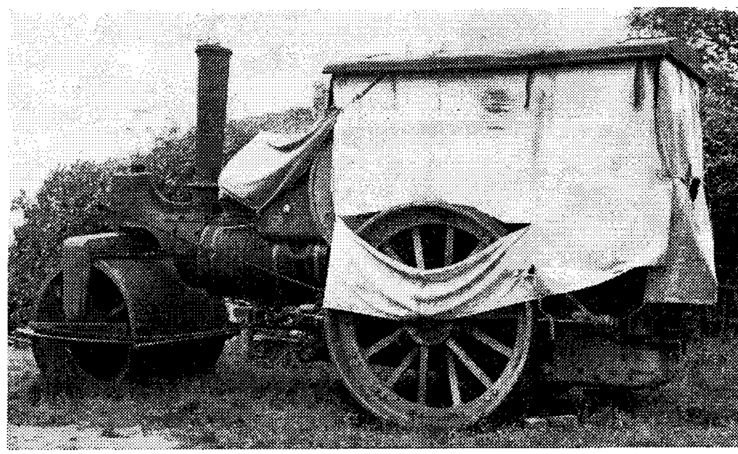
READY FOR THEIR PUBLIC Continued from May 3, page 541

# Beautiful in blue

By ROBIN ORCHARD

Pictures by Brian Western

*Above: Mr H. P. Whipps (centre) with an enthusiast on each side of him. Right: During the East Coast floods of 1953, this Aveling roller was stranded on a sea-front. Mr Whipps will renovate her*



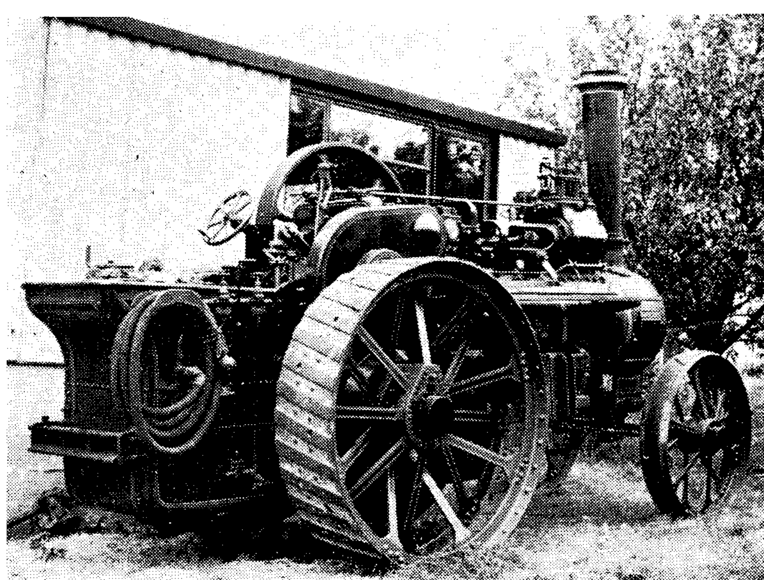
LITTLE *Kathleen*, the first engine owned by Mr H. P. Whipps of Woodton in Norfolk, was later sold to another threshing contractor. Eventually she came into Mr Whipps' hands. Her condition was excellent; all she needed was a good clean down and a re-paint.

She is an absolute charmer. There is something very attractive about these little engines.

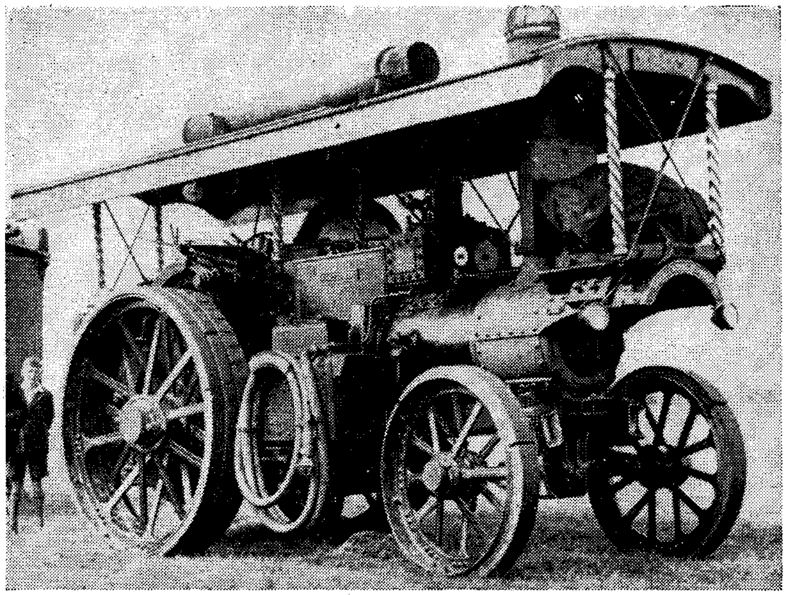
The latest addition to the fleet is an Aveling compound ten-ton roller. She was in service for many years with the Felixstowe Corporation before being sold to Tassey of Ipswich. Mr Whipps bought her earlier this year and intends to renovate her and add her to his stock. In the 1953 East Coast floods she was stranded on a sea-front.

Wherever there are traction enginemen, there you will find a club. In Woodton it is the Norfolk Steam Engine Society. Mr Whipps and his friends are, of course, members. About half a mile up the lane lives the chairman Mr G. C. Howlett. While there was still enough light, we paid Mr Howlett a visit. His home is Woodton Old Hall Farm, where a charming farmyard is set around a duck pond. As we walked up the drive, we could imagine the traction engines coming up, for it is on Mr Howlett's farm that the annual Woodton Rally is held.

Mr Howlett founded the rally movement in this part of the country, using one of his fields as the site. Last year so many people came along



*Little Kathleen, a 6 n.h.p. single-cylinder Garrett, was shipped out of Leiston in Suffolk 40 years ago*



*Mr G. C. Howlett's blue engine when it was still at work in the late 1930s*

that a large number had to be turned away. The club hope to have more room this year.

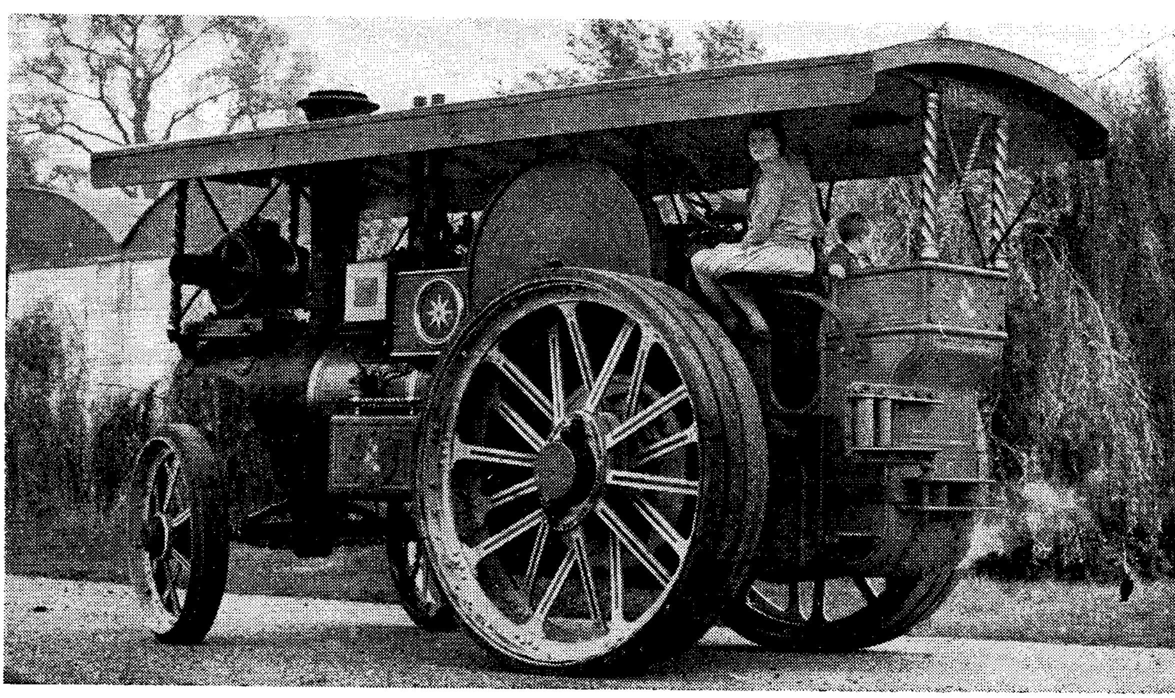
We walked through a gate into the farmyard. It was peaceful; the lowing of new-born heifers and the cackling and squabbling of the geese on the pond seemed a part of the calm. Beside the pond, quietly hissing, stood a small showman's engine; it is Mr Howlett's own machine, the 6 n.h.p. three-speed d.c.c. sprung-mounted Burrell No 3343. When she first left Thetford in 1911 she was probably maroon, but today she is blue, the only blue showman's engine I have ever seen. Some dyed-in-the-wool traction enginemen may be muttering: "Bah, showmen's engines should be maroon—they're never blue." Nonetheless Mr Howlett is justified in keeping his Burrell that colour. She was originally new to Mr Durmer of Jedborough who kept her until 1922 when she was sold to Mr Stocks, a Norfolk fairground man, who still operates in the area.

It was after this date that she adopted the blue livery. Mr Howlett intends to keep his local engine as she was when Stocks owned her.

Until 1933 she was mounted on metal wheels, but soon after that date she seems to have been fitted with rubbers. In 1956 Mr Howlett bought her. As she was in very good shape, he has not had to carry out much restoration. He keeps her at the farm and the Woodton rally is virtually her only public appearance.

By this time the winter light was growing weaker and the mist was rising. We spent about half an hour touring the farmyard on this beautiful engine and then, all too soon, it was time for us to leave.

On our way back to London we thought of the happy day which we had spent. What friendly and helpful people are the traction engine enthusiasts! Nothing is too much trouble for them. ▣



*Blue engine in retirement at beautiful Woodton Old Hall Farm*

*Fig. 1: With Wigan's Hugh Duckworth at the regulator Sydney Christopher's Allchin hauled well over a ton*

# GETTING IT RIGHT

## A few words of advice to model traction engine builders who have run into snags

*By W. J. HUGHES*

MAY be it is the rallies; may be it is just another swing of the pendulum. But whatever the reason, there is an upward trend in the interest shown in model traction engines.

Many more are being built than in previous years, and a great many constructors favour the Allchin design which I fully described in MODEL ENGINEER.

From time to time queries come in from those who are puzzled by one detail or another, and, of course, I always do my best to answer. But sometimes the querist could have found the solution by studying the drawings. A recent query concerning the Pickering governor was a case in point, where almost all the answers could be found on sheet 14 of the plans.

A question which crops up occasionally concerns the injector, which on the drawing is specified as that designed by LBSC for his *Petrolea*. The answer here is that there is no *particular* virtue in that specific design: I do not claim to be an injector expert—or indeed any other sort of expert—and in that field I preferred to use a known design.

But any other successful injector design (by LBSC or anyone else) can be used. It should be near to scale, though it is true that it is more-or-less hidden by the hind wheel rim. Most designs will need to be fitted to an elbow on the water-cock to bring the body of the instrument parallel with the side of the tender.

To fit or not to fit rubber tyres is a regular query, and here my own preference is to leave the wheels without them. They were not fitted

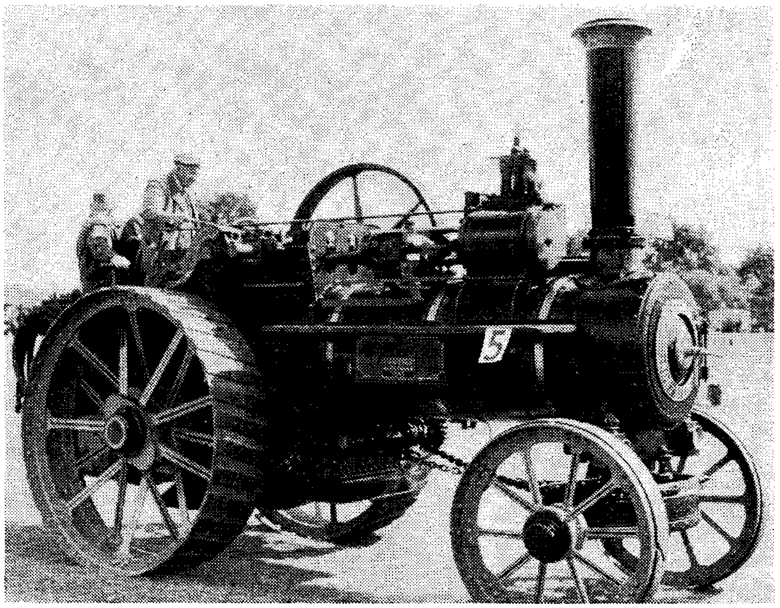
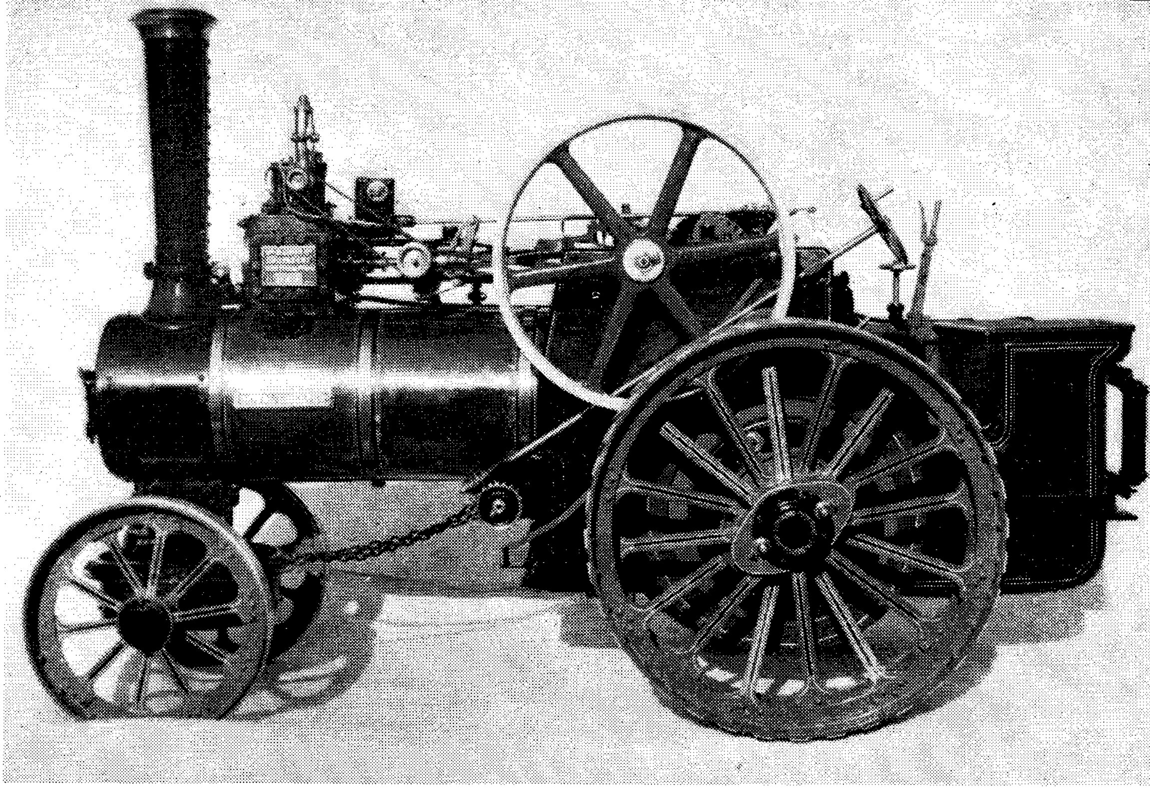
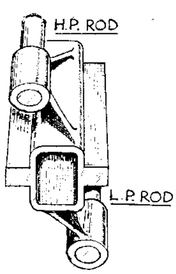


*Fig. 2: Thirty-five years after he first drove her out of the maker's works, Harry Matthews finds* ROYAL CHESTER *as responsive as ever*



*Above, Fig. 3: Scunthorpe reader J. H. Lynam built this fine example of the 1½ in. scale Allchin traction engine. Below, Fig. 4: Driver's view of the Burrell s.c.c. crosshead*




to the full-size engine and I shall not fit them to my small sister, because I want her to look as much like the prototype as possible.

One must admit that they give a bit more adhesion—Sydney Christopher's engine in the accompanying photograph was rubber-shod on the hind wheels when hauling the Rover car—but, on the other hand, Bob Page's Allchin on steel strakes has hauled a ton-weight MG. For ordinary passenger-hauling I think that the standard wheels will answer most needs.

A recent querist asked if there were tyres on the market, to which the answer is no. Anyone wishing to fit rubbers to the Allchin (or any other traction engine) will have to devise his own. Sydney Christopher, I believe, cut long strips from thick rubber matting, and wrapped them round his rims, using scarphed joints cemented with Bostik adhesive. I have also seen V-belts used side-by-side on the rims: another constructor obtained some rubber jointing-rings which were just right.

A friendly enquirer from South Australia wanted to know the colour on the inside of the wheels, and whether there was any lining there.

The inside is coloured the same as the outside. As to the lining, the inside of the front wheels ought to be done, but not the hind ones.

The same enquirer asked if the Allchin transfers were still available. They can be bought from Messrs Reeves at 3s. a pair.

A question not concerned with the Allchin was asked by a reader who has taken ME for 40 years. He did not remember ever seeing a drawing or sketch of the cross-head of a Burrell single-crank compound engine. Neither do I! Nor, in fact, have I ever come across an official drawing of one.

However, here is a sketch which is substantially correct, though obviously not dead to scale. It is a kind of box-tube with extensions at the sides which slide between the two pairs of guide-bars. On the top and bottom sides there are webs carrying the bosses into which the two piston rods are cottered. (A scale drawing of the cylinders, guide-bars, valve cross-head, governors, and so on, does appear in my book *A Century of Traction Engines*—Fig. 112, page 169.)

I hope readers will like the photographs accompanying this chat. Fig. 1 has been mentioned already: Fig. 2 was sent me some time ago by W. Linfield of London, who is himself building one of the finest 1½ in. scale Allchins I have seen. It shows big sister as she has been reconditioned by her present owner, Malcolm Rostron of Beckenham.

At the regulator on this occasion was 80-year-old Harry Mathews—now, alas, laid low in hospital—who was her very first driver of all when she came out of the Allchin works in 1925.

The engine in Fig. 3 was built by Jack Lynam of Scunthorpe, where it was adjudged the best model in the model engineering section of the Arts and Crafts Show.

I did not see it, but I was told later (by the judge himself) that it was a very fine effort indeed. It certainly looks it. Mr Lynam wrote me that she runs well and that he greatly enjoyed building her. She must have been a terrific contrast to the huge draglines on which he normally works as a maintenance foreman! ▣

# AUTOMATIC SIGNALLING

*J. R. W. HESLOP says that the system used by the model engineers at Middlesbrough could be introduced at almost any track*

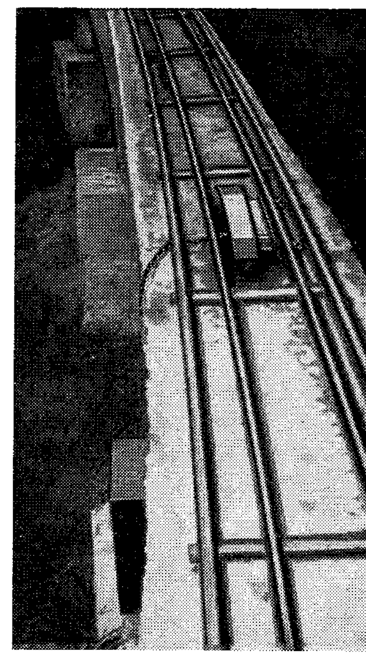
MIDDLESBROUGH live-steam track has a fully automatic signalling system which may be installed almost anywhere without need for insulated sections of rail. One vehicle on each train must have a strike bar to operate the track switches—but this is normally easy to arrange.

The circuit is shown in Fig. 1 and the wiring in Fig. 2.

With 12 v., car batteries can be used when power cannot be brought from the mains through a transformer. Relatively large voltage drops are liable to occur when signals are at some distance from the power supply. With battery operation, the drop can be reduced by providing the smallest bulbs consistent with good visibility —a measure which is desirable in any event, as we want the longest possible running period between rechargings. When a transformer is used, the drop may be overcome by a slightly higher voltage—perhaps 15 or 16.

Lights are switched by the relays (RLA and so forth), which in turn are controlled by the track switches (SA)—micro-switches of the single-pole changeover type, biased in the position shown in the circuit diagram. A green light is displayed when the associated relay is energised, and a red light when it is de-energised.

To understand the working of the system, imagine a train passing from left to right along the line of track switches, and about to pass over switch SA; in these circumstances signal *A* should be showing green, while the previous signal, *D*, will be showing red. As the train passes over, the switch is momentarily operated by the striker bar on one of the vehicles, and the coil circuit of the relay *RLA* is broken, the relay having previously been energised through its self-hold contact *A*2 and the normally-made contact of switch *SA*. The changeover contact *A*1 then switches the power from the green to the red light of signal *A*. At the same time the other contact of switch *SA* is made, momentarily applying power to the relay *RLD*, which then self-holds through contact *D*2, and switch *SD*, and changes signal *D* from red to green, thereby clearing



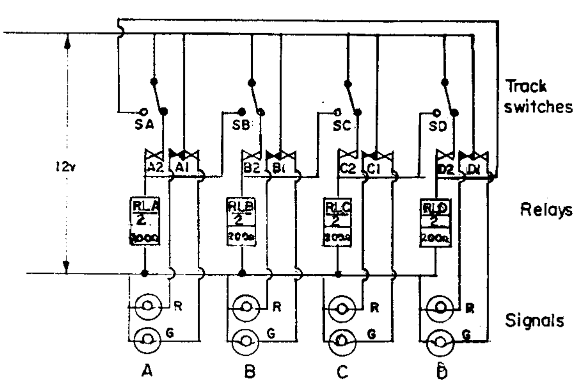
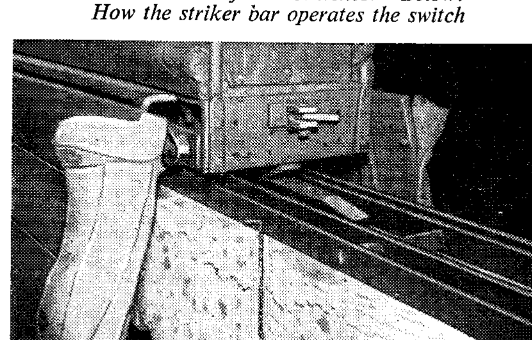



FIG. 1 CIRCUIT DIAGRAM

*Top of page: Track at Middlesbrough. Above: One of the switches. Below: How the striker bar operates the switch*



the section for the following train.

This process is repeated as the train passes over successive switches. The circuit as drawn is for a track divided into four sections, but more sections may, of course, be provided. Their number must be at least one more than the largest number of trains which will be run simultaneously.

You will see that the track switches must be held operated for a period greater then is necessary for the relays to energise and de-energise. With PO Type 3000 relays, a period of 1/10 second is reasonable, allowing for a slight change in the adjustment of contacts and for some drop in supply voltage. As the use of the automatic signalling system tends to increase train speeds somewhat, the length of the striker bar may have to be inconveniently large to provide this period at the highest speeds—particularly as the bar is best mounted on the unsprung part of the vehicle bogie to avoid variations in its height from the rail head.

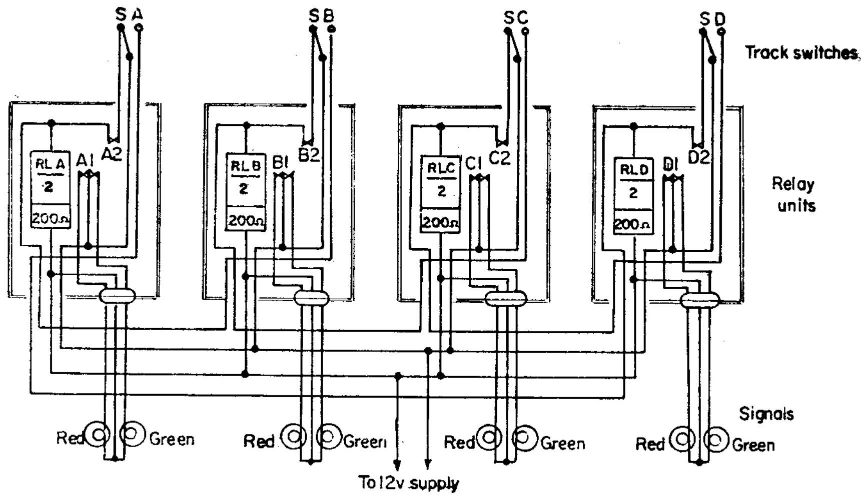
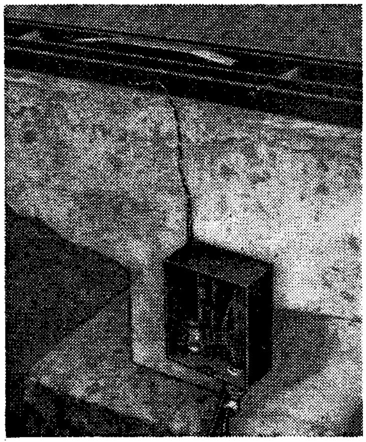
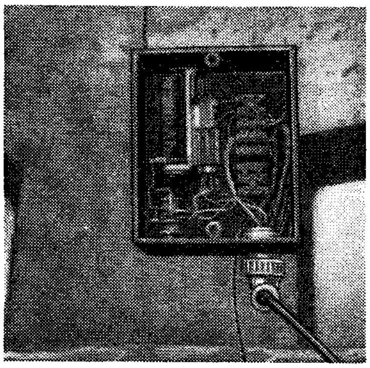


FIG. 2 WIRING DIAGRAM





*Two pictures of the relay box*

To alleviate this difficulty, a track switch assembly (Fig. 3) was designed which itself has an effective operating length of about 8 in.; 16 in. striker bars have given reliable service. The micro-switch, a Burgess V4 with a spring-lever actuator, is mounted inside a box (*1*) which is provided with bearings for the levers (*2*) and (*3*). At their outer ends, the levers are pivoted between lugs on the underside of the operating bar (*4*); the inner end of one of the levers is fitted with a brazed-in pin (*5*) which engages a fork in the end of the other and

● *Continued on page* 626

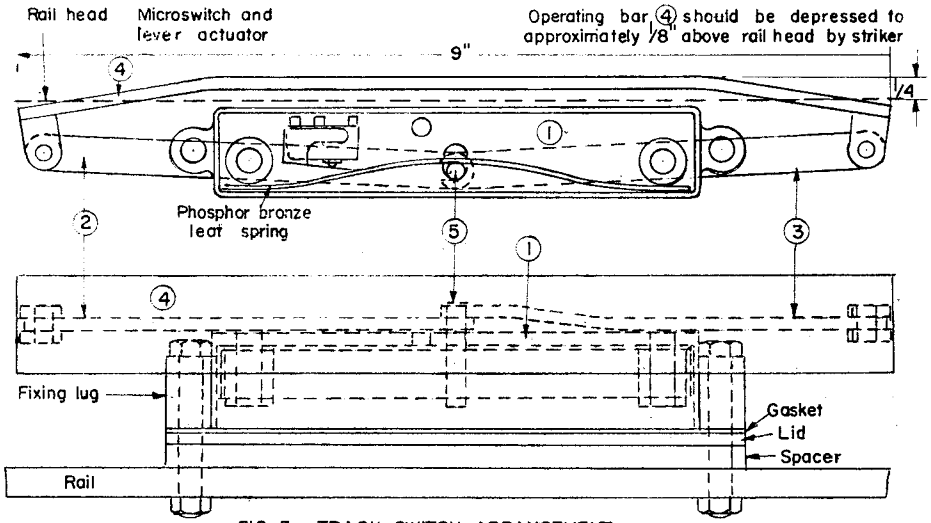


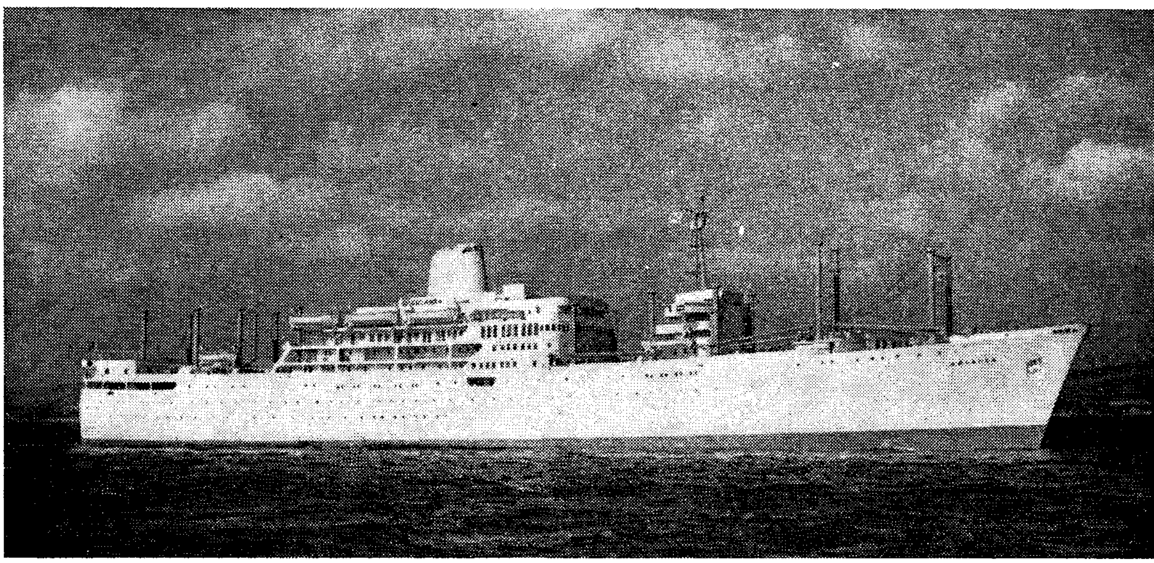
FIG 3 TRACK SWITCH ARRANGEMENT

# HANDSOME ARLANZA

***From London River ships of the Royal Mail Lines sail regularly to South America—a continent of Tomorrow. OLIVER SMITH writes here of the newest among them***

SHIPS of the Royal Mail Lines have long been a familiar sight on London River, where they berth at Tilbury Docks and the Victoria Dock in the Royal Group after arriving from South America.

Less than two years ago three handsome new liners, m.v. *Amazon*, *Aragon* and *Arlanza*, entered the company's service to grace its South Atlantic route. The *Arlanza*, the third of the trio to be built, was launched from the Belfast shipyard of Harland and Wolff on 13 April 1960 by Lady Dorothy Macmillan. Six months later, looking spick and span in the company's colours, white hull and superstructure, pink boot topping



and buff funnel and masts, she sailed proudly down the Thames on her maiden voyage to South America. Since then she has been seen at regular intervals with her sister ships in the River Thames. When I last saw her she was berthed in Tilbury Docks, preparing for her next sailing early in May.

She is of about 20,000 gross tonnage, with length overall 583 ft, length between perpendiculars 540 ft, breadth moulded 78 ft, and depth moulded to the upper deck 41 ft.

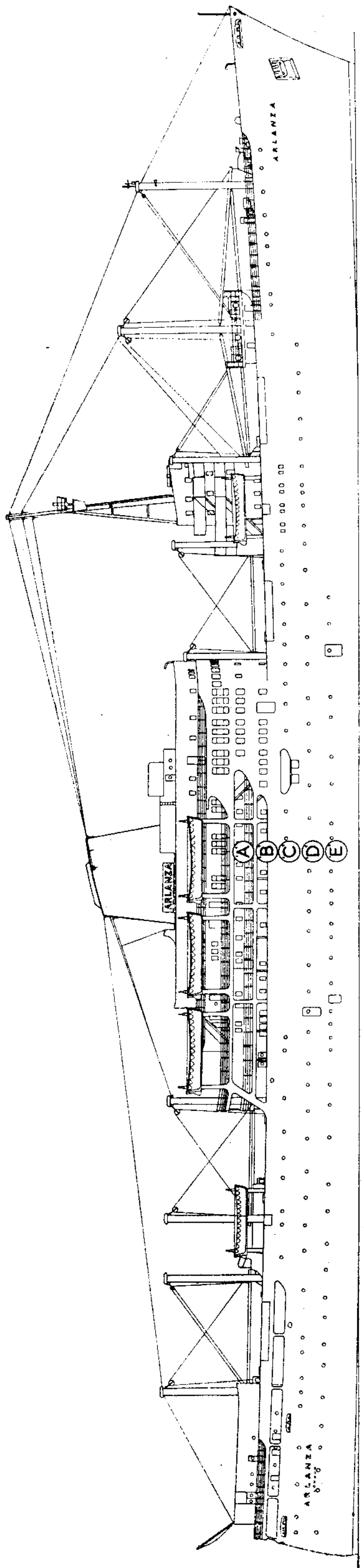
Twin four-bladed propellers driven directly from two single-acting Harland and Wolff-B and W six-cylinder two-stroke engines provide her with a service speed of 17½ knots. The engines, which are direct reversing, run on a heavy grade of fuel oil and at 110 r.p.m. develop 17,000 s.h.p. Each of them is fitted with an exhaust turbo-blower to supply the air required for pressure induction and for scavenging the cylinders during normal running. For starting, manoeuvring and prolonged periods of slow running, air is supplied from two electrically-driven auxiliary blowers.

The engines and turbo-blowers are cooled by fresh water circulated in a closed circuit. The pistons are cooled by lubricating oil. In turn, the lubricating oil and fresh water are cooled by circulating sea water.

After the exhaust gases leave the turbo-blowers they are put to a further use by passing into two waste heat boilers to generate steam for various heating services and for distillation. Forty tons of fresh water can be distilled daily by a Weir's plant to augment the ship's domestic supply. To make absolutely sure that the water is of drinking quality it is filtered through fine sand and sterilised in the chlorination plant.

Electric power is provided by four 750 kW diesel alternators fitted in the wings of the main engine room. A further diesel alternator for emergency use is fitted on deck and can maintain all normal services with the main engine room shut down.

*Arlanza* can accommodate about 450 passengers, divided into three




classes, First, Cabin and Third. First-class passengers are accommodated on A, B and C decks. Cabin class on C and D, and Third—275 of the total number—on D and E. All accommodation is air-conditioned. The First Class cabins have individual control of temperature and flow, and the others have volume control.

The crew's accommodation offers a high standard of living. With a few exceptions, crew members are accommodated in single-berth or two-berth air-conditioned cabins. A portable swimming pool is provided for their exclusive use.

Cargo space totals approximately 541,900 cu. ft, with the greater part, 485,000 cu. ft, insulated for the carriage of refrigerated goods. On the homeward run cargoes of chilled beef and fruit are carried.

Forty-five chambers and trunks are distributed over five holds and four 'tween decks. Each of the 45 chambers is isolated from the others, to prevent cross taint, by insulated gas-tight steel bulkheads. Access for loading and discharging is by insulated doors clad in aluminium. The required temperatures are maintained by the circulation of air in each chamber through numerous diffusers in the deckheads. The air is circulated by axial flow fans and is brought to the needed temperature by being passed over a cooler of pipes through which brine is pumped.

**Deodoriser**

A new method of deodorising cargo spaces has been introduced after satisfactory tests with other ships of the company. It employs ultra-violet lamps which irradiate an air stream from fans, converting some of the oxygen to ozone, a powerful agent for destroying odours. With this plant, any smell remaining from a fruit cargo is quickly eliminated before another cargo is loaded.

The remaining cargo space of 56,000 cu. ft is used for stowing general cargo, including passengers' cars. Among the lifting machinery for handling cargo are two 15-ton, four ten-ton, two seven-ton and twelve five-ton tubular steel derricks, and twenty electric cargo winches.

Great care is taken for the safety of passengers, as well as for their comfort and pleasure. M.v. *Arlanza* has all the latest radio and technical aids for navigation and a fire detection and extinguishing system which gives automatic indication to the Bridge. All accommodation has a Grinnell Sprinkler extinguishing system. And to reduce the roll of the ship in rough water Denny Brown stabilisers are installed. ▣

## AUTOMATIC SIGNALLING ...

*Continued from page 624*

projects into the box. A length of $\frac{1}{2}$ in. × 18 s.w.g. phosphor bronze strip inside the box passes over this pin and under the bearings, and serves the dual purpose of holding the operating bar in the raised position and working the micro-switch when the operating bar is depressed.

You bolt the switch to the most convenient running rail with spacers to centralise it. On the Middlesbrough track the switch was fastened to the $3\frac{1}{2}$ in. gauge rail with a $\frac{1}{4}$ in. spacer between the rail and the lid of the switch box.

The three wires from each of the switches are led to the relay units mounted on the side of the concrete track arches. Each unit comprises a relay—a 200 ohm coil, with a normally-open contact, a changeover contact, a terminal strip for connection to the track switch, and the underground leads, housed in a steel box. A three-way socket takes the lead to the signal.

At Middlesbrough a small bridge rectifier is fitted in each unit to provide a d.c. supply for the relay, the system being transformer-fed from the mains. Three underground leads provide the inter-connections from each relay unit to the next. Two must be heavy enough to carry the total current to the lamps and should, if possible, be run in the style of a domestic ring-main. The other need only be heavy enough to carry the relay coil current. PVC insulated 14-010 and 7-0076 leads should be satisfactory in most instances.

It pays to position the bulbs and lenses carefully so that they give a good beam of light. This is especially important when the signal stands on a part of the track where it may—on rare occasions—have to be seen against strong sunlight. ▣

## ME HANDBOOK

Have you got the new edition of the *Model Engineer Handbook* ? This useful book, which should be on the shelf in every home workshop contains nearly a 100 pages of useful information for the amateur engineer.

Drill sizes, conversion tables, lathe speeds, addresses of societies, clubs and other bodies, and informative articles are among the many features packed between its covers. It may be had for 3s. 6d., or 3s. 11d. by post, from Percival Marshall Ltd., 19-20 Noel Street, London W1.

If you include another 6d. the Working Drawings Catalogue and the current books lists will be sent with the Handbook.

# READERS' QUERIES

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

- 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.

## Beginner in steam

I have recently decided to take up model engineering in steam, and I should like to start with small steam engines for the amusement of my small sons, and progressing to a scale model of a showman's traction engine. Can you tell me of any suitable books ? —E.J.P., Partridge Green, Sussex.

▲ *As a first exercise in steam construction, ME strongly recommends a single-cylinder double-acting engine, such as the Stuart* 10. *The ME handbook* Building a Steam Engine from Castings (2*s*.), *describes the construction of such an engine step by step, with detail drawings and illustrations of machining.*

*Castings for the Stuart* 10 *engine are obtainable from Stuart Turner Limited, Henley-on-Thames, Oxon, and are also stocked by most model shops. This engine would be a useful first subject towards constructing a working model of a showman's traction engine, as the working parts are essentially similar. The handbook* Model Stationary and Marines Engines (9*s*. 6*d*.) *gives much information on small steam engine design and construction, and PM Plans Service can supply working drawings of various steam units, including traction engines.*

## Lathe motor

A very good Denham lathe which I bought recently is fitted with a 1 h.p. motor. The details from the identification plate are: phase 1; volts 460; rating, continuous; h.p. 1; cycles 50. There are two terminals to the junction 60.

Your advice would be much appreciated on whether the motor would run on 230 v. single-phase, and whether it could be adapted to do so without re-wiring.—A.W.G., Darlington, Co. Durham.

▲ *A motor designed to run on* 460 *v. may possibly run at its rated speed on* 230 *v., though this is doubtful. In any event, it would produce very little power. To convert it to run on* 230 *v., complete rewinding of the main and starting windings would be necessary.*

## Black Five not red

I have long been trying to discover whether one of the Stanier 4-6-0 locomotives known as the "Black Fives" was ever painted in LMS red livery. So far all my enquiries have indicated "No."

But Martin Evans, in an article on 19 January last year, said that in 1934 "the new Stanier 4-6-0s . . . were still painted in the red style." Perhaps, therefore, you can enlighten me on this point as I cannot help feeling that at some time or other one of these engines may have been painted red.—W.W.H., Bromley, Kent.

▲ *All the class* 5*MT* (*Black Fives*) *of the LMS were painted black.*

*Possibly you have a picture of one of these engines taken in " shop grey " which gave you the impression that the colour was red.*

*In the passage you quote, Martin Evans was referring to the* 5*XP class, which were painted LMS maroon.*

## Centaur gas engine

I am making the Centaur gas engine and am preparing to secure the plate in the rebate of the baseplate so as to form the fuel reservoir.

The drawing indicates that this plate is cemented in the rebate. I shall be greatly obliged if you will tell me of what this cement consists. —P.W.H., Godalming, Surrey.

▲ *The type of cement recommended for securing the plate in the rebate of the baseplate casting is one based on synthetic resin, which makes a lasting bond with metal and becomes completely insoluble in any ordinary fuel. The cements in this class include the following*:

*Araldite, Devcon Plastic Metal, Holt's Plastic Metal, and Bondaglass Resin. Most of these products are available from tool dealers and ironmongers.*

## Jacobs chuck

I have just bought a No 7 0-¼ in. capacity Jacobs chuck which I intend to fit to a shaft as Ian Bradley has described in ME.

It has a tapered hole (No 2 Morse ?) but there is no hole right through to fit a screw. I am sure that the screw is necessary because it is such a short taper. Should I machine a hole at the end of the tapered hole to clear a screw, and would this allow the screw to be inserted past the chuck jaws, or would I have to dismantle the chuck ? If so, how should I do this ?—S.J.W., Welling, Kent.

▲ *The taper employed for fitting the shank to Jacobs chucks is not a Morse taper, but one which has been standardised by the Jacobs Company. It varies in different sizes, but for your chuck, which is presumably No* 1, *the taper is* 0.92508 *in. per ft.*

*As direct adjustment of the swivelling slide to so fine a taper is almost impossible, some trial and error work will nearly always be found necessary, and you should test the taper with marking colour as fitting proceeds.*

*The fitting of a screw to retain the chuck on the taper is not a standard provision on Jacobs chucks, and the makers generally consider that, with a properly fitted taper, no such provision is necessary. It is not necessary to dismantle the chuck if you wish to fit a screw, but the jaws should be opened to their widest extent, and the size of the screw head be arranged to pass through them.*

*Full details of the tapers for all the various sizes of Jacobs chucks are given in the* ME Handbook (3*s*. 6*d*.) *which also contains a great deal of useful tables and other workshop information.*

**BY THE EDITOR**

**SO many queries are received by Model Engineer that they impose a serious strain on the magazine's staff and advisers. Hundreds of questions on a great many subjects are answered through the post each week.**

**Many who write do not comply with the simple conditions which are set out in the heading to the Readers' Queries page. Though we dislike sticking to the letter of the law, the time has come when we must insist on these conditions being observed. Unless a stamped addressed envelope and a query coupon is enclosed queries will not be answered.**

**Many questions are being sent by non-readers and there is danger that the service will be swamped. The conditions are framed to give preference to regular readers and to ensure that the Readers' Queries Service benefits those for whom it is designed.**

## Road locomotive

I am redesigning the cylinder block of my $1\frac{1}{2}$ in. showman's road locomotive and I wonder if you can help with the valve and port sizes.

I have room for a fair amount of port, but what I want is port and valve sizes for a maximum of $\frac{1}{4}$ in. valve travel in full gear, I would like the cylinders to be efficient, using 100 p.s.i.

What percentage of the port size should the passages to the cylinder ends be ?—R.Y., Frome, Somerset.

▲ *You have made things difficult by limiting the maximum valve travel to only $\frac{1}{4}$ in., which is rather short for efficiency.*

*Assuming that this valve travel is all you can allow for, the proportions suggested are: ports $\frac{1}{16}$ in. × $\frac{5}{8}$ in. (h.p. steam), 5/32 in. × $\frac{5}{8}$ in. (h.p. exhaust), $\frac{1}{16}$ in. × 1 in. (l.p. steam), 5/32 in. × 1 in. (l.p. exhaust) and port bars 3/32 in. This gives you the desired $\frac{1}{4}$ forward-gear valve travel and $\frac{1}{16}$ in. lap.*

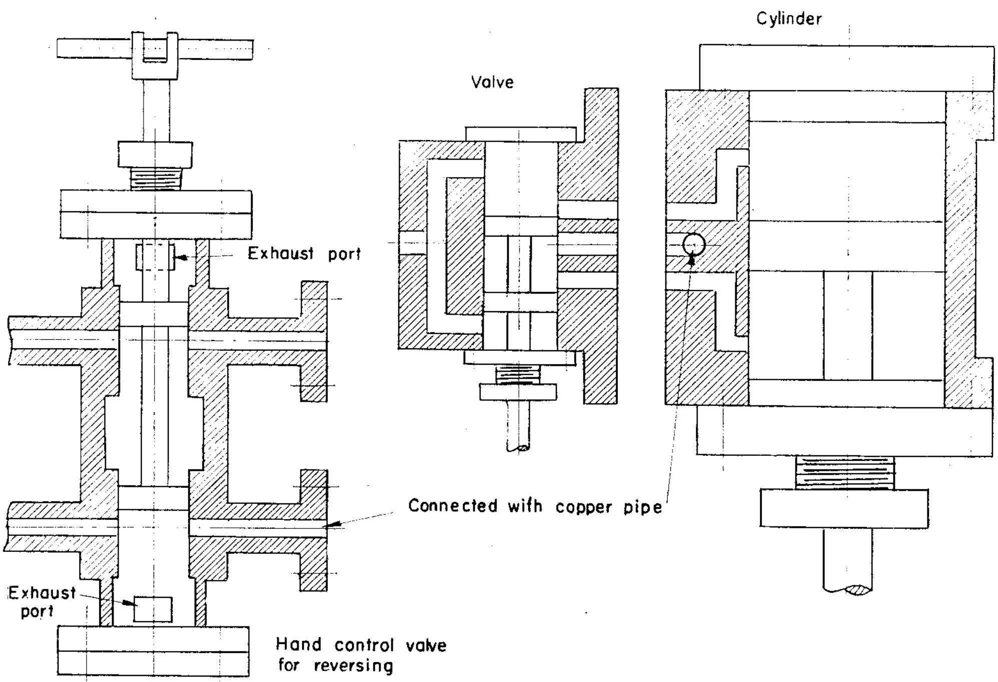
*Set the h.p. valves to give 1/100 in. lead and try the engine with l.p. line for line (no lead). If it is sluggish, reset the eccentric of the l.p. to give 1/100 in. lead. If it is still sluggish, try adding 1/64 in. exhaust clearance to the l.p. valve as well as the h.p.*

*You would do well to use the full 100 lb. pressure, but make sure that your boiler will stand it.*

## Reversing motion

I am building a steam engine and I find the reversing motion unusual and very effective.

Can you tell me anything about this type of reverse ? Why was it not in general use and for what work would this engine be suitable ?—J.S., Earlston, Berwickshire.




*Vertical twin with 2 in. bore and 2 in. stroke. Valves and pistons are fitted with cast-iron rings; the spoke fly-wheel is $6\frac{1}{2}$ in. dia. Reversing motion has no mechanical linkage, but the centre valve is hand operated. When the valve is pressed down the steam feeds through the exhaust ports and exhausts through the inlet ports*

▲ *This particular method of reversing is by no means unusual, and will be found in some simple engines, for such duties as winches, ash hoists and steering gear on ships.*

*It is not used on large or important engines; it is not economical because it operates by changing over the exhaust and inlet ports of the normal piston valve. To use lap and lead is impracticable as steam cannot be employed expansively.*

*The gear is also unsuitable for use with a normal flat slide valve, as reversal of steam and exhaust connections would cause the valve to be lifted from its seat. But the simplicity of the gear enables it to be used in engines where ability to manoeuvre is more important than economy.*

## Traction engine

I am contemplating building a model traction engine, and I would like to know if you have any designs suitable for a beginner. Are castings commercially available ? I would like an engine capable of towing persons. What scale would this be ?

I have a lathe and oxy-acetylene welding and brazing gear, and the usual hand tools.

I am a newcomer to ME and find it a very interesting magazine.—N.J.P., Pinner, Middx.

▲ *No traction engine is particularly easy for a beginner, but it is a great asset to have a good set of detailed plans.*

*The Allchin (Ref. TE 11) $1\frac{1}{2}$ in. to 1 ft, the ME Traction Engine (Ref. TE 1) 1 in. to 1 ft, or a 2 in. scale Burrell,* THETFORD TOWN, *by Dick Simmonds, 5 South Road, Erith, Kent, should be suitable.*

*Castings for the Allchin may be had from Reeves Limited, of 416 Moseley Road, Birmingham 12, and castings for the ME Traction Engine from Bond's O' Euston Road, 257 Euston Road, London NW1. Dick Simmonds will also supply castings for* THETFORD TOWN.

# 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*

## BELGIAN ORGAN

SIR,—I am writing this letter on behalf of my friend Mr R. C. Hooghuys, of the famous firm of fair-organ builders at Grammont in Belgium.

In 1924 they delivered a new 89 or 90 key organ to a Mr H. Thurston, of Rugby, England, who was an amusement contractor. Mr Hooghuys would very much like to know if this organ is still in existence.

I hope that one of the many showman's engine enthusiasts who read ME may be able to help.

Zeebrugge, Belgium. A. S. BURTON.

## PADDLE ENGINES

SIR,—On page 395 of ME for March 29, Mr R. R. May mentions that the engines of the steam tug *Despatch* of Lowestoft could be disconnected.

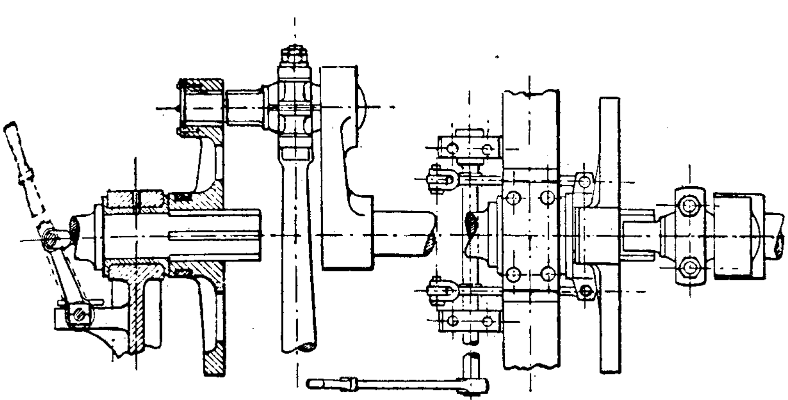
I had the great luck to find a copy of Reed's *Engineer's Handbook* for 1897, where the disconnecting mechanism is shown as Fig. 315 (reproduced on this page).

The crank is fixed to the paddle shaft. Its pin projects to the left and enters a hole in a disc.

To disconnect the engines, the lever is pulled to the left, as shown. Links pull the collar which rides on the boss of the disc, and the disc moves to the left on the splined shaft

The labour of shifting this gear, after an engine had become a bit worn, can well be imagined; no wonder Mr May found that the engines were generally worked separately. These engines were among the most complicated used at sea. Of course, one detail had to be attended to when disconnected, the lever had to be firmly latched or secured, as uncontrolled re-engagement would mean a disaster.

Mill Hill, London. H. H. NICHOLLS.



*Mechanism for disconnecting the engines of a steam tug. The illustration comes from Reed's* Engineer's Handbook *of* 1897

## RUSTING AWAY

SIR,—I was pleased to read in ME of Mr Carroll's discovery of a Whitting Bull tractor. I should like to see more in ME on paraffin tractors of the First World War and the Twenties for there seems to be little about them. In the North Oxfordshire area I know of at least two paraffin tractors of, I think, the Twenties. Both are Fordson, with iron wheels and the back ones spiked.

Only one tractor is in working order. The other was standing by the side of a road rusting away when I last saw it.

Does anyone know of a Saunderson tractor still in existence? I believe that they had two cylinders and a large toolbox over the front axle. I should like to see more 1920 tractors preserved, such as the Allday, Titan, Mogul, Overtime, Fiat and Wallis.

In a scrapyard just outside the town of Shipston-upon-Stour in Warwickshire two old steam portable engines are rusting away. A rusty old iron nameplate on the back of the firebox bore the name "Barrows Ltd, Engineers, Banbury, Oxon." The number was 102.

The engine had a cylinder behind the chimney, and over its firebox were mounted two large flywheels. It was similar to the Barrows traction engine of 1879. The boiler bands and other brasswork had long gone.

The other engine was a Wantage machine of the 1890s and was in fair condition though it had not been in steam for years.

Banbury, Oxfordshire. TONY T. GRANT.

## WRONG ROUTE

SIR,—While I was reading Stephen Musgrave's letter under the heading "Old Postcard," I remembered being told by my father of such an accident. He now confirms that the postcard records an occurrence which he mentioned last summer when we spent an afternoon near Barming in Kent.

The engine was an Aveling and Porter $9\frac{1}{2}$-ton general purpose YLD owned by Chittenden and Simmons of New Hythe near Maidstone. The accident happened during the summer of 1914 while the engine was being driven from Yalding to the New Hythe Depot. The driver was following the Yalding-Farleigh road and was uncertain of the route. He was directed—no doubt inadvertently—across the Medway at Barming bridge to join the Maidstone-Tonbridge road. It was at Barming bridge that the accident occurred.

It is said that the driver observed the incline at the opposite side of the bridge and was firing up as he approached, not noticing the relatively flimsy structure.

I would add that my father, an old engineman, can tell many traction engine tales as well as any old salt relates his stories of the sea. My children and I have listened for hours while he has told of his experiences. We also enjoy our visits to the Weald of Kent Rally where we engage in conversation with his acquaintances.

Gillingham, Kent. D. GILES.

[*William T. Grice of Barming, who watched the recovery of the engine, says that the accident occurred on* 28 *April* 1914, *and that there are two photographs of it in the local hostelry. This correspondence is now closed.*—EDITOR.]

side wings to the smokebox? All St Rollox engines had these handsome adornments from Drummond's time to 1913 when Mr Pickersgill took over? I am still waiting for someone to make a model of the famous "Cardean" or "Sir James Thompson" 4-6-0 locomotives. I would go a long way to see one of these models, being completely surfeit with *Black* 5, *Juliets*, and so forth, seen on any club track.

Stockport, Cheshire. W. TUCKER.

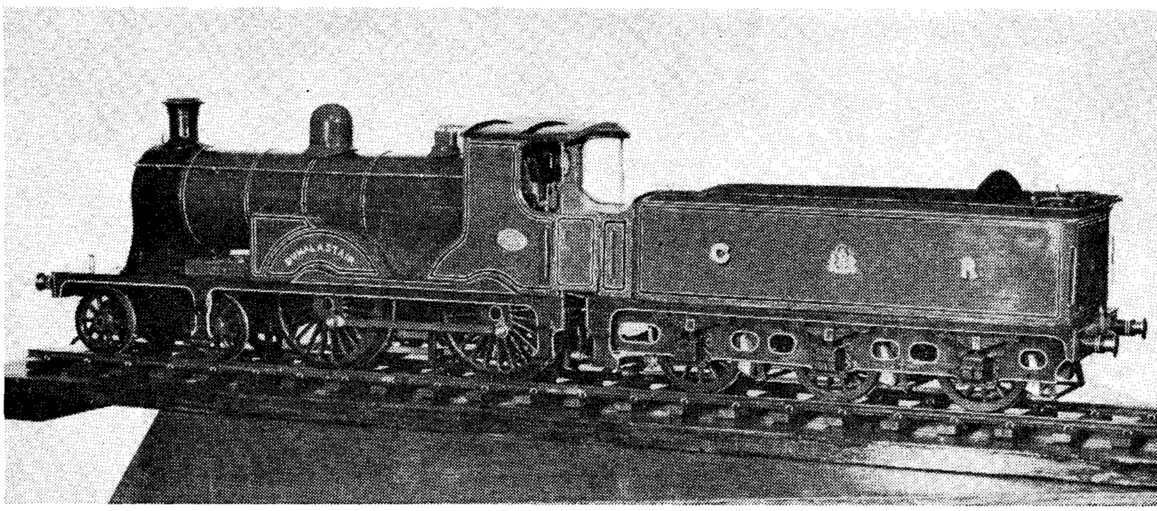
## JUBILEE CLOCK

SIR,—I thought I had better let readers know that there is a misprint in my last article on improving the Jubilee clock; I made a typing error and corrected it by typing over the top without erasing the error first.

It occurs in the top line in the left-hand column on page 292. It reads "$\frac{3}{16}$ in. and $\frac{1}{8}$ in. radius," and it should read "$\frac{3}{16}$ in. and $\frac{3}{8}$ in. radius." As this is to do with a rather important part of the clock I thought I would mention it.

The articles were laid out very nicely.

Billingshurst, Sussex. J. H. WILDING.



*Mr A. Eastham, of Stockport MES, took this picture of a* $3\frac{1}{2}$ *in. gauge* DUNALASTAIR *made by Mr W. Tucker*

## DUNALASTAIR

SIR,—Your issue for March 22, pages 381-382, publishes an interesting letter from Dr Stilley of Derby and shows a photograph of Dr Stilley's model Caledonian Dunalastair. I am equally keen on the locomotives of what was known as the "True Line," as reference to the first issue of the New MODEL ENGINEER in 1955 when you published some drawings of mine of CR No 721 *Dunalastair*. I am enclosing a photo of my own $3\frac{1}{2}$ in. gauge *Dunalastair* taken recently by my friend Mr A. Eastham of the Stockport MES.

I should like to suggest, with all due friendliness to Dr Stilley, that his locomotive is scarcely accurate, as all the Caledonian Dunalastair II (and the III and IVs) all had double bogie tenders, only No 721 and her 15 sisters being provided with the six-wheeled variety. Also, please Dr Stilley, where are all the beautiful

## DUFFIELD TRIPLES

SIR,—I feel sure that the Sir Arthur Heywood who built little engines and made his own railway was the Sir Arthur the campanologist. This would not have been unusual at a time when the Squire might interest himself in the "exercise," as it is called.

The nomenclature of bell-ringing is almost a language of its own. By the name given to a method the ringer knows that it is rung on a certain number of bells.

Sir Arthur Heywood composed a bell method which he named "Duffield," presumably after his home. If it were rung as an "odd" bell method on, say, eight bells, it would be known as "Duffield Triples." This would mean that, although eight bells were ringing, only seven would be changing, and the heaviest and lowest toned bell, the tenor, would come last, or behind, as ringers say.

If all eight were changing, the term would be "Duffield Major."

It is recognised that the queen of odd bell methods is Steadman. Duffield is a somewhat similar method, but it failed to become popular. It is, or was, included in a test book entitled *Standard Methods* of which most ringers would know.

Today we often hear of Steadman but very rarely of Duffield.

Redhill, Surrey. BERNARD H. WELLS.

## TITANIC PICTURE

SIR,—I was much interested in the picture of the *Titanic* in MODEL ENGINEER. But three things rather puzzle me. Not even a wisp of smoke comes from any of the funnels; I cannot detect any people on board; and I cannot discern any name on the hull, in any place.

I suppose that it really is the *Titanic*? It would be interesting to know when and where the picture was taken.

East Ham, London. A. S. G. PIKE.

[*Oliver Smith writes: Mr Pike's powers of observation will not qualify him to be a second Perry Mason.*

*Possibly the photograph was taken during the trials, which would explain the absence of people. With a vessel of this size it is difficult to discern individuals in a picture.*

*The absence of smoke is a good sign from the engineer's point of view; it shows that the boilers are being fired correctly. Only photographers like plenty of smoke to make their picture!*

*The ship's name has been "lost" in the several processes involved in photographing and blockmaking.*

*The picture was used for a special reason. It was one of the best showing her general proportion and, in particular, the eight lifeboats on the starboard side. A special point was made of this in the article. There was room for more lifeboats on both the port and starboard sides, but it was because of the belief that the ship was unsinkable that they were not considered necessary. After the sinking, laws were brought into force making it compulsory for ships to carry sufficient lifeboats for passengers and crew.*

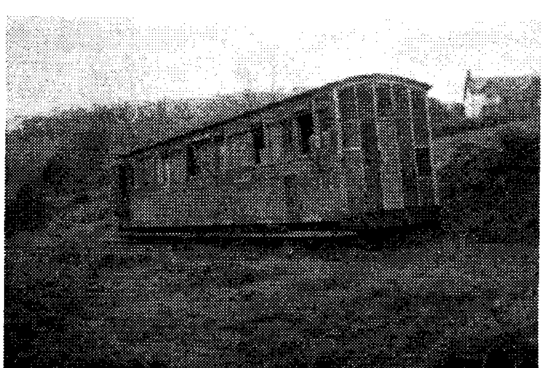
*In the illustration the lifeboats can be seen, four at the forward end of the boat deck and four at the after end.*—EDITOR.]

## LYNTON LINE

SIR,—It is reported in the *North Devon Journal Herald* that a society has been formed to re-open a section of the Lynton and Barnstaple Railway. The Secretary is stated to be Mr M. F. Woodward, of South Norwood.

The mention in ME of the Lynton and Barnstaple Railway coach prompts me to send a photograph taken a couple of years before its removal, when it stood on its own wheels on almost the only section of the original track left. It was in extremely bad condition, with all the interior partitions removed, and was used as a fowl house.

Lynton, Devon. F. G. SKEATES.



*Coach of the Lynton and Barnstaple line becomes a home for hens. A society has been formed to re-open part of this picturesque railway*

## PRESERVED PUG

SIR,—I would like to bring to your notice the fact that a Pug type 0-4-0 has already been preserved and can be seen on display. This engine is Bauxite No 2, preserved at the Science Museum in London.

Could not a locomotive such as an A3, a Raven 4-6-0, or H16 class 4-6-2T be saved ?

Duplication is all right when all the locomotives worthy of preservation have been preserved, but when the extinction of famous classes are in view, everything should be done to preserve them.

Stansted, Essex. N. PENWICK.

## FORCE OF SCREW

SIR,—I enjoy Geometer's articles very much. They are so good that I hope you will not mind if I point out rather a fundamental error which appeared on April 19 (page 481).

In explaining the force exerted by a screw, Geometer says that the mechanical efficiency of the system will be about 80 per cent. This, of course, is quite wrong. Any screw thread needs to have frictional losses exceeding 50 per cent to stay tight. You only have to consider a screw jack under a car to see that this must be so.

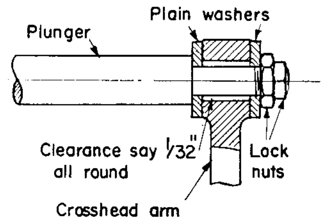
In fact, the frictional resistance must always be just greater than the tendency to run back under load. Or if you like, the mechanical efficiency of the screw must be less than 50 per cent for it to be self locking.

Hayes, Kent. NOLAN LAW. Group Captain RAF (retd.).

[*Geometer writes: I am grateful to Group Captain Law for pointing out the error. As he rightly says, a screw must have a mechanical efficiency of less than 50 per cent, or it is in the class of mechanisms which are able to overhaul. Threads of large pitch are able to do this, as many of us know from the Archimedean drills of our youth; and there is an example in the spin imparted to a bullet leaving a rifled barrel. But it is another story when a pitch is small. In the example given in the article, the pressure is 1,880 lb., which, it is said, will be reduced to about 80 per cent by friction (1,504 lb.). This is quite wrong. The reduction must be to 40 per cent (752 lb.).*—EDITOR.]

## FOR FIREFLY

SIR,—The feed pump for *Firefly* seems to be a sound and straightforward piece of design, but I would suggest that the drive from the crosshead arm should be slightly modified. As at present arranged, any slight misalignment between point and crosshead guide-bars, or any wear on crosshead or bars, will cause binding and wear on the pump ram, gland and barrel.




*Locknuts to be so adjusted as to leave the plunger end free to "float" in the arm but without any end shake*

If the top end of the driving arm is slightly modified, as in the sketch, the outer end of the plunger will have a small amount of float in the head of the driving arm, which will take care of any minor lack of true alignment or of slight wear in the crosshead or slide bars.

This is in no way to be taken as a criticism of Mr Evans' design, but merely as a suggestion for avoiding possible trouble. Mr Evans is to be heartedly congratulated on the quality and completeness of his drawings and their excellent dimensioning. Mr Evans is doing a splendid job very well indeed.

Rustington, Sussex. K. N. HARRIS.

[*Martin Evans writes: Mr Harris' suggestion for* FIREFLY'S *crosshead pump is an excellent one. As Mr Harris points out, it is not easy to avoid a slight misalignment between the pump ram and the slide bars, and the provision of a small amount of float solves the problem.*—EDITOR.]